



Internal Borders: Ethnic-Based Market Segmentation in Malawi

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Summary. — Ethnic diversity is associated with poorer economic development, but why? I argue that market segmentation is one mechanism linking diversity to economic underdevelopment: when ethnic groups are geographically segregated and trust is concentrated within groups, markets will tend to be segmented along ethnic lines. I evaluate this argument using maize price data from seventy Malawian markets over 14 years and combine it with census data on the spatial distribution of ethnic groups. I find that maize price differences—a key indicator of market segmentation—are indeed larger for ethnically dissimilar markets, even after taking sub-national administrative borders geographic barriers, and climatic differences into account. These statistical findings are complemented by interview data from farmers and traders in three markets across Malawi, which highlight the centrality of trust in small-scale maize trading, as well as a preference for coethnic trading partners. Together, these findings suggest that ethnic diversity, and ethnoregional segregation in particular, can have a negative impact on market integration, an important driver of food security and long-term economic development.

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1. INTRODUCTION

African states are among the poorest in the world, with per capita incomes only half of those in Asia, the next poorest continent, and less than 5% of per capita incomes in North America (Heston, Summers, & Aten, 2012). This underdevelopment translates into real welfare consequences, with Sub-Saharan Africa having the highest rates of malnutrition (Meerman, Carisam, & Thompson, 2012), the most extreme food insecurity (Rosen, Meade, Fuglie, & Rada, 2014), and the lowest human development index (United Nations Development Programme, 2014) of any region. Scholars have long tried to explain why African countries lag behind the rest of the world, even after accounting for many correlates of economic development (Englebert, 2000). A key contender in the race to explain the “Africa dummy” has been the continent’s high levels of ethnic diversity, with Easterly and Levine (1997) famously arguing that such diversity is responsible for “Africa’s growth tragedy.” Subsequent studies have gone on to show that diverse societies do indeed tend to experience slower economic growth than more homogeneous ones (Alesina & Ferrara, 2005; Zak & Knack, 2001).

But *how* does ethnic diversity thwart economic development? Existing explanations tend to focus on elite-level mechanisms, including macroeconomic policy distortions (Easterly & Levine, 1997), the under provision of public goods (Alesina, Baqir, & Easterly, 1999; Alesina & Ferrara, 2005), divergent policy preferences (Lieberman & McClendon, 2012), competitive rent-seeking (Shleifer & Vishny, 1993), and opposition buy-off (Annett, 2001). In contrast, I propose a mechanism linking ethnic diversity to poor economic growth via mass-level behavior. In particular, I argue that ethnic segregation and ethnic based trust reduce interethnic trading, ultimately producing segmentation of agricultural markets along ethnic lines.

In most African states, high degrees of ethnic diversity at the county level belie local level homogeneity, with most states comprising an amalgamation of multiple ethnically homogeneous regions (Alesina & Zhuravskaya, 2011; Matuszeski & Schneider, 2006). While trust tends to be concentrated within ethnic groups in Africa, this is especially so when groups are

geographically segregated (Robinson, 2016b). Given the importance of interpersonal trust for trade in weakly institutionalized settings, individuals tend to engage in trade primarily within sub-national, ethnically homogeneous regions or pay higher transaction costs for trading across ethnic lines. As a result, diverse, segregated countries will fail to establish national market integration, resulting in slower growth (Fafchamps, 1992) and reduced food security (Sanogo & Amadou, 2010). In short, if ethnic differences pose intra-national barriers to trade, then ethnically diverse states will suffer market inefficiencies and poor development outcomes.

I evaluate the impact of ethnic differences on market segmentation in the context of Malawi, an ethnically diverse country in southern Africa. Past research has shown that Malawian markets are poorly integrated (Fafchamps, Gabre-Madhin, & Minten, 2005; Goletti & Babu, 1994; Nyongo, 2014; Zant, 2012), and qualitative and survey data both suggest that a major barrier to greater market integration is a lack of trust among traders and farmers (Fafchamps & Gabre-Madhin, 2006; Jayne, Mangisoni, Sitko, & Ricker-Gilbert, 2010). I add to this literature by arguing that patterns of market segmentation in Malawi are due, at least in part, to the spatial distribution of ethnic groups within the country.

To evaluate whether or not regional ethnic segregation explains the way in which markets are segmented within Malawi, I combine fourteen years of monthly maize prices from across seventy markets with fine-grained census data on the spatial distribution of ethnic groups. Maize price

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differentials between pairs of markets—a standard measure of market segmentation—are estimated as a function of the degree of ethnic difference between the two markets, while controlling for the physical distance between them. The results demonstrate that ethnic differences are indeed a barrier to trade: market pairs with no ethnic overlap are segmented to the same degree, on average, as ethnically identical markets separated by an additional 211 km. This effect is robust to controlling for potential omitted variables, including sub-national administrative borders, geographic barriers, and climatic differences, all of which could be correlated with both ethnic geography and market segmentation. In addition, by taking advantage of variation across ethnic groups in Malawi, I show that the degree of cultural distance between members of different ethnic groups are consequential for market segmentation, while ethnic divides emphasized in national-level politics are not.

To address the problem of inferring individual behavioral patterns from aggregated price data, I supplement these statistical findings with interview data from farmers and traders across three Malawian markets situated near three different “ethnic borders.” The resulting qualitative data are consistent with my argument that ethnic based trust contributes to market segmentation by influencing the strategies of individuals. In particular, farmers and traders emphasized the risks inherent to trading maize—especially those related to faulty measurements and price information asymmetries—and the importance of shared ethnicity in bolstering trust in response to such risks.

In sum, the findings of this paper suggest that within-country ethnic diversity, and ethnoregional segregation in particular, has important implications for national market integration. These findings are likely to generalize to other contexts in which ethnic groups are geographically segregated, trust is conditioned on shared ethnicity, and markets rely on informal contract enforcement. Given the ubiquity of these conditions in much of Sub-Saharan Africa, the mechanism proposed here may help account for economic underdevelopment and food insecurity across the continent, as well as offering a link between ethnic diversity and economic growth more broadly.

2. MARKET SEGMENTATION AND DEVELOPMENT

The integration of markets—globally, regionally, and within countries—is crucial for economic development. Integration is conducive to growth by reducing the volatility of prices and by allowing gains from trade based on regional comparative advantages. Intranational integration is also important for food security, as such integration allows for the efficient movement of goods from areas of surplus to areas of deficit (Mutambatsere & Christy, 2008; Sanogo & Amadou, 2010). Thus, barriers to trade, and, as a result, barriers to market integration, are detrimental to development (Frankel & Romer, 1999; Keller & Shiue, 2007).

Market integration has typically been studied using pricing data, the most reliable data available for most markets. Inferring market behavior from price differentials across space, an approach called spatial price analysis, stems from the very definition of a market: the geographic extent to which the same good demands the same price at the same time in all areas (Fackler & Goodwin, 2001). Price equalization, or the Law of One Price (LOP), is achieved through trade, although integration does not necessarily require direct trade between all points within the market, as long as all points within the

integrated market are part of the same trading network. Within such integrated markets, the difference in prices of the same good in two different locations will be, at most, equal to the cost of moving that good from the area with the lower price to the area with the higher price (Fackler & Goodwin, 2001). If the price difference exceeds the cost of transport, then a market inefficiency exists, and some barrier must exist to prohibit the profitable trade of that good. Most prominent studies of market integration have focused on estimating the degree to which international borders pose barriers to trade (e.g., Aker, Klein, O’Connell, & Yang, 2014; Anderson & Wincoop, 2002; Broda & Weinstein, 2008; Engel & Rogers, 1996, 2004; Engel, Rogers, & Wang, 2003; Gopinath, Gourinchas, Hsieh, & Li, 2011; Helliwell, 1997; Nitsch, 2000; Parsley & Wei, 2001).

