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Ethnic Diversity and Economic Instability in Africa:
Policies for Harmonious Development

Evidence from Spatial Correlation of Poverty and Income in Kenya

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Nobuaki Hamaguchi*

Abstract

Using the district-level data, we found that even in a relatively poor country like Kenya, ethnic diversity is associated with better economic outcomes at local level. However, we found that income spillovers depend on ethnic similarity. This suggests the influence of ethnic bias through which ethnic diversity may undermine economic efficiency at the national-level, as many cross-country regressions have pointed out. This result implies, for policy making, that the question of interregional transaction costs cannot be narrowly focused on problems of transportation infrastructure but it is also related with ethnic divisions in African context.

Keywords: ethnic bias, spatial correlation, regional economy

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Introduction

In this chapter, I employ a spatial autoregressive model to analyze the relationship between ethnic diversity and economic development at the district level in Kenya. This approach enables us to assess this relationship on two levels; first, the impact of ethnic diversity on poverty and income *within* individual districts and second, the impact of ethnic differences *between* neighboring districts. Our findings in the individual district analysis suggest that districts with higher levels of ethnic diversity have higher levels of income and lower levels of poverty, a departure from the conventional wisdom that associates ethnic diversity with poor economic outcomes (e.g. Easterly and Levine 1997). Next, we extend the model to capture effects of ethnic differences between districts. These differences are conceptualized much like physical distance in the economic geography literature. As such we conjecture, following the lead of Shipton (2009), that lack of trust between neighboring areas with different ethnicities creates "distance" between ethnic communities, and thus works as a deterrent to trade between them. Hence, per capita income of a district would be lower than otherwise if it is surrounded by districts whose ethnic compositions are quite different from its own.

In other papers of this research project, Lonsdale, Berman and Shipton employed qualitative strategies to understanding the relationship between ethnic diversity and economic volatility in Africa. Drawing on historical evidence and inferences, these authors argued that quantitative approaches to ethnicity are inherently problematic because: (a) ethnicity is specific to time, location and occasion, and hence difficult to measure; and (b) the relationship between ethnicity and economy is too complex to be captured through simple mathematical equations. However, I believe that regression analyses provide valuable insights into this relationship if we carefully consider and address the potential shortcomings of quantitative strategies.

How is our approach free of some of the weaknesses identified by Lonsdale, Berman and Shipton? First, we employ data from Kenya's national census to determine the ethnic configurations of each district. For the census, recipients are asked to identify their own ethnicity out of the full list of

ethnicities provided in the questionnaire. Therefore, the census not only provides a direct measure of geographic ethnic distribution, but also captures people's self-identification of their ethnicity rather than a potentially biased external evaluation. Second, we estimate the correlation between the level of economic development and its possible determinants, including ethnic diversity, at the sub-national level (i.e. cross-district). This means that we avoid complications associated with cross-national studies, including the availability of comparable and reliable measures of ethnic distributions in different countries. Third, we work with cross section analyses, rather than time series. In other words, we compare levels of economic development spatially while controlling for time. This allows us to avoid statistical problems arising from the variability of ethnic identity and its construction over time.

Following a brief introduction to the characteristics of economic geography in Africa and the implications of ethnic bias on intra-country trade (Section 2), we present the basic structure of our empirical model outlined above. The basic structure is the same as a conventional cross-national regression of economic development (see Alesina and Ferrara 2005 for a comprehensive review), except that we conduct this regression at the subnational (i.e. district) level. The dependent variable is the level of economic development of a district; we run two different models, one measuring development as per capita income and the other as the poverty head count within a district. The independent variables include levels of ethnic diversity – as measured by both fractionalization or polarization indices – and the conventional variables of infrastructure and human capital. We postulate that whether ethnic diversity is good or bad for an economy is an empirical question because it can go in either way, depending on the balance of offsetting forces. It does not even depend on whether it is a rich or poor country, at least at the subnational level. Our hypothesis is that ethnic diversity is associated with higher levels of economic development at the subnational level (Section 3).

We then include the neighboring districts' economic indicators as explanatory variables (i.e. spill-over effects) on the level of economic development of an individual district (Section 4). Next, we extend this standard spatial autoregressive model by introducing the possible impact of ethnic

similarity or dissimilarity of the neighboring districts as additional spill-over effects. Our hypothesis of this ethnicity-augmented spatial autoregressive model is that the more ethnically similar the neighboring districts, ceteris paribus, the higher the spill-over effects (Section 5).

