Diversity and Development: The Interaction of Political Institutions with Social Context

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Abstract

This paper uses data from the Demographic and Health Surveys (DHS) to explore the interrelationships of ethnic diversity, political institutions, and development outcomes, such as education and public health indicators. Specifically, it tests the hypothesis that the effects of ethnic diversity on these outcomes are mediated by the degree of political competition and the geographic distribution of ethnic populations. The DHS data have been collected in dozens of countries using nationally representative samples. These data, however, do not include measures of political institutions. This paper is part of a broader project that will expand the datasets to include political indicators, facilitating both cross-national and sub-national analyses. The ability to use individual-level survey data, rather than national indicators of development, permits the measurement of inequality in outcomes across ethnic groups and trace these outcomes to political patterns in each country.

Previous research has established robust linkages between higher levels of ethnic diversity and worse outcomes in terms of health and education indicators, but there are many unanswered questions when it comes to explaining how these outcomes emerge and the manner in which the political and institutional context matters. Worse outcomes in diverse societies have been attributed variously to competitive rent-seeking, ethnic favoritism in public service provision, collective action problems, or divergence in preferences over public services. In all of these mechanisms, the effects of ethnic diversity are some function of the interaction between a country's political institutions and the manner in which ethnic populations are distributed within a country, but these relationships are neither fleshed out fully nor are the magnitudes of the effects well-understood. The goal of this project is to address these gaps in our knowledge.

In general, existing research comes in two forms. First, cross-national statistical studies provide evidence that overall ethnic diversity is associated with poorer performance on aggregate indicators of development. Second, studies of individual countries reveal the effects of ethnic diversity at the local or regional level. The former style of research typically does not incorporate information about the nature of a country's internal politics or the particularities of the distribution of ethnic groups in a country. The latter, by contrast, provides much richer detail about internal ethnic politics but lacks the leverage of cross-national comparison to estimate the causal effects of differing political institutions and ethnic population distributions. The research presented here seeks to occupy the middle ground between these two approaches, using individual-level survey data from a range of different countries to bring greater understanding of internal country dynamics to cross-national comparisons.

Specifically, this project uses data from the Demographic and Health Surveys (DHS) conducted during the 2000-2010 time period to gather information about health and education outcomes for members of different ethnic groups in 27 countries. It also uses the survey information to develop measures of the geographic distribution of the ethnic populations

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within each country. These data are employed to test hypotheses regarding how the effects of ethnic diversity on health and education outcomes, and inter-group inequality in particular, are mediated by the nature of politics and the geographic distribution of ethnic groups. Cross-national and multi-level statistical methods permit an estimate of the magnitude of these effects.

The next section highlights the main findings from existing research and explains how this project seeks to add to this body of work. Section 2 develops hypotheses regarding the effect of the interaction of ethnic diversity and political institutions on development outcomes. The subsequent section describes the new data this research will bring to bear on these questions, and Section 4 uses these data in a set of empirical tests. Section 5 concludes.

1   Ethnic Diversity and Development Outcomes

Several cross-national studies have found that ethnic heterogeneity, commonly measured by indexes of ethnic fractionalization, is associated with worse outcomes on range of different country-level indicators. On average, countries with higher levels of ethnic fractionalization have slower growth of GDP per capita (Easterly and Levine, 1997; Alesina et al., 2003; Montalvo and Reynal-Querol, 2005; Alesina and La Ferrara, 2005), lower levels of schooling (Easterly and Levine, 1997; Alesina et al., 2003), lower levels of public goods provision (Alesina et al., 1999; Kuijs, 2000; Ghobarah et al., 2004; Kimenyi, 2006), weaker responses to the AIDS epidemic (Lieberman, 2007), lower life expectancy (Ghobarah et al., 2004), higher child mortality (Kuijs, 2000; McGuire, 2006), and less effective governance (Easterly and Levine, 1997; La Porta et al., 1999; Kimenyi, 2006).

Complementing these cross-national studies are others that focus on individual country cases, permitting a closer look at the internal politics and disparities in outcomes across localities and ethnic groups. In a study of localities in western Kenya, for example, Miguel and

Gugerty (2005), find that ethnic diversity is associated with lower levels of school funding and well maintenance. Likewise, Banerjee and Somanathan (2007) find that social fragmentation (measuring both caste and religious divisions) within Indian districts is negatively associated with provision of ten types of public goods. Other case studies highlight the effect of politicized ethnicity in leading to group competition. The present study can contribute to this enterprise. Like Jackson (2007), Huber et al. (2011) and Franck and Rainer (2012), it occupies a position between cross-national studies and country case studies by using survey data to obtain more finely-grained information across multiple countries.

While the empirical linkages between ethnic diversity and poorer development outcomes are quite robust, there is not consensus over how they arise. Several potential mechanisms have been suggested in the literature, and recent work has focused on trying to determine which are the most influential (Habyarimana et al., 2007). One possible mechanism is that greater diversity creates divergence in preferences over public goods spending, leading to underprovision of public services and thus poorer education and health outcomes. A variant of this approach emphasizes the reluctance of members of one group to support spending on public goods if they perceive that members of other groups are the primary beneficiaries (Alesina et al., 1999). Another variant focuses more basically on disagreement over spending priorities (Easterly and Levine, 1997) arising from ethnic differences. For example, strongly divergent views over aspects of schooling such as the language of instruction could lead to lack of support for funding education. As Miguel and Gugerty (2005) point out, however, this theory does not explain why spending is also lower for public goods that lack any clear ethnic dimension.

A second mechanism is that diversity creates difficulties in collective action, leading to free-riding, "common pool" problems and the like. For example, Miguel and Gugerty (2005) find in Western Kenya that the ability of local leaders to use social sanctioning to collect funds for schools is reduced where there is greater ethnic diversity. It is easier to sanction

co-ethnics than members of other groups. Habyarimana et al. (2007) call issues such as these "technology" problems in that ethnically homogeneous societies may have a larger toolbox for solving collective action problems than heterogeneous ones.[1]

A third mechanism is that greater diversity leads to higher levels of social polarization and inter-group conflict. The result is competitive rent-seeking, wars of attrition, and sometimes violence. This mechanism is stronger than mere differences in preferences. In this case, ethnicity becomes politicized and used to create divisions in society. In such cases, rulers often employ clientelistic practices or provide public services in a manner that favors some groups over others. Padró i Miquel (2007), for example, theorizes that the fear of exclusion from patronage drives members of an ethnic group to support a co-ethnic ruler even when that ruler is generally interested in rent extraction. Development outcomes may even improve as measured by aggregate statistics, but such measures may mask internal inequality of results.