While *intra*-national market integration has received less scholarly attention, such integration is crucial for development. In addition to the fact that inefficient markets result from market segmentation, there are additional negative implications of market segmentation in developing economies. For agricultural markets in Africa, for example, Fafchamps (1992) argues that greater market integration would facilitate economic growth by shifting small-scale agriculture from subsistence farming to export-oriented crop production. When markets are geographically segmented, the price of agricultural products are volatile and dependent on local conditions. Under such conditions, farmers will protect themselves from volatility in food prices by growing their own food (subsistence farming) instead of investing in the production of cash crops. However, if markets are nationally-integrated, food prices would be significantly more stable, and even small-scale farmers will rationally invest in growing cash crops. In the aggregate, market integration would allow more farmers to shift from subsistence to income-generating farming and agricultural productivity and exports would increase, positively impacting economic growth.

A large literature has focused on understanding why national market integration sometimes fails in developing countries (see Fackler & Goodwin, 2001 for a review), and has identified three main barriers to national market integration: high transport costs due to poor infrastructure, government control of trade and pricing, and the lack of formal contract enforcement, all of which are chronic problems in much of Sub-Saharan Africa. First, in terms of high transport costs, scholars cite the lack of well-maintained road networks and the extreme isolation of many rural markets as culprits in prohibitive transport costs. In Malawi and Madagascar, Fafchamps *et al.* (2005) find that transport costs could be reduced by organizing larger loads, but that the dominance of small-scale trading and the dearth of motorized transport in some areas lead to the inefficient use of low-volume transport.

Second, many African states use, or have used, state-controlled agricultural marketing boards with monopoly buying rights to restrict the private trade of agricultural goods. These policies were ostensibly implemented to protect small-scale farmers from price volatility by guaranteeing a minimum price for their excess harvest, but in practice they often resulted in below-market prices for farmers. As a result, in the 1980s and 1990s, international organizations began tying financial assistance to the implementation of market liberalization policies, which were often part of a larger package of policy reforms collectively referred to as “structural adjustment programs.” There is some empirical evidence that market integration did indeed increase following such liberalization policies in several Africa countries (Badiane & Shively, 1998; Dercon, 1995; Goletti & Babu, 1994).

Third, most trade in Sub-Saharan Africa operates in the absence of formal avenues for contract enforcement. [Fafchamps \(2004\)](#) attributes this to the fact that most transactions are too small to justify the cost of legal action and that most offending parties are too poor to have assets that could be seized in court settlements. Without legal contract enforcement, trade in much of Africa is limited to face-to-face transactions with known and trusted trading partners. The resulting small-scale and very localized nature of trade means that markets are fragmented and increasing returns to scale are not realized. In the remainder of this paper, I focus on how one solution to the lack of formal contract enforcement—ethnically defined trade networks—limits market integration when ethnic groups are spatially segregated.

3. ETHNIC BARRIERS TO MARKET INTEGRATION IN AFRICA

Interpersonal trust is crucial for the operation of agricultural trade within Sub-Saharan African countries, because most transactions are not protected by formal contracts ([Lyon, 2000](#)).¹ The major risks faced by small-scale trade—arising primarily from price information asymmetries, disagreements over measurement, and misrepresented product quality ([Fafchamps & Gabre-Madhin, 2006](#))—are not typically protected by formal institutions because of the small stakes of each transaction and because most farmers and traders lack any collateral upon which institutions could bear claim ([Fafchamps, 2004](#)). As a result, small-scale agricultural trade in Africa—which makes up the majority of agricultural markets ([Fafchamps et al., 2005](#); [Jayne et al., 2010](#))—operates similarly to ancient overseas trade practices in which the risk of exploitation was overcome by restricting trade to members of a particular network within which collective enforcement of cheating is expected ([Greif, 1989, 1993](#)). While the personalized nature of such trade relations allows for economic transactions to proceed despite risk, the adverse effects of these closed networks of trust are to restrict the scale or scope of mutually beneficial transactions, and to limit the development of impersonal forms of contract enforcement ([Greif, 1994](#)).

In personalized trading systems, trust can arise from repeated interactions, resulting in networks of suppliers and clients within which trade occurs exclusively ([Lyon, 2000](#)). However, when those networks are defined along ethnic lines, then expectations of trustworthiness can come to be inferred from one's ethnic identity, even if the individual is not personally known ([Fafchamps, 2003, 2004](#); [Fafchamps & Minten, 2001](#)). This is indeed the case for many ethnic groups in many Sub-Saharan African countries. For example, cooperation is higher among coethnics because sanctioning of non-cooperation is more likely within ethnic groups than across ethnic lines ([Habyarimana, Humphreys, Posner, & Weinstein, 2009](#); [Miguel & Gugerty, 2005](#)), and public opinion data show that across most African countries, coethnics enjoy a trust premium ([Robinson, 2016b](#)).

Because trust facilitates trade, and trust tends to be concentrated within ethnic groups, we should expect that trade will be more common among coethnics. Indeed, there is ample evidence that ethnicity is a central component of trade relations in African markets (e.g., [Fafchamps, 2004](#); [Himbara, 1994](#); [Macharia, 1988](#); [Marris, 1971](#)). But, the implications of ethnic-based trade networks for economic growth depend on the geographic distribution of ethnic groups. For non-indigenous minorities, such as the Lebanese in West Africa ([Khuri, 1965](#)) or South Asians in East Africa ([Kristiansen &](#)

[Ryen, 2002](#)), the ethnic concentration of trade, while exclusionary, may still offer efficient integration of geographically disparate markets if the ethnic group is not geographically clustered. More generally, if members of different ethnic groups are evenly distributed across an ethnically diverse country, then the concentration of trust and trade within ethnic communities would not result in geographic market segmentation. However, in most Sub-Saharan African countries, ethnic groups are regionally segregated ([Alesina & Zhuravskaya, 2011](#); [Robinson, 2016b](#)).

Thus, I argue that it is the particular combination of ethnic-based institutions for trade on the one hand, with the geographic segregation of ethnic groups on the other, which contributes to the negative relationship between ethnic diversity and development in Sub-Saharan Africa. While much empirical work has tied levels of ethnic diversity to both lower trust and poorer economic outcomes, there has been less scholarship demonstrating the influence of ethnic diversity on economically-relevant behavior. Thus, the goal of this paper is to evaluate the degree to which ethnoregional segregation influences trade relations and national market integration in the case of Malawi.