A brief summary of main findings and a short discussion of future directions of study conclude the paper. The main points are as follows: First, the current consensus in the development literature–that ethnic diversity can explain poor economic outcomes–may need revision, as our regression results suggest that ethnic diversification – but not polarization – may in fact help raise economic development. Second, ethnically isolated areas exhibit poorer outcomes, which suggest that lack of trust may contribute to constraining regional (intra-country) trade, hence lowering economic growth. Measures to reduce such "ethnic distance" or "territorial confinement" could therefore improve economic outcomes. An extension of this paper could help guide in formulating relevant policy interventions (Section 6).

Background

Africa's economic development has been affected by unfavorable economic geography (Venables 2010). On the environmental side, endowments of high-quality agricultural land with adequate rainfall are scarce. There is a high propensity of diseases, both in humans and animals. In terms of the global economy, Africa's geographic location is also problematic. In addition to being a long distance from the world's main economic centers, many countries are land-locked. Sub-Saharan Africa as a whole has virtually no navigable river and few natural harbors, reducing its ability to trade with the rest of the world.

Collier and Venables (2010) and Venables (2010) point out that Africa's economic growth is also hampered by its fragmentation into more than 50 small nations. Because economies of scale are forgone, the costs of public good provision are high and supplies of private goods are often monopolized. Moreover, these impediments to private and public economies are mutually reinforcing. Based on an empirical assessment of the degree of international market integration of Sub-Saharan

African countries, Bosker and Garretsen (2008) predict that improving intraregional market access would have a considerable positive effect on economic growth.

Moreover, market integration within each country remains low, which presents three important implications for efficiency and growth of national economies. First, gains from trade based on the comparative advantages of each subnational region will be diminished. Second, as factor endowments, especially fixed endowments such as arable land, are unevenly distributed among regions. This lack of factor mobility will decrease growth prospects in those areas with fewer resources, while simultaneously diminishing returns in areas that have relatively more resources (Venables 2000). Third, an economy with high interregional trade costs and low factor mobility is prone to geographical dispersion of population and production (Fujita et al. 1999). Consequently, cities and individual production units are smaller than optimal size. Insufficient agglomeration is related to lower levels of the division of labor, knowledge spillover, and higher costs of shared inputs (e.g. intermediate goods and services and local infrastructure) – all leading to lower productivity.

The presence of ethnic bias is another potential roadblock to economic growth, as often identified by the political economy literature on Africa. For example, Bates (2000) observes that because public institutions are weak in Africa, people seek a better life through capitalizing on private relationships, such as remittances from family members who have migrated to urban areas, or through learning skills from each other. If families organize their economic relations across generations and locations, then their ethnicity may shape particular codes of conduct that can reduce inter-ethnic interactions. Fafchamps (2004) explains that ethnic bias persists in a self-sustaining way because of *statistical discrimination* and *network effect*. The former suggests that individuals belonging to different groups might be treated differently even if they share identical observable characteristics in every other respect because of high cost of gathering and evaluating information.[1] The latter refers to

1. Mohamed and Zenou (2005) presented a theoretical model suggesting that discrimination in the labor market might occur along ethnic lines in developing countries where people are ethnically diverse and production is highly volatile. Employers tend to hire workers of similar ethnic background; employees from different ethnic groups bear the risk of production volatility whereas those from similar ethnic background of the employee earn a stable income.

the characteristic of market transactions in Africa, which often involve many intermediaries in sequential steps linked by a chain of trust-based personal acquaintances. However, it must be noted that ethnic diversity *per se* is not a source of inefficiency because heterogeneity forms the basis for trade (in technology, taste, etc.), as predicted by international trade theory. But when ethnic diversity and ethnic bias are combined, inefficiency can occur because the market is thus fragmented into small homogeneous markets.