This role of political institutions is often left lurking in the background in this literature. There is little examination of how institutions interact with different social settings to affect the nature of public service delivery and thus development outcomes. Generally, the cross-national literature estimates the effects of ethnic heterogeneity across different institutional contexts. Much room remains, accordingly, to expand our understanding of the contexts in which ethnic heterogeneity is most influential.

At the deepest level is the role of political institutions in the construction of ethnic cleavages. The particular constellation of group identities that we observe, contend Chandra and Wilkinson (2008), is arbitrary. They represent a particular subset of possible identities that have become activated in either private or political life. As explained in Lieberman and Singh (2012), the presence of social diversity in terms of languages, physical traits, religions, and so forth is thus only a starting point. These differences become salient when political

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[1]Their category of "strategy selection" also addresses problems of cooperation that may arise in socially diverse contexts.

entrepreneurs "broadcast the observation that people with different skin color, height, language, ancestral home, style of dress, or other (combination of) traits are, in fact, distinct and separate communities" (Lieberman and Singh, 2012: 3). The extent to which these identities become institutionalized varies across countries.

One potential danger for empirical studies, accordingly, is whether measurements of ethnic diversity are meaningful. In other words, do fractionalization measures that measure diversity in linguistic or racial traits actually capture relevant diversity of ethnic identities? Posner (2004b), for example, argues that the common indices of ethnic fractionalization used in the cross-national literature are inappropriate for testing the political mechanism through which these effects are expected to materialize. Instead, we should count only groups that are politically relevant: those that participate in politics "as members of groups with distinct political identities" (2004b: 855). Posner's PREG index is an effort to measure cases in which ethnic groups are significant participants in conflicts over economic policies in African countries. This goal of measuring politically-relevant ethnic groups was advanced in the Ethnic Power Relations dataset (Cederman et al., 2009) with coverage worldwide coverage.

Measures such as these, however, carry with them a second potential danger: endogeneity. To the extent that measurements of ethnic diversity are designed to capture the presence of politicized ethnic competition, they naturally may be associated statistically with poorer outcomes on many of the developmental indicators described above. In other words, if our interest is in determining when and how underlying ethnic differentiation translates into poorer development outcomes, we want to understand the conditions under which particular social and political configurations produce ethnic groups that are "politically relevant" in Posner's terms and when they do not. The presence of politically relevant ethnic groups in this sense is a phenomenon closely associated with our outcomes of interest.

Lieberman and Singh (2012) grapple with this problem directly by exploring the extent to which states have institutionalized ethnic distinctions over time. These prior actions

of colonial and sovereign states in conducting censuses, creating legal documents such as identity papers, marking territorial boundaries, recognizing languages, and defining citizen and economic rights have lasting effects that serve to formalize ethnic categories. The value of this research is in providing an exogenous factor that helps explain the contemporary configuration of politically relevant in contemporary politics, permitting a clearer assessment of the causal effects of ethnic exclusion on various outcomes.

Similarly, this study rejects the idea that ethnicity is primordial in politics and argues instead that the political salience of group identities is affected by the actions of political elites and enshrined by institutions. The effects of underlying ethnic differences depend upon the degree of diversity, its geographical distribution, and the level of political competition. These factors interact with each other to create incentives for political actors either to activate ethnic cleavages or build broader political alliances. These same incentives affect the delivery of public services, and we can observe their effects in indicators such as infant mortality and years of schooling.

The role of democratic political competition in diverse societies is not clearly understood. On the one hand, the presence of political contestation and political rights may help mitigate the effects of ethnic diversity by inducing rulers to expand delivery of public services, by creating incentives to build broad cross-ethnic coalitions, and by protecting political losers from exclusion from public services. On the other hand, political contestation could intensify group loyalties and create incentives for the selective redistribution and public service provision along ethnic lines.

Both perspectives have empirical support in the literature. The benefits of democratic political competition are noted in Collier (2000), for example, who finds that the ill effects of ethnic fractionalization on economic growth are absent where levels of political rights (as measured by Freedom House) are high. Bluedorn (2001), with more sophisticated econometric methods, concurs with this finding but warns that our certainty is too low to prescribe

greater democracy in ethnically diverse regions as a solution to economic stagnation. Elsewhere, Rodrik (1999) finds that democratic institutions help resolve conflicts in ethnically diverse societies, facilitating recovery from economic shocks.

More recent empirical work finds that political contestation can intensify ethnic identification and thus may increase any ill effects of ethnic heterogeneity. Using survey data from 10 African countries, Eifert et al. (2010) find that survey respondents are increasingly likely to identify themselves in ethnic terms as a presidential election draws nearer. Evidence in Franck and Rainer (2012) supports the idea that this effect is driven by the fact that rulers show ethnic favoritism in delivering public services. Their study of health and education outcomes in 18 countries in sub-Saharan Africa shows health and education outcomes are substantially improved for members of an ethnic group when a co-ethnic holds power, the apparent result of targeted delivery of public services. Elsewhere, using a broader set of surveys, Huber et al. (2011) also argue that ethnic diversity serves as a convenient basis for politicians to engage in strategic redistribution. They attribute the lack of success of democracy in reducing overall levels of economic inequality to the fact that targeted redistribution is much more efficient than general redistribution for building political support and that ethnic groups offer a convenient set of targets.

One possibility is that political competition exacerbates the harmful effects of ethnic diversity in some cases but ameliorates them in others. For example, the effects of political competition may depend upon not only upon the degree of heterogeneity but also upon the geographic distribution of ethnic groups in a country. The next section develops a simple theory that illustrates why a conditional relationship of this kind is possible, and the empirical approach taken in this paper offers the ability to gain some leverage to test this proposition.

The DHS provide individual- and household-level data on health and education, along with ethnic identification in many of the surveys. These data can be aggregated at various

levels – survey cluster, region, and country – and surveys from several countries can be combined to permit multi-level statistical analysis. Here, I seek to measure the extent to which health and education outcomes diverge across a country's ethnic groups, and it extracts some information about the geographic distribution of ethnic groups inside each country. Incorporating data on political factors, such as the level of political rights or political contestation, facilitates tests of the interaction of these factors with differing ethnic distributions. Future work will attempt to add more information concerning domestic politics, such as the nature of domestic political coalitions and party representation of country regions.