This project contributes to the nascent body of work empirically linking ethnicity to market segmentation in Africa. First, [Hamaguchi \(2010\)](#) argues that in addition to improving physical infrastructure, policy makers must focus on overcoming ethnic tensions that hamper economic integration in Kenya. Rather than trade, Hamaguchi focuses on income, showing that the degree to which poverty in neighboring districts “spills over” into bordering areas is related to their ethnic similarity. Second, also working in Kenya, [Versailles \(2012\)](#) relates the ethnic composition of cities to their degree of economic integration. He uses maize price data disaggregated by city and finds that price shocks are more easily transferred between markets the closer they are to each other, in terms of both geographic distance and ethnic makeup. Third, [Aker et al. \(2014\)](#) evaluate the impact of the Niger–Nigeria border on agricultural trade. Consistent with the literature, they find that the international border increases price dispersion; however, their primary contribution is in showing that this border effect is smaller where a single ethnic group straddles the international border. They take this as an indication that coethnicity facilitates trade, which they then confirm by evaluating integration between markets within Niger. By identifying markets with high ethnic diversity that separate markets with low ethnic diversity in southern Niger, home to two ethnic groups (the Hausa and the Zarma), they find that price dispersion is lower within ethnically homogeneous regions than between them.

Together, these studies suggest that ethnic differences indeed pose a barrier to economic integration in Africa. In the current study of market integration in Malawi, I build on these studies in three important ways. First, my use of fine-grained census data on ethnic demographics allow for more precise measures of ethnic differences between market places than these studies, which rely on more aggregated ethnicity data that potentially masks important ethnic overlap. Second, my study of market integration includes all major ethnic groups in Malawi, reducing concerns that results are driven by unique dyadic relationships and also allowing me to exploit variation in political relevance and cultural distance across different ethnic boundaries. Third, the aggregate patterns of market segmentation that I report are complemented with original qualitative data from producers and traders on how the need for trust and the presence of ethnic differences manifests in everyday trading.

4. MAIZE TRADE IN MALAWI

Malawi is a small, densely populated, landlocked country in south-central Africa. It is home to eleven major ethnic groups, and members of these groups are, by and large, geographically segregated (Ejdemyr, Kramon, & Robinson, 2015). Across the nearly 13,000 Census Enumeration Areas, less than 20% do not have an ethnic majority, and over half have an ethnic majority larger than 80%. In other words, while Malawi is a very diverse country at the national level, most Malawians live in highly homogeneous settings.

Survey data suggest that trust in Malawi is particularly ethnically-defined. The third round of the Afrobarometer public opinion surveys asked individuals in several African states about their degree of trust in different types of individuals, including coethnics and members of other ethnic groups within the country (Afrobarometer, 2006).² While 55% of Malawians reported trusting their coethnics a lot, only 38% said the same of non-coethnics, and, overall, 29% of Malawians expressed more trust in coethnic than non-coethnic fellow Malawians. Across the sixteen states in the sample, Malawi ranks 15th in terms of the rate at which non-coethnics were trusted relative to coethnics. Robinson (2016a) confirms that these attitudes reflect real behavior by showing that rural Malawians trust coethnics more than non-coethnics in the behavioral economic trust game. In short, Malawi offers a particularly appropriate setting in which to study the impact of ethnic based trust and ethnic segregation on market integration.

In order to observe market integration over time, I focus on a single agricultural good: maize. Because maize is the primary staple crop throughout Malawi, with an estimated 97% of households growing maize each year (Jayne *et al.*, 2010), we should not expect differences in preference for maize across ethnic groups.³ There is one maize harvest per year, typically in late April or early May. While most farmers grow maize only for their own household needs, a sizable portion (around 20%) of smallholders sell some portion of their maize harvest for cash (Jayne *et al.*, 2010). This maize is typically sold right after the harvest, giving farmers access to cash in order to settle debts or pay school fees. Such farmers sell to a variety of sources, including other households within their village, local small-scale traders, mobile small-scale traders, agents for large trading companies, or the Agricultural Development and Marketing Corporation of Malawi (ADMARC).⁴ In an average year, maize sold by small-scale farmers accounts for almost 60% of maize traded (Jayne *et al.*, 2010).

The trade of maize in Malawi is both small-scale and extremely local. Most traders in Malawi buy directly from farmers and sell directly to consumers, rather than operating through intermediaries such as larger scale traders, collectors, or retailers (Fafchamps & Gabre-Madhin, 2006; Fafchamps *et al.*, 2005). When large-scale traders are present, they tend to specialize in wholesale and are very poorly vertically integrated: as a result, even large-scale maize traders rely on the small-scale traders operating throughout rural Malawi (Fafchamps *et al.*, 2005; Jayne *et al.*, 2010). Most villages have multiple resident traders and mobile (bicycle) traders from whom the farmers can choose to sell their maize (Jayne *et al.*, 2010). As a result, the average distance between the purchase and sale of maize is only 55 km, with around a fifth of traders' transactions occurring within the same market (Fafchamps *et al.*, 2005). Almost all traders operate alone and focus their operations on a single market, although a majority also operate to a lesser degree in other markets, too (Fafchamps & Gabre-Madhin, 2006).

Despite privatization of the maize market in the late 1980s, and widespread participation by the rural population, the Malawian maize market is not well integrated (Goletti & Babu, 1994; Zant, 2012). Lack of trust may be one reason for such poor market integration (Fafchamps & Gabre-Madhin, 2006), since interpersonal trust is crucial for the maize trade at several stages. When farmers wish to sell their excess maize, the decision of whom to sell it to often comes down to whom they trust, since farmers are vulnerable to being cheated by traders in a number of ways. For example, while mobile bicycle traders who travel through villages are appreciated by farmers because they save them the cost of transporting their excess maize to the local market, this service is risky, since the farmer may be offered prices much lower than the current price of maize. Even in contexts where the farmers have some idea about current prices, traders are often able to convince a farmer in desperate need of cash that the price of maize has fallen dramatically (Jayne *et al.*, 2010).

Even when farmers transport their maize to the local market place, and have options from among different traders and company agents, trust still plays a role. For example, many small-scale traders and buying agents operating in local markets use faulty weights in order to pay less for a product (Jayne *et al.*, 2010). In addition, while purchasing on credit is not very common in Malawi (Fafchamps & Gabre-Madhin, 2006), when it does occur farmers must simply trust that credit will be repaid by the traders (Jayne *et al.*, 2010).

Once the maize is sold from the farmer to a trader, interpersonal trust remains central to the functioning of markets. In a survey of traders in Malawi, Fafchamps and Gabre-Madhin (2006) find that a lack of trust among traders was a key impediment to trade. In the case of agricultural products, many traders were only willing to buy after visual inspection of the product because they did not trust the seller to accurately convey the quality of the good. Due to the high cost of individual transport, this lack of trust severely limits traders to transactions within a small geographic area. The radius is expanded through networks of trust, such that individuals may ask someone they do trust, who is local to the product, to inspect it on their behalf. Evidence suggests that such networks of trust exist and facilitate trade in Malawi (Fafchamps & Gabre-Madhin, 2006; Fafchamps & Minten, 2001). I have argued that because such trust tends to be concentrated within ethnic groups, and ethnic groups are geographically segregated, maize market integration is likely to be ethnically bounded.

5. DATA

In order to estimate the aggregate effect of ethnic differences on market segmentation in Malawi, I combine three sources of data: the location of 70 maize markets within Malawi, monthly maize price data from each of those markets during 1998–2005, and fine-grained census data on spatial distribution of ethnic groups across Malawi. The resulting market pair—month dataset includes a measure of maize price dispersion between market pairs, the degree to which markets are ethnically different, and the distance between them.