It is also noteworthy that, specifically in the context of Kenya, ethnic groups have a "blocker" geographic distribution by which ethnic identities correspond reasonably well with geographic placement (Shipton 2009). Oucho (2002) points out: "[T]he present day provinces are largely a repeat of those created in 1924, apparently a deliberate attempt by the departing colonial administration to institutionalize tribalism or ethnocentrism in independent Kenya" (p. 42). The separation along ethnic lines for historical reasons has been sustained through low labor mobility because of weak agglomeration economies, as described above.[2] As a result, ethnic heterogeneity at a national level co-exists with high degree of homogeneity at the local-level (Ranis 2009). Therefore, we might observe high transaction costs in inter-regional domestic trade both in terms of physical infrastructure and ethnic divisions.

Basic model

We first set up a model without spatial auto-correlation. The estimated regression equation is shown as

$$Y_i = \alpha_0 + \alpha_1 X_i + \alpha_2 D_i + e_i , \qquad (1)$$

2. Miguel and Gugerty (2005) suggest that relocation cost is high in rural Kenya because of thin local land markets and difficulty in obtaining approval from relatives to sell the clan land.

where the dependent variable Y is the level of economic development in a particular district indexed by i. Included in the independent variable set X are: endowment of infrastructure, human capital, and ethnic diversity. The error term is assumed to be i.i.d.

The model is operationalized in two ways. We run two separate regressions: one with the poverty headcount ratio (the proportion of the population under the poverty line) as Y_i, and the other with log of per capita income. The two variables will have different implications when we consider the spatial auto-correlation of Y_i. Poverty may be contagious across the space because of some latent common local profiles such as agro-climatic and health-sanitary conditions. Income spillovers should involve more human exchange such as trade and job searches. We expect that ethnic bias, if exists, will be more relevant in income spillovers.

A few comments on years of the data will be clarifying. At the time of the study when the results of the 2009 census were not available, the most recent comprehensive primary data source was the 1999 census from which we obtained the district-level poverty headcount ratio Data on average regional income should have been obtained elsewhere because they are lacking in the census data. Fortunately, we could rely on the UNDP's estimate of per-capita gross regional domestic product at district-level (UNDP 2006). We used the figure of 2005, which was the most recent.

As a measure of the endowment of infrastructure, we use an access to main trunk roads. This is a dummy variable that we assign one for districts lying on international trunk ("class A") roads. The information derives from the geographic information system database compiled by World Resource Institute.[3] Because the provision of trunk roads has not increased substantially since mid-1980s in Kenya,[4] we can consider that information of the access to the trunk road is invariant in time. Therefore, this variable is used in both poverty and income regressions. As common sense might reveal, we expect that access to roads can reduce poverty (therefore, a negative sign is assumed for the estimated coefficient) and that it has a positive impact on income.

3. "Major roads in Kenya," available from http://www.wri.org/publication/content/9291#basedata.
4. See Washike, W.S.K (2001), Table 6.

The human capital endowment is represented by the population share having no formal basic education or the adult illiteracy ratio. For the poverty regression, we use the education data obtained from the 1999 population census; for the income regression we use the adult illiteracy rate in 2005. To use different data is just for the sake of the coherence with the dependent variable by deploying the data from the same year and the same data source. Because we expect that better human capital reduces poverty and increases income, the predicted sign of the population share having no formal basic education on the poverty headcount ratio is positive and that of the adult illiteracy ration on income level is negative.

We use two measures of ethnic diversity: ethnic fractionalization and ethnic polarization. As done in many researches (for example, Alesina et al. 2003), fractionalization index was computed as one minus the Herfindahl index of the ethnic shares obtained from the Kenya Population Census 1989 that is the last year which the information on ethnicity of the population is publicly available. Using the same data, polarization index was calculated using the formula proposed by Motalvo and Reynal-Querol (2005). The two indices address the question of ethnic diversity in different context. Fractionalization increases as the population is capsulated in many small groups while polarization intensifies when the population is split into a few number of (typically two) large groups. Alesina et al. (2005) points out that polarization explains better the outbreak of conflicts such as a civil-war while fractionalization serves better as a explanatory variable for poorer economic performances. It should be noted that the two indices should have been calculated with the 1989 population census data for the reason that the ethnicity data was not published from the 1999 census results because they were classified as politically sensitive information. This is unsatisfactory because ethnic compositions at subnational-level could change more substantially than the national-level because of migration.[5] We assume that the ethnic diversity in each district as of 1989 contains information about what have affected the evolution of poverty and income thereafter. We set no preconceived notion related to