While acknowledging the problems described above with measuring ethnic diversity, this study relies on the ethnic classifications employed in both the commonly-used indices of ethnic fractionalization[2] and in the DHS surveys. Even though these classification systems are at least to some degree socially and politically constructed, for this project they are preferable to measurement strategies that explicitly eliminate or combine ethnic categories into groups based on whether they are observed to have distinctly political identities. Instead, the emergence of these political constellations of ethnic categories is something that this line of research potentially can help explain.

2   Formulation of Hypotheses

Although the research cited above is consistent in finding that higher levels of ethnic heterogeneity, as measured by ethnic fractionalization at the country-level, are statistically linked with poorer development outcomes on average, fractionalization scores do not capture relevant information about the geographic distribution of ethnic populations. Countries can have similar ethnic fractionalization scores despite being very different in the extent to which groups are geographically concentrated. To understand the role of political competition and its interaction with ethnic heterogeneity, we would like to know more about the degree of

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[2]In particular, that of Alesina et al. (2003).

ethnic heterogeneity at subnational levels and its impact on development outcomes.

Specifically, three sets of questions are explored in this work. First, is the relationship that we observe at the cross-national level between greater ethnic heterogeneity and poorer development outcomes also present internally within countries? Second, what is the role of political competition, if any, in shaping how these outcomes emerge? Third, to what extent does the geographic distribution of ethnic groups affect the nature of ethnic politics and thus development outcomes?

With respect to the first question, each of the mechanisms described above suggests that localities with higher levels of ethnic diversity will experience worse development outcomes than those that are more homogeneous. Whether ethnic heterogeneity works through the mechanisms of differing preferences, collective action problems, or social polarization and conflict, local provision of public services should be less extensive in localities where heterogeneity is higher.

Additionally, if ethnicity is a convenient basis for rulers to target delivery of public spending, we might expect that more diverse areas would tend to be neglected relative to more homogenous areas populated by favored or politically-important groups. Such targeting could be facilitated when there is geographical separation between groups such that public services provided in one area effectively exclude other ethnic populations. Alternatively, it could be that political organization along ethnic lines becomes more difficult when ethnic populations are widely dispersed and the local-level of ethnic diversity is high.

Hypothesis 1 *Localities with greater ethnic heterogeneity will have worse outcomes in health and education indicators than those with greater homogeneity.*

If the evidence instead shows that local levels of ethnic diversity make no difference for development outcomes, it would be logical to infer that while ethnic heterogeneity may have strong impacts at the national level, the geographic distribution of ethnic groups is not important given a particular level of ethnic diversity. Alternatively, the evidence could

reveal that local-level diversity is associated with better development outcomes, which might arise if local diversity is beneficial by preventing the domination of minority groups by larger groups. Yet, it would be difficult to reconcile such an outcome with the robust findings in the cross-national literature. Heterogeneity would have to be harmful at the country level but helpful at the local level.

The second and third hypotheses concern the interaction of ethnic heterogeneity with political contestation. Recall the findings from the cross-national literature. On the one hand, at the aggregate country level political contestation appears to ameliorate the negative effect of ethnic heterogeneity, which is consistent with a story that it forces political elites to reach out more broadly for votes, expanding public services to increase their political appeal. As contestation increases, more groups should be incorporated into the system. Political competition should thus lead to better development outcomes on average, mitigating the negative effects of ethnic heterogeneity. Localities where heterogeneity is high should not perform substantially worse than localities where heterogeneity is low.

On the other hand, to the extent that politicians have strong incentives to target particular constituencies with public services areas with greater ethnic diversity would be less attractive targets, since it would be more difficult to restrict usage of these services to group members compared to areas where these groups are dominant. In this case, raising the level of political contestation would not improve outcomes in more diverse localities.

These two sets of findings are not mutually exclusive. Political contestation can improve development outcomes in the aggregate while having at the same time having varying effects inside countries according to local-level of ethnic diversity. This prediction is expressed in Hypothesis 2.

Hypothesis 2 *Political competition is less effective at improving development outcomes where local-level ethnic heterogeneity is higher.*

This hypothesis should be rejected if the data show that diverse localities either perform

better or no differently than less diverse localities in the presence of greater political competition. Additionally, the data could show that the most diverse areas actually do worse as political competition increases. Evidence of this kind would also call for the rejection of Hypothesis 2.

Moving to the country level, information regarding the degree to which ethnic groups are concentrated in particular areas permits a fuller exploration of the cross-national data than the usual ethnic fractionalization index. Consider two countries that are equally heterogeneous in terms of a fractionalization index but have different geographic distributions of ethnic groups. In one case, the members of all ethnic groups are spread uniformly throughout the country, so that all regions are as heterogeneous as the country overall. At the other extreme is a country where the members of each ethnic group are concentrated regionally, such that individual regions of the country are essentially homogeneous. Work by Posner (2004a,b) reveals the importance of thinking about the larger geographic context in which ethnic groups are situated.

The first case, where heterogeneity is even throughout the country, represents the country-level counterpart to Hypothesis 1. Given the findings of the existing literature, we expect to see poorer development outcomes in countries with more diffuse, but diverse, ethnic populations. In the case where ethnic groups are geographically concentrated, however, development outcomes should be better in the aggregate. Regional homogeneity would mitigate local collective action problems and differences in preferences. This analysis suggests the following hypothesis:

Hypothesis 3 *Ethnic heterogeneity has a less detrimental impact on a country's overall health and education outcomes when ethnic populations are more concentrated geographically.*

This claim, if supported by empirical evidence, would bring a significant modification to the existing literature. It would point to the importance of the collective action and preference mechanisms. Yet, ethnic polarization at the cross-regional level nevertheless remains a

possibility. National politics, for example, may involve competition on ethnic/regional lines and perhaps the emergence of ethnic parties. Where a single ethnic group, or a small number of groups, is politically dominant, facing little electoral competition, we might expect those in power to channel greater resources to their own group members, excluding other groups. Geographical concentration of ethnic groups facilitates such transfers, since resources spent on public services can be effectively targeted toward group members. Concentration may thus create inequality of development outcomes.

Yet, when electoral competition is very high, there are stronger incentives to reach out to other ethnic groups, forming broader coalitions. Additionally, resources may be spread more widely in an effort to build electoral support from other regions. Political competition thus may mitigate the effects of ethnic group concentration on the level of inter-group inequality of development outcomes.

Hypothesis 4 *When the level of political competition is low, geographic concentration of ethnic groups leads to greater cross-group disparities in health and education outcomes. This effect decreases as the level of political competition increases.*

Evidence consistent with this hypothesis would support theories that emphasize the role of ethnic groups as a convenient set of targets for politicians, but it would serve to cast doubt on theories that emphasize the role of shared ethnicity as a tool for facilitating collective action. Conversely, if geographic concentration is instead found to be associated with lower cross-group disparities in development outcomes, the story of targeted resource distribution would be less plausible.