(a) Geographic location of Malawian markets

I matched the names of all 70 markets for which price data are available (see below) to a geocoded list of over 10,000 locations provided by the National Geospatial-Intelligence Agency. Figure A.1 of the appendix maps the location of these

markets across Malawi. From this market-level geographic data, I produce a dataset of market pair dyads with geocoded locations for both markets in each pair. For all 2,451 possible market pair dyads, the average geodesic distance between markets is 253 km ($s = 165$). However, because the maize trade in Malawi is extremely localized and small-scale, analyses are limited to the 478 market pairs within 100 km of each other. Limiting the geographic scope of the analyses reduces the number of unobserved heterogeneities between markets—geography, climate, production, demand—that might otherwise confound the impact of internal ethnic borders on market segmentation (Aker *et al.*, 2014). It also removes market-pairs for which the transport costs surely outweigh price differences, and, thus, whose price differences are less informative about market integration (Brenton, Portugal-Perez, & Régolo, 2014). The 100 km range was chosen based on the average scale of traders' operations within Malawi, which is 53 km (Fafchamps & Gabre-Madhin, 2006), and the expectation that two traders could interact up to the bounds of each of their trading areas.⁵

(b) Monthly price of maize in Malawian markets

Monthly maize price data are made available by the Famine Early Warning System Network based on data collected by the Malawi Ministry of Agriculture and Food Security. I use monthly maize prices between January 1998 and December 2011. The starting date of 1998 was chosen because many additional markets were added to the price collection efforts in that year and because by this time the influence of the parastatal ADMARC had declined (Goletti & Babu, 1994). Table A.1 in the Supplemental Information lists the 70 markets by region, district, months of price observations, and summary statistics of maize prices (in USD) within each market.

From these market-level price data, I produce a dataset of all market pair dyads within 100 km of each other for each month in which there are price data available for both markets.⁶ To capture the degree of market segmentation between each pair of markets in each month, I use a conventional measure of price dispersion:

$$PD_{ijt} = |\ln(p_{it}/p_{jt})|$$

where p_{it} is the price of a kilogram of maize (in USD) in market i in month t and p_{jt} is the price in market j for the same month.⁷ The greater the price difference, the less integrated are the two markets. Across the 478 market pairs, the average price dispersion is 0.19 ($s = 0.16$), which translates into a 20% difference in price. Figure A.2 of the appendix shows that the average price dispersion among markets separated by less than 100 km has decreased slightly over time, potentially due to increased market liberalization (Badiane & Shively, 1998; Dercon, 1995; Goletti & Babu, 1994) and expanding mobile phone coverage (Aker, 2010; Aker & Fafchamps, 2014; Jensen, 2007).⁸

(c) Ethnic composition of Malawian markets

Data on the distribution of ethnic groups across Malawi are made available by the National Statistics Office of Malawi and is based on the 2008 Malawian census.⁹ The total number of residents, as well as the numbers of individuals from each of the main ethnic groups in Malawi, is available for all 12,567 Enumeration Areas (EA) within Malawi.¹⁰ The EA is the smallest unit of observation within the census data: on average, EAs have 1,036 residents and cover six square kilometers. Figure 1 shows a map of the distribution of ethnic groups

across Malawi based on the underlying EA-level ethnic group data.

I relate this spatial distribution of ethnic groups to particular markets in two ways. First, I use the underlying spatial distribution of ethnic groups within Malawi to identify the approximate location of “ethnic borders.” In particular, borders represent the point at which the largest group within an EA shifts. Figure 1 shows the location of these borders, with regions enclosed by such borders labeled by the majority tribal group within that ethnic region. Market pairs are then coded for whether or not they are separated by an ethnic border. Just over 40% of markets within 100 km of each other are located in different ethnic regions meaning that goods or traders moving between those two markets must cross at least one ethnic border.

This focus on the largest ethnic group within each enumeration area gives us a good sense of the regional concentration of groups across Malawi. However, it masks import ethnic overlap between markets in different ethnic regions. In particular, while two markets may be located in areas dominated by different ethnic groups, if minorities of each of those groups exist in large enough numbers within the market pair, there may still be enough ethnic overlap to facilitate integration between those markets. Thus, the second measure of ethnic differences between markets considers not just the largest group, but the degree to which the ethnic composition of each market pair overlap.

To do this, I first establish each market's ethnic make-up by observing the ethnic make-up of the EA in which the market is located. For each market pair, I then measure the degree of ethnic difference between the two markets by calculating a Herfindahl index reflecting the probability that a randomly selected individual from one market is from a different ethnic group than a randomly selected individual from the other market using the following formula:

$$EthDiff_{ij} = 1 - \sum_{g=1}^{12} (p_{gi}p_{gj})$$

where p_{gi} is the proportion of residents in market i from group g , p_{gj} is the proportion of residents in market j from group g , and the product of those proportions is summed across all eleven ethnic groups and subtracted from one. As a result, $EthDiff_{ij}$ is a number between 0 and 1 representing the ethnic difference between markets i and j , with higher numbers representing greater ethnic difference. Among markets within 100 km of each other, the average degree of ethnic difference is 0.61 ($s = 0.31$) meaning that, on average, individuals randomly selected from two different markets will be from different ethnic groups 61% of the time. However, there is significant variation in ethnic overlap across market pairs, with 10% of market dyads being extremely ethnically similar ($EthDiff_{ij} < 0.10$) and almost 20% being almost maximally distinct ($EthDiff_{ij} > 0.9$). The two measures of ethnic difference between markets are strongly related, confirming the high degree of ethnic segregation in Malawi: the average degree of ethnic difference is 0.45 within ethnic regions and 0.85 for market pairs separated by an ethnic border.

6. ESTIMATION AND RESULTS

Following the convention in the border-effects literature, I use a market pair regression analysis to determine the degree to which ethnic borders are related to maize price dispersion by estimating the following model:

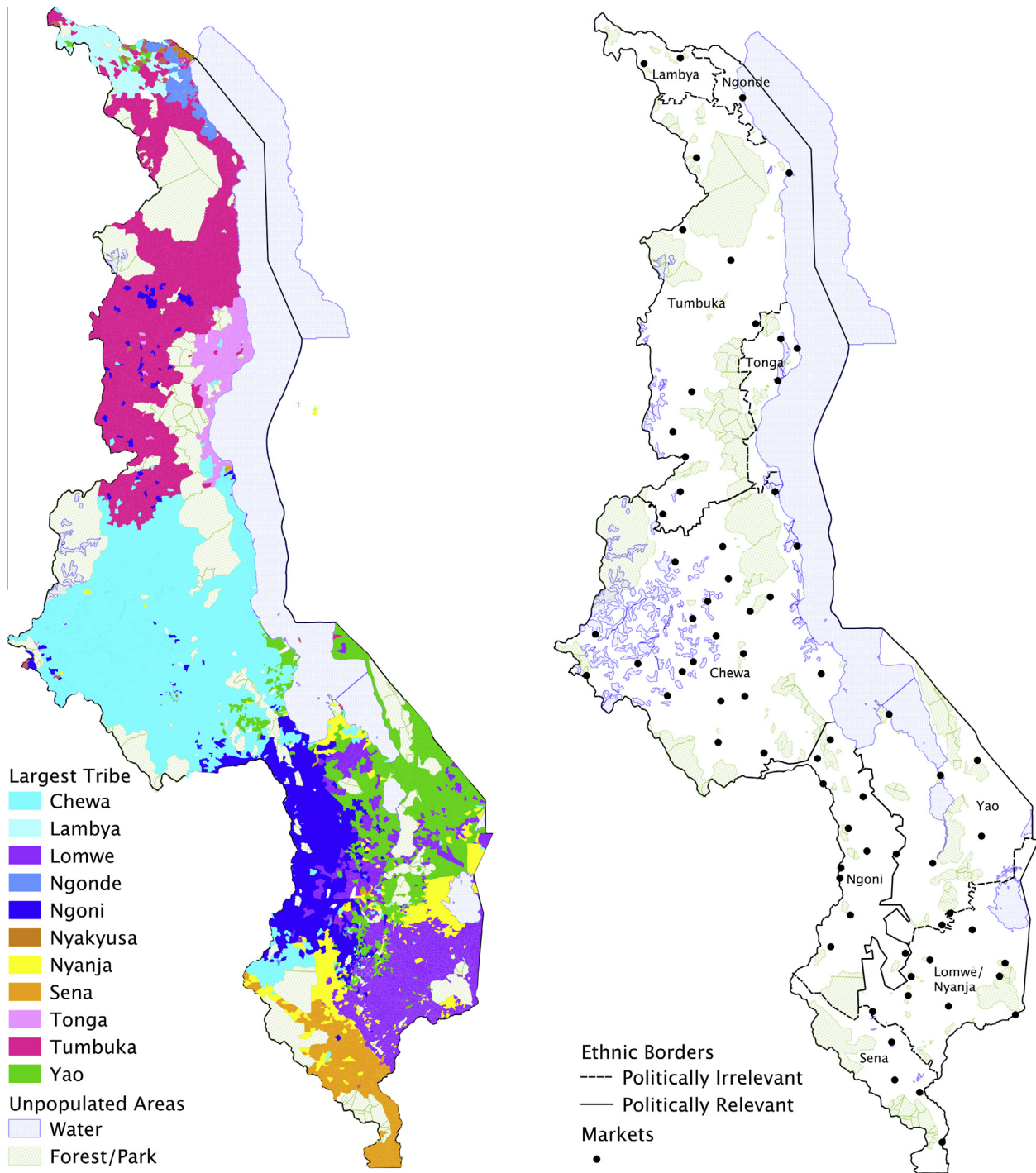


Figure 1. Ethnic groups and ethnic borders in Malawi.

$$PD_{ijt} = \beta_0 + \beta_1 EthBorder_{ij} + \beta_2 Distance_{ij} + \mu_i + \delta_j + \eta_t + \epsilon_{ijt}$$

where PD_{ijt} is the relative price difference (price dispersion) for maize in markets i and j in month t , $EthBorder_{ij}$ a dummy variable indicating whether markets i and j are separated by an ethnic border, $Distance_{ij}$ is the natural log of kilometers between markets i and j , μ_i and δ_j are market fixed effects for market i and j , η_t is the monthly time effect, and ϵ_{ijt} is the error term. Market fixed effects help account for many market-specific characteristics related to market-integration, including the local quality of infrastructure, the presence of

ADMARC depots, or local maize production. Similarly, the month fixed effect accounts for changes in ADMARC policies, environmental shocks, and other time varying factors affecting price dispersion, which fluctuate significantly, as shown in Figure A.2. Standard errors are clustered by market pair dyad in order to account for dependence between observations of the same market pair over time.¹¹

The coefficient of interest is β_1 , which estimates the change in the price ratio for markets within the same ethnic region compared to markets separated by an ethnic boundary. If ethnic borders do impede market integration, as hypothesized,

then the estimate of β_1 should be positive. We can similarly estimate the impact of the degree of ethnic difference by substituting $EthDiff_{ij}$ —the degree of ethnic difference between markets i and j —for $EthBorder_{ij}$ in the equation above.¹² Here β_1 estimates the change in the price ratio when we move from a market pair in which there is complete ethnic overlap ($EthDiff_{ij} = 0$) to a market pair in which there is no ethnic overlap ($EthDiff_{ij} = 1$), controlling for the distance between those two markets. To allow for a non-linear relationship between ethnic difference and market segmentation, market pairs are also categorized by quintiles of ethnic difference, and the equation above is reestimated with a set of indicators for level of ethnic difference.¹³

Table 1 presents the estimates for these three market pair regressions. Model 1 shows that ethnic boundaries have a positive and statistically significant impact on price dispersion, increasing price dispersion by 8% and price differences by 1.2%, compared to markets of equal distance apart but within a single ethnic region. This effect is similar in magnitude to the border effect between two ethnically distinct regions in Niger, as well as the Nigeria–Niger international border (Aker *et al.*, 2014). Comparing the coefficient on the ethnic border indicator to the impact of distance—the most common metric in the border effects literature—suggests that being separated by an ethnic boundary increases market segmentation to same degree as an increase in distance of around 95 km.¹⁴

Model 2 of Table 1 estimates the impact of the degree of ethnic difference between market pairs on price dispersion. Here we see that compared to market pairs with complete ethnic overlap, markets in which there is no commonality in ethnic group make-up have, on average, a 15% or a two percentage point increase in price dispersion. In terms of distance, this corresponds to the same impact as around 211 km of geographic separation. Compared to ethnically identical market pairs, price dispersion increases by 0.9, 1.6, and 1.8 percentage points for market pairs with ethnic difference at the 25th, 50th, and 75th percentiles, equivalent to increasing market separation by 57, 128, and 157 km, respectively.

Model 3 reports the estimation results for the quintile indicators, and Figure 2 plots the predicted level of market

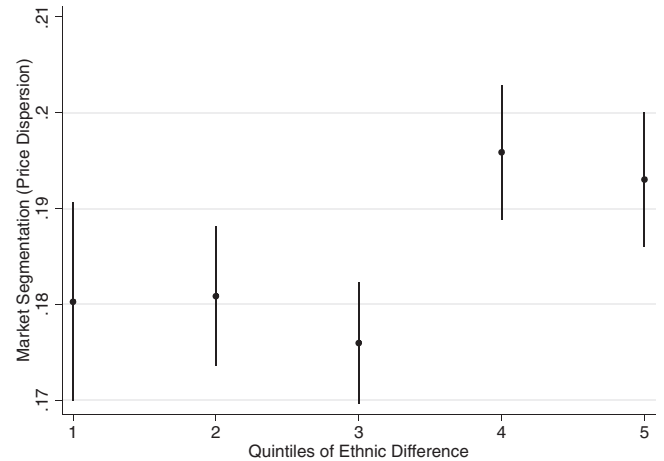


Figure 2. Ethnic difference and market segmentation.

segmentation, measured by price dispersion, as a function of different levels of ethnic difference. These results show that the negative effect of ethnic difference on market integration is driven by highly dissimilar markets with ethnic difference indices in the fourth and fifth quintile. This suggests that at moderate levels of ethnic overlap there are enough coethnics to maintain market integration similar to ethnically identical market pairs, but above a certain threshold (estimated here to be around $EthDiff_{ij} = 0.8$) there are not.

In terms of real price differences, these effects of ethnic difference are modest. Based on Model 2, ethnic difference increases the price of a 50 kg bag of maize by only 30 MWK (\$0.20). However, for the median Malawian trader, who earns less than \$4 per day and trades many dozens of bags in an average day (Fafchamps *et al.*, 2005), such margins are certainly meaningful.