5. However, in this way we could avoid the problem of possible endogeneity between economic results and ethnic diversity.

the overall impact of ethnic diversity on poverty and income because it could be either positive or negative depending on the balance of offsetting forces Ethnic diversity may be detrimental for an economy if it is linked to bias on ethnic lines for the lack of trust, or to eventual violent conflicts (Easterly and Levin 1997). On the other hand, we could also argue that ethnic diversity would enhance productivity through the combination of strong points of each group, exchanging goods, job opportunities, and ideas. Although previous studies (Alesina and Ferrara 2004) have found that ills of ethnic diversity outweigh virtues in particular in poor countries, we will find this may not be the case at local level.

Our data shows that among the top ten districts in terms of the poverty headcount ratio seven are from Nyanza province, while all bottom ten are from either Central or Rift Valley provinces (See table in appendix). In order to control for this concentration, we introduce regional dummy *D* referring to Nyanza, Rift Valley, and Nairobi & Central to capture the level differences. We expect that dummy assigned to Nyanza is associated positively with poverty,, while the opposite should be the case for Rift Valley and Nairobi & Central.

Table 1 presents some summary statistics. The poverty headcount ratio is the lowest in Kiambu district (Central province), adjacent to the northern border of Nairobi. Kuria district (Nyanza province) had the highest intensity of poverty. Income level measured by the per-capita GDP is the highest in Nairobi and the lowest in the Wajir district (Northeastern province). Bordering Somalia and Ethiopia, Wajir district occupies about one-tenth of the Kenyan territory but 75% of its land is semi-arid. The proportion of the population without completing formal education was the highest in Mandera (Northeastern province); the adult illiteracy rate was the highest in Marsabit (Northeastern province). Mombasa is the most ethnically diverse district in Kenya. This makes sense due to its history as the major port city in Eastern Africa. In Nyamira district (Nyanza province), ethnic fractionalization is the lowest. Ethnic polarization was the lowest in Gucha district (Nyanza province) where Kisii people comprise 98% of the population, whereas Busia (Nyanza province), the district

with the highest polarization index, 90% of the population was divided into two groups (Luhya 61% and Teso 29%).

Table 1. Summary statistics

Variable	Mean	Std. Dev.	Min	Max
Poverty	0.5411905	0.1218208	0.2171581 (Kiambu)	0.808475 (Kuria)
Income	6.528851	0.7000979	5.135798 (Wajir)	8.303505 (Nairobi)
No education	0.6348116	0.1370097	0.2862105 (Nairobi)	0.9429141 (Mandera)
Adult illiteracy	0.3375797	0.1520748	0.111 (Mombasa)	0.826 (Marsabit)
Fractionalization	0.3430435	0.2493434	0.03494 (Nyamira)	0.86518 (Mombasa)
Polarization	0.4429359	0.2324567	0.0684938 (Guhca)	0.839626 (Busia)

Estimated results obtained using equation (1) are presented in Table 2. We set the poverty headcount ratio as the dependent variable in the first two columns. In the right-most two columns, we chose per-capita GDP as the dependent variable. As expected, access to trunk roads is associated with a lower incidence of poverty although it did not work well to explain income level; a lack of formal basic education and adult illiteracy is associated with higher levels of poverty and lower income. Regional dummies reflect that poverty is more severe in Nyanza province and less in Central and Rift Valley provinces. Districts in Central province and Nairobi have significantly higher per capita income compared to others.