Finally, I examine the role of geographic distance between the center of an ethnic population and the center of the national population. Greater distance could lead to worse outcomes for two reasons. First, the physical separation of a group could translate into reduced access to public services due to isolation or other difficulty in delivering services over distance. Second, greater distance could help facilitate targeting of ethnic groups by

making it easier to exclude other groups from otherwise public services through geographical separation.

Hypothesis 5 *Greater geographic distance of ethnic groups from the population center leads to greater cross-group disparities in health and education outcomes. This effect decreases as the level of political competition increases.*

Testing these hypotheses requires sub-national data to measure development outcomes at the individual- or group-level, as well as information concerning the geographic distribution of ethnic populations. These kinds of indicators can be extracted from survey data and then merged for use in multi-level or cross-national analysis.

3   Data

The DHS surveys, managed by ICF Macro and funded by the U.S. Agency for International Development and other donors, began operation in 1984 in order to gather data regarding a range of health and population trends in the developing world. Since that time, over 240 surveys have been conducted in 85 countries.[3] The surveys are statistically-representative, large-sample surveys of households, and they are designed to be comparable across countries. Not all surveys ask respondents about their ethnicity, however. In particular, I draw upon 27 surveys conducted during the period 2000-10.[4] The surveys use multi-stage sampling techniques, so individual data can be linked to others in the same survey cluster.

I focus on the survey of women, which includes information regarding infant mortality, vaccinations, and many other health measures, as well as measures of education and literacy. The surveys also include geographical information at varying degrees of precision. This information can be used to measure the geographic concentration of ethnic group members.

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[3]See http://www.measuredhs.com/aboutdhs/ for additional information.

[4]Albania, Bangladesh, Benin, Bolivia, Burkina Faso, Burundi, Cameroon, Chad, Colombia, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Moldova, Niger, Nigeria, Pakistan, Peru, Philippines, Senegal, Sierra Leone, and Zambia.

Given variation in data availability concerning ethnicity and location, the number of countries that appears in individual statistical tests ranges from 15 to 27.

Survey clusters in most countries typically contain between two and three dozen survey respondents chosen at random, and each country's survey includes hundreds of clusters. By aggregating individual-level data to the cluster level, we can get obtain snapshots of a large number of locales. I use this technique to measure cluster-level ethnic fractionalization, average wealth, average years of education, the rate of infant deaths, and urban/rural designation.

Ethnic fractionalization is calculated according to the usual Herfindahl formula, where s_j is the proportion of the respondents in the cluster belonging to ethnic group j out of J groups present in each cluster k:

$$\text{EthnicFrac}_k = 1 - \sum_{i=1}^{J} s_j^2$$

Across the surveys that contained ethnicity information, there are 18,952 survey clusters. As measured within these clusters, ethnic fractionalization ranges from .0 to 1.0 with mean .294 and standard deviation .329. A fractionalization score represents the probability that any two individuals drawn at random would be from different ethnic groups. By comparison, the mean country-wide level of ethnic fractionalization in these countries as measured by Alesina et al. (2003) is .645 with standard deviation .177. Unsurprisingly, localities tend to be much less diverse than countries.

The mean level of wealth in each cluster is calculated using the wealth index factor that DHS calculates for each individual in the clusters. These scores are calculated using a range of questions concerning the assets owned by the individual's household, characteristics of the dwelling, type of drinking water, and type of sanitary facilities. Using principal components analysis, these data are assigned factor scores (weights) and summed up at the household level to measure wealth. Although complex, this method permits some cross-

national comparability in that trying to measure wealth through incomes would be difficult given differences in currencies, cost-of-living, and so forth. *Wealth* ranges from -1.9 to 6.1 with a mean of .031 and a standard deviation of .89.

Cluster-level infant mortality ($InfMort_k$) is measured by expressing the number of all infants born to survey respondents in each cluster that died before reaching 12 months of age as a rate of deaths out of 1,000 births. This method is consistent with the way that infant mortality rates are calculated in international statistics. The mean of cluster-level infant mortality is 57.5 with a standard deviation of 56.1. Years of education ($YearsEd_k$) are measured as the mean number of years for survey respondents in the cluster, and *Urban* is a dummy variable designating urban areas as 1 and non-urban areas as 0.

The individual-level data can also be aggregated to the country level to measure variables that capture inter-ethnic variation in development outcomes. For example, after finding the mean level of infant mortality for each ethnic group, one can calculate the standard deviation of these ethnic group means around the countrywide mean, weighted by group size. The larger this standard deviation, the greater the inter-ethnic disparities in the rate of infant mortality. The resulting variable is called *InfMortSD*. In the same fashion, I calculate *YearsEducSD*, the standard deviation in the mean years of education for each ethnic group. This approach offers the ability to gain some new insights, since cross-national studies typically aggregate all groups together.

To measure the geographic concentration of ethnic groups (*Concentration*), I use a formula that sums up the sums up the deviations of each region's share of the county's population from its share of each ethnic group. If the region's ethnic mix perfectly mirrors the composition of the country's ethnic mix, the region contributes nothing to the country's Concentration score. Deviations from the country's mix are squared and summed across all ethnic groups in a region and then across all regions. Let r be an index for regions and j for ethnic groups. Then, e_{rj} is the region's share of the ethnic group's national population, and

p_r is the region's share of the national population.

$$\text{Concentration} = \sum_{r=1}^{R} \sum_{j=1}^{J} (e_{rj} - p_r)^2$$

Finally, to measure the typical distance from the geographic centers of the ethnic populations in each country to the geographic center of the national population, I use Global Positioning System (GPS) data from those DHS surveys for which this information is recorded. With these data, I estimate the geographic center of each ethnic group using the mean latitude and longitude of the survey respondents that identify with the group. I do the same with all survey respondents to estimate the national population center. I then calculate the Great-Circle distance from the center of each ethnic population to the country population center, and to make this statistic more comparable across countries of different sizes, I normalize the distance by dividing by the mean distance from the population center of all survey respondents in the country. Finally, I aggregate the group-level data by calculating a population-weighted mean. The resulting variable is called *GroupDistance*.