(a) Alternative explanations

These results suggest that ethnic differences do indeed matter for market integration, implying that ethnic barriers to trade exist in Malawi. However, the results could be driven by omitted variables that are related to both greater ethnic difference and increased market segmentation. First, if intra-national administrative borders pose barriers to trade (Wolf, 2009; Zant, 2012), and different administrative districts are associated with different ethnic groups—due to colonial policy (Berman, 1997) or ethnically motivated district partition (Treisman, 2007; Grossman & Lewis, 2014)—then we will observe a spurious correlation between ethnic differences and price dispersion. Indeed, Malawian markets are less integrated across subnational district borders (Table B.5, Model 1 of the appendix) and markets separated by a district border are more likely to be separated by an ethnic border ($t = 15.9$, $df = 476$, $p < 0.001$) and have a significantly higher degree of ethnic difference ($t = 4.7$, $df = 476$, $p < 0.001$). However, Models 2 and 3 of Table B.5 in the appendix show that the main results are robust to controlling for markets separated by administrative borders.

A second potential omitted variable is the presence of geographic or infrastructural barriers. For example, the separation of two market areas by a mountain range could give rise to linguistic and cultural divergences historically, observed today as ethnic differences, and make trade today more difficult. Or, if infrastructural investments tend to be better developed within ethnic regions than across them (e.g.,

Table 1. Ethnic difference and market segmentation, 1998–2011

	(1)	(2)	(3)
Ethnic Border	0.012*** (0.004)		
Ethnic Difference		0.021** (0.009)	
Ethnic Difference Quintile = 2			0.001 (0.006)
Ethnic Difference Quintile = 3			-0.004 (0.007)
Ethnic Difference Quintile = 4			0.016** (0.008)
Ethnic Difference Quintile = 5			0.013* (0.007)
Ln of Distance (100 km)	0.009** (0.003)	0.010*** (0.003)	0.009*** (0.003)
Constant	0.220*** (0.039)	0.213*** (0.038)	0.216*** (0.039)
Market Fixed Effects	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes
Observations	31,040	31,040	31,040
Adjusted R^2	0.163	0.163	0.163

Robust standard errors, clustered by market pair, in parentheses.

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

Burgess, Jedwab, Miguel, Morjaria, & i Miquel, 2015; Ejdemyr *et al.*, 2015), then we would expect ethnically similar markets to be better connected than similarly close ethnically dissimilar ones. Through either or both of these mechanisms, geographic barriers and poor road networks could produce a spurious correlation between ethnic differences and market segmentation. I operationalize geographic and infrastructural barriers as the degree to which travel distances are farther than geodesic distances, based on the assumption that geographic features and poor infrastructural connections pose barriers to trade by effectively increasing travel time between markets. Using this approach, I calculate the actual travel distance between markets along roadways and construct a ratio of geodesic distance to travel distance.¹⁵ I find that geographic and infrastructural barriers are indeed related to ethnic differences: the ratio of geodesic distance to travel distance is significantly lower in the market pairs separated by an ethnic border than in the market pairs within a single ethnic region ($t = 3.86$, $df = 476$, $p < 0.001$). In other words, it takes longer to travel between ethnically distinct markets than between ethnically similar markets with the same degree of geodesic separation. To make sure that geography alone is not driving the relationship between ethnic difference and market segmentation, I show that the main results are robust to controlling for the natural log of travel distance, rather than geodesic distance, in Table B.6 of the appendix.

Finally, climatic differences between regions could have reified ethnic differences historically (Michalopoulos, 2012) and led to different rates of maize production—and, thus, different prices—today. To make sure that this alone is not driving the results, I replicate the main analyses while controlling for differences in maize production and climatic suitability for growing maize between each market pair. Very localized data on maize production (in metric tons) come from the EarthStat dataset (Monfreda, Ramankutty, & Foley, 2008), while suitability for growing maize—eight categories based on soil conditions, rainfall, and temperature—is taken from the Global Agro-Ecological Zones dataset (FAO/IIASA, 2011). For both measures, I calculate the absolute value of the difference between the two markets within a pair. Table B.7 of the appendix shows that the main results are robust to controlling for market pair differences in maize production and climatic constraints on maize production.¹⁶

(b) Political competition and cultural distance

Thus far, I have treated all ethnic boundaries within Malawi as equally consequential for trade. However, some ethnic differences may pose a greater barrier to trade than others. I first consider variation in the degree to which a particular ethnic cleavage is relevant within national-level politics. Given different sizes of ethnic groups, and the particular history of interethnic relations within Malawi, some ethnic identities are more politically salient than others. If ethnic differences impact political and economic outcomes through the politicization of ethnicity by elites (e.g., Posner, 2004b), then we should expect more politically relevant ethnic boundaries to pose a greater barrier to trade than politically irrelevant ethnic borders.

According to Posner (2004a), there are five politically relevant ethnic groups in Malawi—the Chewa, the Tumbuka, the Yao, the Ngoni, who are considered political allies of the Tumbuka, and the Lomwe who are allies of the Yao. I code each of the twelve ethnic borders as politically relevant if both groups separated by the ethnic border are politically relevant *and* they are not part of the same political alliance.

While 41% of markets are separated by an ethnic border, only 25% are separated by a politically salient ethnic border. I also calculate an index of politically relevant ethnic difference for each market pair, which is equal to the probability that two randomly selected individuals from different markets are from non-aligned politically relevant ethnic groups. This measure is calculated in the same way as the main ethnic difference index, except that it only considers individuals from non-aligned politically relevant ethnic groups to be ethnically distinct.¹⁷ Table 2 shows that neither politically relevant ethnic borders, nor the degree of politically relevant ethnic overlap, are related to price dispersion. These results suggest that the mechanism relating ethnic differences to market segmentation is not primarily driven by politicized ethnic differences.

I next consider variation in the degree of cultural distance between different ethnic groups. Cultural distance could be driving market segmentation because more culturally dissimilar groups lower intergroup trust (Guiso, Sapienza, & Zingales, 2009). To quantify the degree of cultural overlap across markets separated by an ethnic border, I start with a measure of cultural distance that relies on similarities in language classification as a proxy for cultural similarities (Fearon, 2003; Desmet, Ortuño-Ortín, & Weber, 2009).¹⁸ I then weight each ethnic border by the degree of cultural distance between the two ethnic groups it divides. I also calculate an index of cultural distance for each market pair, analogous to my measure of ethnic difference, which takes into the account the aggregate cultural fractionalization between two markets.¹⁹ Weighting ethnic difference by cultural distance reduces the overall degree of difference, since the ethnic difference index weights all ethnic differences as maximally culturally distinct: as a result, the cultural difference index varies from 0 to 0.19 with a mean of 0.10, while ethnic difference index varies from 0 to 1 with a mean of 0.61.

To estimate the impact of cultural differences on price dispersion, I replace the ethnic border indicator and the ethnic difference index with their culturally-weighted analogs. The results, presented in Table 3, show that cultural distance has a positive and statistically significant impact on price dispersion. In terms of magnitude, compared to two markets within the same ethnic region (or within different ethnic regions with no cultural difference), being separated by a moderate cultural border ($\tau = 0.05$) increases price dispersion by 4%, while markets separated by the largest cultural border ($\tau = 0.11$) increases price dispersion by 7%. Similarly, the index of cultural distance is positive and statistically significant. A one standard deviation increase in cultural distance is associated with a 4% increase price dispersion, with maximally culturally

Table 2. Politically relevant ethnic differences and market segmentation, 1998–2011

	(1)	(2)
Politically Relevant Ethnic Border	0.006 (0.004)	
Politically Relevant Ethnic Difference		−0.002 (0.009)
Ln of Distance (100 km)	0.011*** (0.003)	0.013*** (0.003)
Constant	0.225*** (0.039)	0.232*** (0.039)
Observations	31,040	31,040
Adjusted R ²	0.162	0.162

Robust standard errors, clustered by market pair, in parentheses.