Table 2. Regression results with regional dummies

	Poverty		*Poverty*		*Income*		*Income*	
Road	-0.040154	**	-0.0354573	**	-0.0338705		-0.07589	
	(0.0161025)		(0.0149134)		(0.1714399)		(0.1720885)	
No education	0.2344886	***	0.2394624	***				
	(0.055839)		(0.0485739)					
Adult illiteracy					-1.22584	*	-1.140387	**
					(0.65434)		(0.5582955)	
Fractionalization			-0.0927405	***			0.8152888	**
			(0.032022)				(0.3860441)	
Polarization	-0.054102				0.4190911			
	(0.0412469)				(0.3717827)			
Nyanza	0.0948081	**	0.0844276	***	-0.0723709		0.0258334	
	(0.029431)		(0.0294909)		(0.1925601)		(0.1814985)	
Rift Valley	-0.0939295	***	-0.0976902	***	0.0072516		0.0252957	
	(0.0181776)		(0.0169064)		(0.2207658)		(0.2161774)	
Central	-0.2260062	***	-0.2383974	***				
	(0.0262816)		(0.0258739)					
Nairobi_Central					0.507424	*	0.5954395	***
					(0.2847261)		(0.2247545)	
Constant	0.4699371	***	0.4760187	***	6.728047	***	6.59691	***
	(0.0479139)		(0.0428439)		(0.3338173)		(0.2753026)	
R-squared	0.7332		0.7541		0.1708		0.2282	
Prob. > *F*	0		0		0.0103		0.0002	
Observation	69		69		69		69	

*** 1 per cent, **5 per cent, *10 per cent. Robust standard errors are shown in parentheses.

Our first major finding is that higher ethnic diversity as measured by the fractionalization index has a negative association with the intensity of poverty and a positive relation to income levels.[6] In other words, after controlling for physical and human capital, higher levels of ethnic fractionalization are related with better economic outcomes at the district-level. This contradicts the

6. The polarization index did not show a statistically significant effect here. Alesina, et al (2005) already pointed out that the polarization index is a poorer indicator of economic outcome than the fractionalization index. We also followed their study not to include the two ethnicity variables together because high correlation can be expected between them.

results from the cross-national studies that followed Easterly and Levine (1997), which found correlations between higher ethnic diversity and bad economic performance. Later, Alesina and Ferrara (2005) elaborated that there are costs and benefits of ethnic diversity; while the benefits may facilitate growth in richer countries, the costs may lead to worse economic outcomes in poorer countries. Yet our finding suggests that even in a poor country like Kenya, ethnic diversity may be beneficial for an economy at the local level. It is plausible that the higher levels of ethnic diversity in particular areas capture geographic endowments, such as good agro-climatic conditions. Thus, these areas historically attracted in-migration of various ethnic groups. Alternatively, it may suggest that ethnic diversity promoted division of labor and knowledge sharing that contributed to enhance productivity and reduce poverty. This might be the case for urban areas such as Nairobi and Mombasa.

Spillover from adjacent districts

Next, we include the economies from adjacent districts as potential spillover effects on levels of poverty and income. The regression we estimate is of the following form.

$$Y_i = \alpha_0 + \alpha_1 X_i + \rho W_i Y_i + e_i \qquad (2)$$

In this equation, W_i is the adjacency weight consisting of w_{ij}/n_i where we assign $w_{ij} = 1$ if districts *i* and *j* share the border and 0 otherwise; n_i denotes the number of districts that share a border with district *i*.[7] Equation (2) is called the *spatial autoregressive model* or *spatial lag model*. It assumes that situations of poverty and income level of district *i* (i.e., Y_i) are not only determined by its own local conditions (X_i) but are also affected by the income level of neighboring districts. This has two implications. First, if spatial autocorrelation is expected, an OLS regression that does not include this measure can yield a serial correlation in the error term. Second, the estimated parameter ρ represents the inter-district spillover effect. If ρ has a statistically significant coefficient,

7. We do not include regional dummies that appear in equation (1) because correlation can be expected with the spatial lag term $W_i Y_i$.

we can interpret that this suggests the existence of interactions across space (i.e. spillover effects). Table 3 reports estimated results.

Estimated results of variables road, *no education, adult illiteracy*, *fractionalization*, and *polarization* barely change from those presented in equation (1). The effect of an access to trunk road on income is still statistically insignificant and has unexpected sign in the last column. Focusing on estimates of parameter ρ of equation (2), we found a positive spatial autocorrelation for the district-level poverty headcount ratio (i.e. poverty spillover), although the spatial autocorrelation of per capita district GDP was not statistically significant. Hence, after controlling for conditions of physical and human capital and the degree of ethnic diversity, a district exhibits higher intensity of poverty if it is adjacent to poor neighbor districts. However, a systematic relationship is *not* observed for the income level. Here, the lack of a clear indication of inter-district income spillovers is worth noting. Such spillovers, also known as trickle-down process in the literature of development economics, presume backward- and forward-linkages in inter-district economies. Thus, the lack of income spillovers may imply lack of economic interactions between the inhabitants of the districts. If this is the case, we may further ask whether any ethnic bias could be involved in lower levels of inter-district linkages. This issue will be addressed in the next section.