For relevant political variables at the country-level, I draw upon several commonly-used datasets. The variable *PolRights* is the mean level of country's political rights score from Freedom House (2008) over the period 1975-2005. I use the mean value over this long period due to the assumption that the effect of political rights on development outcomes takes many years to materialize. Similarly, I use the Executive Index of Electoral Competition (*EIEC*) from the Database of Political Institutions (Beck et al., 2001). Additionally, I use the variable *Contestation* developed by Coppedge et al. (2008), which seeks to measure the dimension of democracy that relates to the degree of political competition.[5]

Finally, in order to measure a country's overall level of infant mortality, I turn to the statistics gathered by international agencies rather than rely on calculations from individual

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[5]These variable have been recoded and rescaled to run from 0 to 1, with higher values meaning greater political rights, electoral competition, or political contestation.

Table 1: Geographic Measures vs. EthnicFrac from Alesina et al. (2003)

Country	Concentration	GroupDistance	EthnicFrac
Philippines	0.82	1.01	0.24
Ethiopia	0.73	0.76	0.72
Kenya	0.58	0.91	0.86
Nigeria	0.55	1.02	0.85
Congo, Dem Rep	0.48	1.06	0.87
Burkina Faso	0.42	0.65	0.74
Zambia	0.42	0.92	0.78
Cameroon	0.41	0.97	0.86
Pakistan	0.37		0.71
Guinea	0.32	0.84	0.74
Malawi	0.32	0.74	0.67
Peru	0.32	0.32	0.66
Benin	0.31		0.79
Chad	0.28		0.86
Colombia	0.25	0.37	0.60
Moldova	0.24	0.20	0.55
Niger	0.24		0.65
Sierra Leone	0.24		0.82
Mali	0.22	0.79	0.69
Congo, Rep.	0.20		0.87
Gabon	0.20		0.77
Ghana	0.20	0.93	0.67
Cote d'Ivoire	0.14		0.82
Senegal	0.13	0.52	0.69
Albania	0.07	0.02	0.22

surveys. *InfMort*, the number of deaths per 1,000 live births, comes from The Inter-agency Group for Child Mortality Estimation (2010). From the World Bank (2011), I use *EnrollSec*, the gross rate of secondary school enrollment in each country. For a representative measure of each country's ethnic fractionalization (*EthnicFrac*) from the existing literature, I use the index constructed by Alesina et al. (2003). Data on the overall level of country wealth (*GDPcap*) are the logged value of real GDP per capita using the Lespayres index (rgdpl2) from Heston et al. (2011).

4   Empirical Tests

To test the hypotheses presented above, two types of estimation are employed. First, with the cluster-level dataset, multi-level analysis is used to test Hypotheses 1 and 2. Second, standard OLS regression is used with country-level data to test Hypotheses 3-5.

Table 2 presents results from two sets of tests, each with three models. For the first set, the dependent variable is InfMort_k, the rate of infant death at the cluster level, measured as the number of infants per 1,000 live births that die during the first 12 months. In the second set, the dependent variable is YearsEduc_k, which is also measured at the cluster level. The three models in each set contain results from using a different measure of political competition: Contestation, PolRights, and EIEC. Since the level of consistency across these measures of competition is very high, the discussion of the results will focus on Models 1 and 4, which use Contestation.

According to Model 1, the predicted rate of infant death in a rural, ethnically homogeneous, extremely-poor cluster in a country with no political competition would be 108.14 deaths per 1,000 births. The standard deviation of this prediction across country units, according to the random effects parameters, is 2.85. With the level of Contestation held constant at zero, raising the level of EthnicFrac_k from 0 to 1 is predicted to cause the level

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Table 2: Subnational Fractionalization, Competition, and Development Outcomes

	(1) InfMort$_k$	(2) InfMort$_k$	(3) InfMort$_k$	(4) YearsEd$_k$	(5) YearsEd$_k$	(6) YearsEd$_k$
Main Model						
Wealth	−12.66**	−12.66**	−12.66**	2.43**	2.43**	2.43**
	(0.58)	(0.58)	(0.58)	(0.02)	(0.02)	(0.02)
Urban	0.15	0.12	0.11	−0.13**	−0.12**	−0.12**
	(1.11)	(1.11)	(1.11)	(0.05)	(0.05)	(0.05)
EthnicFrac$_k$	−6.03	−4.24	−18.74*	−1.53**	−1.56**	−1.36
	(6.78)	(7.12)	(9.51)	(0.58)	(0.58)	(0.88)
Competition	−117.38**	−92.58**	−96.93**	10.56**	8.06**	8.37**
	(21.15)	(21.32)	(18.93)	(2.99)	(2.85)	(2.77)
Competition·EthnicFrac	38.31*	29.61^	39.99**	0.97	0.96	0.23
	(18.59)	(17.73)	(14.59)	(1.67)	(1.51)	(1.39)
Intercept	108.14**	103.88**	130.57**	1.52	1.98^	−0.27
	(7.40)	(8.32)	(12.00)	(1.05)	(1.12)	(1.75)
Random Effects Parameters						
sd(EthnicFrac$_k$)	2.55**	2.57**	2.40**	0.23	0.23	0.24
	(0.22)	(0.22)	(0.23)	(0.17)	(0.17)	(0.16)
sd(Intercept)	2.85**	2.97**	2.89**	0.94**	1.00**	1.00**
	(0.15)	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)
corr(EthnicFrac$_k$, Intercept)	−0.28	−0.36	−0.06	−0.35^	−0.32	−0.25
	(0.27)	(0.26)	(0.29)	(0.21)	(0.21)	(0.21)
Residual σ^2	3.84**	3.84**	3.84**	0.64**	0.64**	0.64**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Competition Measure	Contestation	PolRights	EIEC	Contestation	PolRights	EIEC
N	18,547	18,547	18,547	18,547	18,547	18,547
Countries	27	27	27	27	27	27

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 1. Mixed-effects model.

of infant mortality to drop by a statistically insignificant 6 deaths, and the standard deviation around this prediction is 2.55. Ethnic heterogeneity, in other words, does not have a consistent negative effect in absence of political competition, in contrast to the prediction of Hypothesis 1.

Higher levels of Contestation, on the other hand, are linked with a much lower rate of infant death. With EthnicFrac$_k$ held constant at 0, raising the level of Contestation by one standard deviation (.23) is predicted to cause the rate of infant mortality to drop by about 27 deaths. The magnitude of this beneficial effect is lessened when levels of ethnic diversity are higher, as is predicted by Hypothesis 2. In the most heterogeneous clusters, the same standard-deviation increase in Contestation is associated with a decline in the infant mortality rate by about 18 deaths. The same findings are generally true in Models 2 and 3, where PolRights and EIEC are used as the measures of political competition. The main difference is found in Model 3, where higher levels of EthnicFrac$_k$ are linked with worse infant mortality outcomes even in environments of low competition.