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

Table 3. Cultural distance and market segmentation, 1998–2011

	(1)	(2)
Cultural Distance at Ethnic Border	0.129*** (0.040)	
Cultural Distance		0.125*** (0.045)
Ln of Distance (100 km)	0.008** (0.004)	0.009*** (0.003)
Constant	0.218*** (0.039)	0.212*** (0.038)
Market Fixed Effects	Yes	Yes
Month Fixed Effects	Yes	Yes
Observations	31,040	31,040
Adjusted R ²	0.163	0.163

Robust standard errors, clustered by market pair, in parentheses.
p* < 0.10, *p* < 0.05, ****p* < 0.01.

distinct market pairs segmented 14% more than culturally matched market pairs.

Together, these results demonstrate that cultural distance between ethnic groups is associated with greater market segmentation, while the political salience of ethnic divisions is not. This suggests that the association between ethnic differences and price dispersion is not primarily driven by ethnic antagonisms stoked by national-level political competition. Instead, cultural differences seem to drive ethnic barriers to

trade, by making communication more difficult due to linguistic distance, by reducing trust due to cultural distinctions, or both.

7. QUALITATIVE EVIDENCE ON TRUST AND ETHNIC BARRIERS TO TRADE

The results above show that the maize market in Malawi tends to be fragmented along ethnoregional lines. However, while the mechanism that I propose deals with differential trust in coethnics versus non-coethnics, the price data do not allow me to directly test this hypothesis. Thus, I conducted interviews with small-scale maize traders and rural farmers to better understand the *mechanism* linking ethnicity to trade. These data allow me to better understand how the aggregate patterns described above emerge from the behavior of key individuals engaged in rural maize trading.

Qualitative data were collected in July and August 2014 across three Traditional Authorities, each centered around a major market: Chulu Market in Traditional Authority Chulu, Kasungu District; Balaka Market in Traditional Authority Nsamala, Balaka District; and Jali Market in Traditional Authority Mwambo, Zomba District. The extent of the three field sites, and the markets around which they are centered, are highlighted in Figure 3. These three markets were chosen because they each lie at the boundary between two different ethnic groups—Chewa and Tumbuka in Chulu, Ngoni and Yao in Balaka, and Lomwe and Nyanja in Jali—allowing

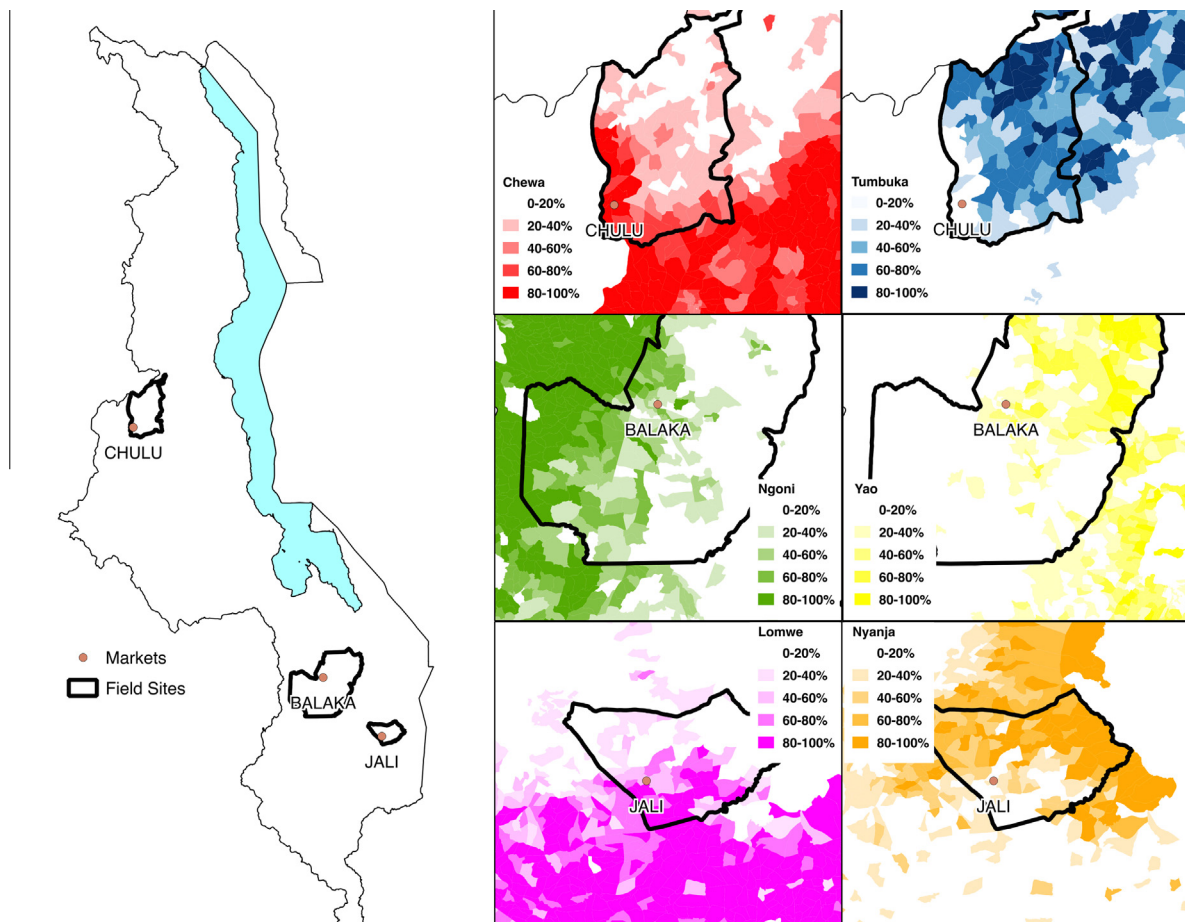


Figure 3. Field sites of qualitative data collection.

me to exploit local variation in the ethnic make-up of villages in close proximity to one another, as well as interview traders and producers from two different ethnic groups surrounding the same market.²⁰ Within each of the three market areas, both maize traders and farmers were interviewed.

Active maize traders were recruited through referral sampling in and around the central market in each site. A total of 18 traders were interviewed, three Chewa and three Tumbuka in Chulu, three Ngoni and three Yao in Balaka, and five Lomwe and one Nyanja in Jali. Each interview was conducted in Chichewa by a Malawian research assistant and lasted approximately 30–45 min. The interview focused on the trader's business organization, buying and pricing strategies, trust in both sellers and other traders, and the role of ethnicity in the trade of maize (see [Appendix C](#) for question wording). Most traders were male (72%) and had, on average, almost 7 years of experience. All traders reported that they primarily buy maize directly from farmers, and most work alone.

Rural maize farmers were recruited from eleven communities near the three markets. Communities were randomly selected from a list of all villages in each of the three market areas, stratified by ethnic make-up (dominant ethnic group) and distance from the market (above or below the median distance). Within each selected village, farmers who had sold maize in the previous two years were identified by the village headman and invited to participate in a focus group discussion with nine to ten other farmers. Discussions were led by Malawian research assistants and focused on reasons for selling maize, how traders are selected, determination of selling price, trust, and the role of ethnicity, if any, in selling to traders (see [Appendix C](#) for question wording).