Table 3. Regression results with spatial correlation

	Poverty		*Poverty*		*Income*		*Income*	
Road	-0.0458996	**	-0.0409929	**	0.0118628		-0.0231559	
	(0.0192405)		(0.0183548)		(0.1637239)		(0.1563547)	
No education	0.167372	**	0.1798538	**				
	(0.0836058)		(0.0827373)					
Adult illiteracy					-1.540431	***	-1.52936	***
					(0.5801538)		(0.4984949)	
Fractionalization			-0.0884833	**			0.7536241	**
			(0.0393338)				(0.3587953)	
Polarization	-0.0595084				0.2789139			
	(0.0371971)				(0.3020793)			
*W*poverty*	0.9586826	***	0.9658064	***				
	(0.1403531)		(0.1299536)					
*W*income*					0.1777369		0.2890305	
					(0.2745791)		(0.2589353)	
Constant	-0.0238925		-0.0343925		5.771954	**	4.935014	***
	(0.0735505)		(0.0746591)		(1.855182)		(1.749749)	
R-squared	0.5725		0.5912		0.1305		0.1901	
Prob. > *F*	0		0		0.0609		0.0047	
Observation	69		69		69		69	

*** 1 per cent, **5 per cent, *10 per cent. Robust standard errors are shown in parentheses.

Impact of ethnicity

Now we introduce ethnicity by modifying the spatial autoregressive model of equation (2) to the following form:

$$Y_i = \alpha_0 + \alpha_1 X_i + \theta E_i W_i Y_i + e_i \qquad (3)$$

where E_i is an ethnic weight matrix where *i*-th row elements consist of e_{ij}/e_i where e_{ij} represents population size in district *j* belonging to the dominant ethnic group in district *i,* and e_i is the

total population of district *i*'s dominant ethnic group in its all adjacent districts. For example, suppose that district *i*'s dominant group is Kikuyu and it is adjacent to districts *j*, *k*, and *l*; the total Kikuyu population in the three districts are 100 thousand distributed as 25 thousand, 35 thousand, and 40 thousand respectively in *j*, *k*, and *l*. In this case we have 0.25, 0.35, and 0.40 in column *j*, *k*, and *l* and zeros in others of *i*-th row. The ethnic weight matrix differentiates the impact of spillovers from adjacent districts depending on the size of people of the same ethnicity. Therefore, $E_iW_iY_i$ might be designated as the *ethnicity-augmented* spatial lag term. Notice that we will assign zero in E_iW_i even for adjacent districts if no one of the same ethnicity lives there. Therefore, while ρ in the previous section identifies the effect of physical closeness, θ captures spatial spillovers occurring among *ethnically similar* adjacent districts.

Table 4 presents the estimated results. Basic characteristics remain almost unchanged, except that the effect of ethnic fractionalization on poverty becomes statistically not significant. More importantly, we found statistically significant positive coefficients of the ethnicity-augmented spatial lag term for both poverty and income. The case of income spillover is of particular interest. Although we did not find a spatial correlation in equation (2), Table 4 shows that the income spillover is statistically significant between ethnically similar adjacent districts. We can infer that the ambiguous result on income spillovers in Table 3 results from the influence of mixed effects, with the significant interactions between ethnically similar districts mitigated by the low levels of interactions (hence less spillovers)between ethnically dissimilar districts. It should be also noted that the magnitude of the estimated coefficient θ is greater than ρ. Hence, we can conclude that ethnic similarity has a role for spatial income spillovers to become more relevant and stronger.