In the second set of estimates, where the dependent variable is YearsEduc$_k$, ethnic fractionalization is linked with lower levels of education on average. This finding is consistent with Hypothesis 1. According to Model 4, in clusters where EthnicFrac$_k$ is one-standard deviation (.33) higher, the mean number of years of education is predicted to be less by about one-half of a year. For Contestation, by contrast, a one-standard-deviation increase is linked to education levels that are higher by 2.4 years. Similar results obtain in Models 5 and 6, but coefficient on EthnicFrac$_k$ in the latter model is not different from zero with high levels of statistical confidence.

The interaction term in Model 4 shows that political competition mitigates the negative effect of ethnic fractionalization on education. The overall marginal effect of EthnicFrac$_k$ on YearsEduc$_k$, as a function of the level of Contestation, ceases to be distinguishable from zero with 95% confidence when Contestation is about .58 and higher. This result accords with

the prediction of Hypothesis 2.

Overall, the results from the cluster-level analysis thus suggest that the effects of ethnic heterogeneity on development outcomes matter not only at the aggregate country level but also matter for internal outcomes. We might therefore conclude, therefore, that countries with greater geographical mixing of ethnic populations would have worse outcomes overall than countries with less mixing, even given the same level of overall heterogeneity. Moving to country-level data, I will explore these findings more fully.

Table 3: Interaction of EthnicFrac and Geographic Concentration

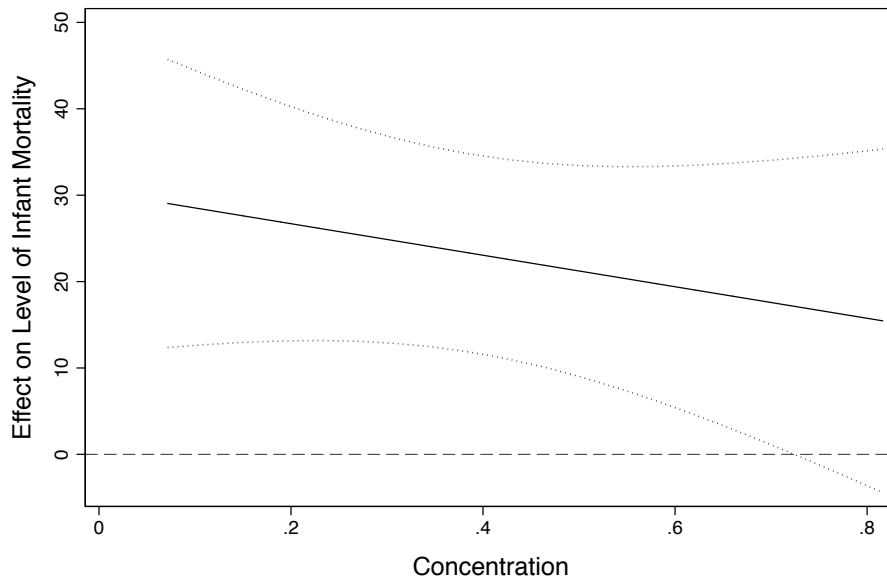|	(1) InfMort	(2) InfMort	(3) EnrollSec	(4) EnrollSec
GDPcap	−20.39**	−20.82**	23.84**	23.60**
	(5.14)	(5.17)	(4.78)	(4.21)
Concentration	−12.46	32.56	13.44	−133.26^
	(23.07)	(53.24)	(18.30)	(65.32)
EthnicFrac	102.37**	133.70**	−70.02*	−219.02**
	(25.68)	(42.16)	(24.09)	(67.71)
Concentration·EthnicFrac		−80.39		242.39*
		(85.63)		(104.61)
Intercept	155.08**	140.04*	−88.07^	10.69
	(50.48)	(53.10)	(44.88)	(58.11)
N	25	25	19	19
R^2	0.71	0.73	0.76	0.83

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$
OLS regression with standard errors in parentheses.

Table 3 investigates the effect of geographic concentration of ethnic groups within countries. Each model is a simple Ordinary Least Squares (OLS) regression with a sample consisting of the 25 countries for which the DHS contained data that could be used to measure Concentration. In the first two models, the dependent variable is the country's overall rate of infant mortality according to international development agencies. In the latter two, it is the gross rate of secondary school enrollment (EnrollSec). The measure of ethnic fractionalization at the country level, EthnicFrac, is from Alesina et al. (2003).

Model 1 indicates that infant mortality is indeed significantly higher where EthnicFrac

is higher, and this estimate is significant at the .01 level despite the small sample size. Geographic concentration of ethnic groups does not appear to matter much on average. Yet, as Model 2 reveals, there is an interactive effect between EthnicFrac and Concentration. When Concentration is at the low end of its range (.13 for Senegal), the level of infant mortality is expected to be 28.3 deaths greater than when EthnicFrac is one standard deviation (.23) higher. When Concentration is very high (.82 for the Philippines), however, the same increase in EthnicFrac is associated with a rate of infant mortality that is 15.6 deaths higher. This latter effect is not different from zero with high confidence. Figure 1 depicts this interactive effect. The main line shows how the size of the expected change in infant mortality from a one-unit increase in EthnicFrac decreases as Concentration increases. The dotted lines represent the 95% confidence interval around this effect.[6]

Figure 1: Marginal Effect of Ethnic Fractionalization as a Function of Concentration

Similar results are observed when using EnrollSec as the dependent variable, but the level of statistical precision is higher. When ethnic populations are heavily concentrated

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[6]The figure, however, shows the effect of a one-unit change in EthnicFrac rather than a standard-deviation change.

in particular regions, the effect of the overall level of ethnic diversity on school enrollment is indistinguishable from zero. When ethnic populations are more diffuse, higher levels of heterogeneity are linked with significantly lower levels of secondary school enrollment. This evidence is consistent with Hypothesis 3.

Conversely, geographic concentration of ethnic groups is associated with very poor outcomes when the overall level of diversity is low. Plausibly, a country with a small number of geographically-separated ethnic groups is likely to be more polarized than one with a very large number of ethnic groups. In such a scenario, the losers of political competition at the national level may find themselves in a disadvantaged position when it comes to access to public services. Geographic concentration gives the winners the ability to channel resources to co-ethnics more easily.