Table 4. Regression results with ethnicity-weighted spatial correlation

	Poverty		*Poverty*		*Income*		*Income*	
Road	-0.043895	**	-0.042358	**	-0.016126		-0.039841	
	(0.0204129)		(0.0195607)		(0.157504)		(0.1500607)	
No education	0.1874827	**	0.1990724	**				
	(0.0829944)		(0.0866672)					
Adult illiteracy					-1.428324	***	-1.465143	***
					(0.5187375)		(0.4698105)	
Fractionalization			-0.032579				0.6030055	*
			(0.0412908)				(0.3393688)	
Polarization	-0.010317				0.1961421			
	(0.039874)				(0.2852494)			
*E*W* pov_ratio*	0.6861334	***	0.6777612	***				
	(0.1064225)		(0.1057059)					
*E*W* pc_income*					0.4395456	***	0.4222738	***
					(0.1560752)		(0.159973)	
Constant	0.0908942		0.0936748		4.089088	***	4.106704	***
	(0.0703801)		(0.0700019)		(1.064078)		(1.075231)	
R-squared	0.5419		0.5457		0.2172		0.2585	
Prob. > *F*	0		0		0.0015		0.0005	
Observation	69		69		69		69	

*** 1 per cent, **5 per cent, *10 per cent. Robust standard errors are shown in parentheses.

We can extend the following conjecture from this result. Interactions through market transactions and extra-market interaction (such as knowledge exchange and technological spillovers) will be mutually beneficial for all participants. In the case of the Kenyan regional economy, income spillovers were found only between ethnically similar adjacent districts. Overall, such effects are not statistically significant. Therefore, we cannot blame a lack of infrastructure for reduced economic outcomes, but must conclude that some sort of ethnic bias additionally impedes interactions across geographically divided ethnic groups.

We found poverty spillovers in both the general setting (Table 3) and an ethnically similar situation (Table 4), which suggests that ethnic similarity has no role in the context of

poverty spillovers. This suggests that poverty can be attributed to omitted variables that commonly affect adjacent districts but do not affect economic interactions between people in those districts. For example, prevalence of diseases climate (temperature, rainfall), and soil quality may all play a role in determining levels of poverty. Inclusion of these independent variables might have invalidated the spatial correlation of poverty we identified.

Summary and conclusions

In this paper, we examined the impact of ethnic diversity on levels of poverty and income through identifying spatial spillovers. Using district-level data of Kenya, we found that income spillovers depend on ethnic similarity. Assuming that spillovers result from economic interactions between people in neighboring districts, this suggests that interactions are more likely to occur between people in the same ethnic group. This result implies that the question of interregional transaction costs should not narrowly focus on problems of transportation infrastructure but are also related to ethnic divisions. If transactions are confined along ethnic lines due to ethnic bias, then it would not be sufficient to promote internal market integration through improving physical infrastructure; policies for reducing ethnic bias and facilitating inter-ethnic economic interactions are also necessary. Alternatively, if we are to take ethnic bias as given, then policies that facilitate interactions among similar ethnic groups located in different districts would create greater scale economies and growth-enhancement (Shipton 2009).

This chapter also provides a challenge to the conventional wisdom that relates high levels of ethnic diversity to poor economic outcomes. These studies often relied on cross-national data. However, through our subnational design, we found that even in a relatively poor country like Kenya, ethnic diversity is associated with better economic outcomes at local level. This does not, however, necessarily contradict the conventional view on ethnic diversity as impeding economic growth. When ethnic diversity and ethnic bias are combined, inefficiency increases because the market is fragmented into small homogeneous markets, gains from trade among different groups are forgone, and technical

progress through exchanging different types of knowledge will be undermined. Thus, even though ethnic diversity seems to have a positive role at the local level, it may be detrimental to the economy at the national level. For more precise policy recommendations, it is indispensable to study the *microfoundation* of ethnic bias through rigorous empirical strategies. One promising direction is the formation of trust-based divisions, as have already been studied by Fafchamps (2004). Researchers can also examine which institutional frameworks promote trust among heterogeneous agents.

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Abstract (in Japanese)

要約

県レベルのデータを用いることによって、ケニアのような比較的貧しい国でも、民族の多様性が、ローカルレベルでの良好な経済パフォーマンスと関係があることが明らかになった。しかし、所得のスピルオーバー効果については、民族的な類似性に依存することが分った。このことは、過去に行われた多くのクロスカントリー回帰分析が示す通り、民族構成が多様であることによって、全国レベルでの経済の効率性が損なわれるという民族的バイアスの影響を示唆している。こうしたことから、政策形成のためには、地域間の取引費用の問題を、運輸交通インフラの問題に限定することなく、アフリカの文脈の中で民族の分断と関連づけて考えることも必要である。

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