Table 4: Interaction of EthnicFrac and Geographic GroupDistance

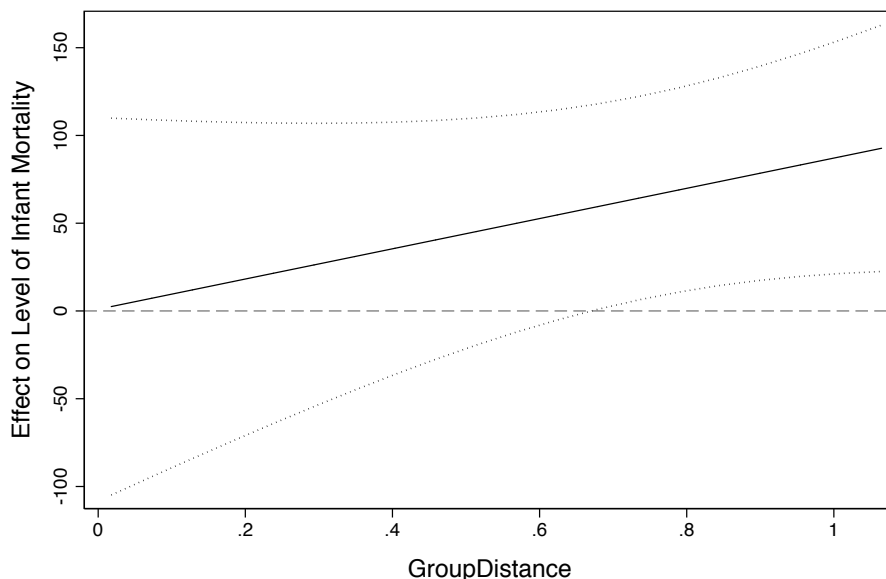|	(1) InfMort	(2) InfMort	(3) EnrollSec	(4) EnrollSec
GDPcap	-18.49^*	-17.23^*	21.53^{**}	18.89^{**}
	(7.04)	(6.88)	(5.70)	(4.93)
GroupDistance	26.52	-15.83	-9.60	-223.21^*
	(20.03)	(36.70)	(15.58)	(91.77)
EthnicFrac	$65.20^\wedge$	0.96	-69.64^*	-409.82^*
	(30.51)	(55.73)	(24.87)	(146.15)
GroupDistance·EthnicFrac		86.14		350.48^*
		(63.35)		(149.02)
Intercept	$138.87^\wedge$	159.32^*	-56.94	173.43
	(66.39)	(66.06)	(54.09)	(108.01)
N	17	17	15	15
R^2	0.78	0.81	0.79	0.87

$^\wedge p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$

OLS regression with standard errors in parentheses.

The next set of tests, presented on Table 4, examines how development outcomes are linked to the interaction of GroupDistance and EthnicFrac. The GroupDistance, in essence, measures how far the population center of ethnic groups tends to be spread away from the country's population center. The greater this distance, the more likely it is that members of

ethnic groups can be geographically targeted with public services or excluded from them.

Figure 2: Marginal Effect of Ethnic Fractionalization as a Function of Group Distance

The findings from these tests are not obviously consistent with each other. Greater group distance is associated with both higher infant mortality and higher school enrollments, and the negative effects of country-level ethnic fractionalization become more harmful for infant mortality, but less harmful for school enrollment, when GroupDistance increases.[7]. In highly diverse countries, greater average distance from the country population center could mean less access to health care services while possibility reducing conflicts over schooling that would hinder enrollment.

This brings us to tests of Hypothesis 4, which states that there will be greater inter-ethnic disparities in development outcomes when political competition is low and groups are geographically concentrated.

The results of these tests are presented in Table 6. In the first two models, the dependent variable is the standard deviation of the infant mortality rate across the ethnic groups in

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[7]Although the interaction term in Model 2 is not significant with high confidence, the marginal effect graph shows that the effect of EthnicFrac is different from zero with 95% confidence

Table 5: Competition, Concentration, and Inter-Ethnic Variation in Outcomes

	(1) InfMortSD	(2) InfMortSD	(3) YearsEducSD	(4) YearsEducSD
GDPcap	0.16	0.19	0.22	0.26
	(0.11)	(0.12)	(0.19)	(0.19)
Contestation	−2.71**	−1.92^	−1.13	0.17
	(0.59)	(1.08)	(0.98)	(1.81)
Concentration	1.00*	1.88	1.93*	3.39^
	(0.45)	(1.11)	(0.76)	(1.87)
Contestation·Concentration		−2.57		−4.25
		(2.96)		(4.97)
Intercept	0.64	0.17	−0.70	−1.48
	(0.79)	(0.96)	(1.32)	(1.61)
N	25	25	25	25
R^2	0.56	0.58	0.25	0.28

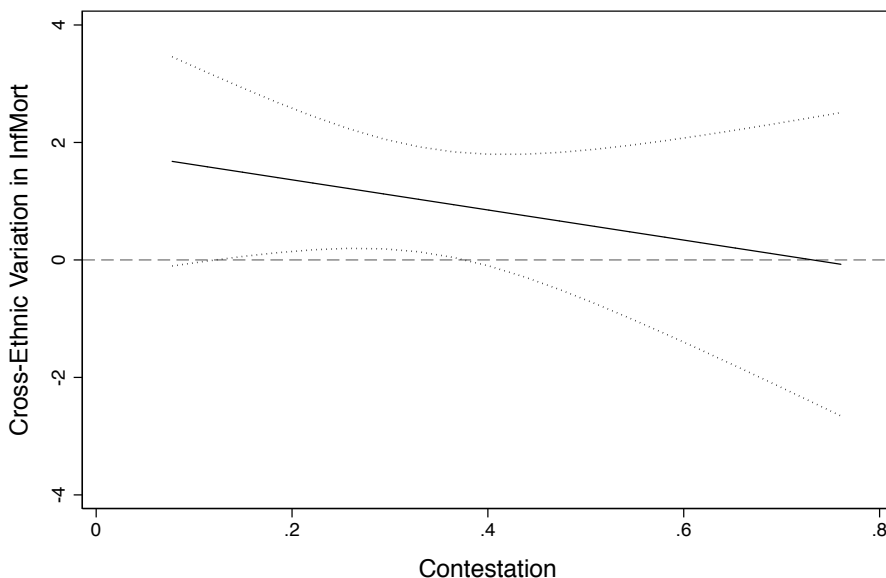^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

OLS regression with standard errors in parentheses.

each country (InfMortSD). In the latter two models, the dependent variable is the standard deviation in the mean number of years of education across ethnic groups (YearsEducSD). All models use OLS regression. Model 1 shows that, indeed, there is greater disparity in cross-ethnic rates of infant mortality when ethnic groups are more geographically concentrated. Model 2 reveals that political contestation negates this effect. It is easiest to see this effect graphically in Figure 3.

When Contestation is at the low end of its range, the marginal effect of Concentration is to increase cross-ethnic variation in infant mortality rates. An increase in Concentration equivalent to the full range of the sample (.74) is predicted to produce an increase in the standard deviation in infant mortality rates across ethnic groups by about 1.18 when Contestation is at the low end of its range (.11). This effect is distinct from zero with greater than 95% confidence. Once the level of Contestation reaches about .38, however, the effect of Concentration cannot be distinguished from zero any longer.

Using the cross-ethnic standard deviation in mean years of education in Models 3 and 4 yields very similar results. High levels of Contestation decrease the effects of ethnic group

Figure 3: Marginal Effect of Ethnic Concentration on Cross-Group Variation in Infant Mortality as a Function of Contestation

concentration on disparities across the groups. The implication is that political competition forces political elites, and their party organizations, to reach out more broadly for political support and thus distribute public services more equitably. These findings are consistent with Hypothesis 4.

The final set of tests explores the role of political contestation in mediating the effect of GroupDistance on inter-ethnic variation in infant mortality and enrollment levels. For both of these development indicators, greater average distance of ethnic populations from the country population center leads to a greater disparity in outcomes across ethnic groups. Yet, these effects are fully negated by high levels of political contestation.
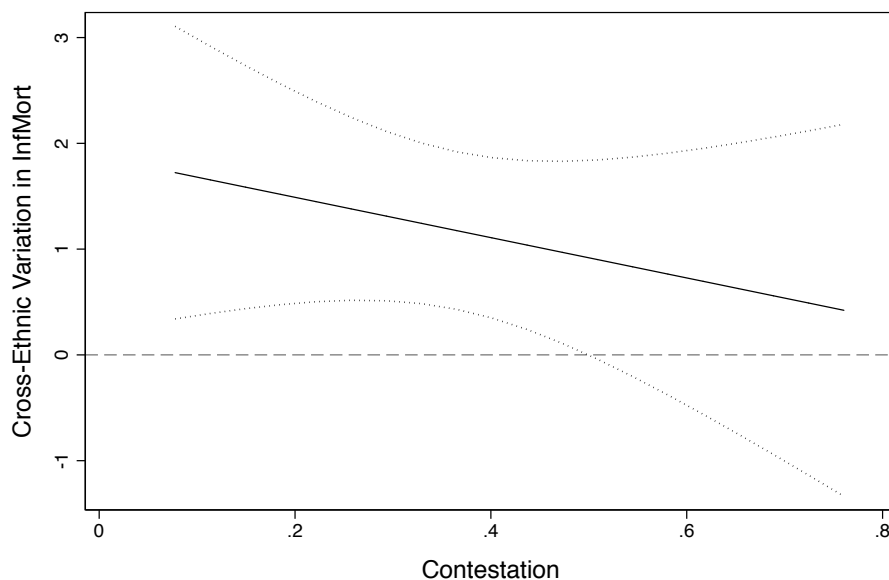
5   Discussion of Findings

By engaging in cross-national analysis that incorporates information from sub-national data, this study brings to light several issues that can lead to a better understanding of the contexts

Table 6: Competition, GroupDistance, and Inter-Ethnic Variation in Outcomes

	(1) InfMortSD	(2) InfMortSD	(3) YearsEducSD	(4) YearsEducSD
GDPcap	0.29^	0.33^	0.57^	0.69*
	(0.16)	(0.16)	(0.29)	(0.29)
Contestation	−2.36**	−1.39	−0.93	1.75
	(0.71)	(1.26)	(1.31)	(2.23)
GroupDistance	1.17**	1.87*	2.09*	4.02*
	(0.38)	(0.84)	(0.70)	(1.49)
Contestation·GroupDistance		−1.91		−5.28
		(2.06)		(3.64)
Intercept	−0.87	−1.59	−4.08^	−6.08*
	(1.19)	(1.43)	(2.20)	(2.52)
N	17	17	17	17
R^2	0.72	0.74	0.44	0.53

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

OLS regression with standard errors in parentheses.

Figure 4: Marginal Effect of Group Distance on Cross-Group Variation in Infant Mortality as a Function of Contestation

in which ethnic heterogeneity produces poorer development outcomes. We can learn a great deal more by moving beyond statistical correlations between the aggregate level of ethnic heterogeneity and a variety of country-level indicators. Aggregate data leave out a great deal of interesting variation. Three other lessons stand out.

First, not all ethnic heterogeneity is equal. This research demonstrates that the geographic distribution of ethnic group members inside each country is quite important. Health and education outcomes vary inside countries in part due to the degree of ethnic heterogeneity of localities, so it is important to account for the extent to which the members of ethnic groups are concentrated or dispersed. When ethnic groups tend to be concentrated in particular areas, rather than spread widely, high levels of ethnic heterogeneity are not very harmful for overall health and education outcomes. Yet, the combination of low ethnic heterogeneity with ethnic concentration appears to lead to worse outcomes.

The likely explanation is that these two scenarios produce different political dynamics. The overall degree of heterogeneity determines the extent to which ethnic and regional differences line up together. A small number of geographically-concentrated ethnic groups could create reinforcing cleavages, leading to greater polarization and significant consequences of political defeat. When heterogeneity is very high, by contrast, it is more difficult for any group or small number of groups to become politically dominant. So the effects of heterogeneity are not universally bad.

Second, the political context matters, but the effects of political competition also are context-dependent. Higher levels of political competition can either magnify ethnic tensions or reduce them, depending on the geographic factors just mentioned. This finding helps explain the divergent results in the literature, which does not account for geographic factors. The evidence presented here shows that the effect of ethnic concentration on inter-group inequality depends upon the level of political competition. Additional research can help develop these findings more fully.

This paper represents the early stages in a larger research endeavor, and much more work remains. As this project proceeds, one goal is to incorporate more information about the political systems of the countries included in the study. In particular, information about the nature of political parties, such as the presence of ethnic parties, will be helpful. Election returns, especially by region, can be used to determine which parts of a country constitute the support base for the party in power, thus enabling a test of the extent to which rulers favor their base of power. Presumably, where ethnic parties are in power, the regions where these ethnic groups are strongest will benefit. Information about the size of ethnic groups, both nationally and within regions can also help estimate the effects of minority status on development outcomes. In short, fuller description of the political institutions of each country will generate a much more complete understanding of the contexts in which ethnic heterogeneity leads to poorer outcomes.

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