(a) Ethnic-based trust and market segmentation

These interviews and focus group discussions confirmed the necessity of trust in maize transactions and the ways in which shared ethnicity facilitates such trust, resulting in ethnic barriers to trade. Given all the different ways in which farmers and traders are open to risk (see [Appendix D](#)), every single trader and every group of farmers attested to the crucial importance of trust in maize transactions. However, it is often difficult to know whom to trust. As one farmer put it, “trust is very difficult, nobody has stamped on the forehead that this one is trustworthy” (FGD 2, Yao Village, Balaka). However, the qualitative data reveal that shared ethnicity is one way in which those engaged in trade make decisions about whom to trust.

One trader admitted that he himself preferred to do business primarily with members of his own ethnic groups and attributed this to a lack of trust in members of other groups: “The same tribes will trust each other more. Like these if they are both Yao they will trust each other more and do more business while these other are different and they cannot trust each other” (Trader 2, Yao, Balaka). A Ngoni trader in the same market observed this tendency among the Yao, stating “They like trading with their fellow Yao. If you get on the market you will just see that they talk in their own language, selling or buying from each other and even lending each other money.” (Trader 12, Ngoni, Balaka). That same trader acknowledged little trust between the two groups: “Here, the Ngoni and the Yao they do not really go together well [*samw-erana madzi*, literally, they do not drink water from each other's household]. There is very little trust between a Yao and Ngoni.” Among both farmers and traders there were many statements akin to the judgement of one farmer, “the

ones who are the same they trust each other while the ones who are different there is less trust” (FGD 6, Tumbuka Village, Kasungu). Such trust manifests as an assurance that the types of “tricks” farmers and traders fear (see [Appendix D](#)) are less likely to be used among coethnics. One farmer explained that “most people have decided to do business with a member from their own tribe because they want to reduce risks. For instance, if a Yao trades with a Yao, they understand each other, while if he trades with an Ngoni like me the result in this business will be problems, which can be prevented if they were doing business with someone from our own tribe. To trust someone nowadays, people are preferring to do business with someone from their tribe” (FGD 4, Ngoni Village, Balaka).

Much of this “coethnic trust premium” ([Robinson, 2016b](#)) was attributed to prejudice and in-group preference by the respondents. For example, a Tumbuka trader explained that “they just don't trust other tribes. They think that if someone is from another different tribe then he can do bad things to him” (Trader 9, Tumbuka, Kasungu) and a farmer noted that “when you go to the market sometimes you ask a price from a Yao trader and they do not treat you well. So we do avoid them.” (FGD 5, Tumbuka Village, Kasungu). However, some respondents attributed the difference to strategic considerations. Consistent with [Habyarimana et al.'s \(2009\)](#) findings in Uganda, there was an expectation that a wronged party would be better able to locate and sanction a trading partner who acts in bad faith if they were from the same ethnic group. For example, one farmer in Balaka explained, “If you are a Tumbuka and we trust you and at the end you cheat us, where are we going to find you? Maybe you will go back to your home village in the Northern region. How are we going to identify you? Maybe your clan is Banda or Nyilongo, we just won't know.” (FGD 2, Yao Village, Balaka).

Many traders and farmers noted that weak interethnic trust limited lending and credit, further constraining trade. Traders noted that “the same group will give each other more loans” (Trader 2, Yao, Balaka), “if they are from different tribes then they cannot trust, and so there cannot be credit among them” (Trader 4, Lomwe, Zomba), and that “the people who are different they do not know each other well, so they cannot give each other loans, while those who are the same they know each other and they will borrow from each other without problems” (Trader 8, Tumbuka). This lack of lending limits transactions among traders from different ethnic groups, as noted by a trader in Kasungu: “Because we can give credit to each other [within our tribal group] while others we cannot, we trade more because more money circulates” (Trader 9, Tumbuka). While credit is more rarely given to farmers, at least one farmer suggested that he would be more likely to access a loan (in the form of maize) from a coethnic trader, stating that “if your maize is finished, you can go to him [someone from your own group] and borrow and you can agree to pay back after harvesting next season” (FGD 3, Ngoni Village, Balaka).

A very common explanation for ethnically constrained trade among farmers and traders was a very specific form of lending where farmers sell their maize right after harvest and then buy it back later in the year at a higher price, due to seasonal fluctuations in maize prices and chronic food shortages in Malawi. Others have characterized this “selling low and buying high” as a form of high interest loan ([Burke, 2014; Stephens & Barrett, 2011](#)). Many of our respondents suggested that this type of lending was influenced by shared ethnicity, as farmers anticipated that coethnic traders were both more likely to keep the maize and sell it back locally and to offer a better price. A farmer explained, “if a Lomwe from Phalombe buys maize

from a Chewa in Machinga, this person takes the maize to Phalombe. How will a Chewa access this maize later? That maize is gone" (FGD 10, Lomwe Village, Zomba). Similarly, a trader noted that, "my business is between me and my relatives here. These relatives know that if they sell me their maize it will not go far. It will come a time when they will come and buy from me. Indeed, there is more maize business between the same group because people know that if they run short of maize they will buy from the same person." (Trader 8, Tumbuka, Kasungu,). In a country that experiences a "hunger season" each year, and full fledged famines in recent memory (Ellis & Manda, 2012), selling to a coethnic is a form of insurance: "people of the same group trade more in maize because when there is famine you cannot buy maize from the Yao's area. You will go to your own group" (FGD 7, Chewa Village, Kasungu).

Taken together, these qualitative data, collected from the very individuals engaged in small-scale maize trade, help elucidate the importance of trust in linking ethnic differences to trade. Most traders and farmers were well aware that the maize trade in Malawi was ethnically segmented (see Appendix D), and when asked *why*, all 12 groups of farmers and 77% of traders suggested that weak trust between ethnic groups is a main cause for the market barriers. While many farmers and traders also pointed to language difficulties—e.g., "it will be difficult for me to do business with a person who is speaking a language I do not understand" (Trader 3, Lomwe, Zomba)—weak trust between groups was ranked as more important for ethnic market segmentation by both farmers and traders than language differences or any other explanation.

8. CONCLUSION

It has been well documented that ethnically diverse polities—cities, states, and countries—tend to have worse economic outcomes than more homogeneous ones (Alesina & Ferrara, 2005). Given that African states are among the most diverse in the world, many scholars attribute poor economic outcomes on the continent to their high levels of diversity (Easterly & Levine, 1997). However, much less work has been done to understand how ethnic diversity actually leads to poor economic performance. The dominant view seems to be that ethnic diversity at the national level leads to poor economic policies because elite actors in diverse states cannot cooperate to enact growth-enhancing policies.

In contrast, this paper lays out a mechanism relating diversity to poor growth based on the economic behavior of regular citizens. This mechanism is expected to operate when three conditions are met: individuals trust coethnics more than non-coethnics; members of different ethnic groups are geographically segregated; and there is weak or absent formal

contract enforcement. Because interpersonal trust is crucial for market transactions in the absence of formal contracts, small-scale trade will tend to be concentrated within ethnic groups, resulting in the segmentation of markets along sub-national, ethnic lines. Such segmentation contributes to slower economic growth by forgoing the growth-promoting benefits of national market integration: less price volatility, gains from inter-regional trade resulting from different comparative advantages, and the efficient distribution of goods across space.

By combining data on the price of maize across Malawian markets with fine-grained data on the spatial distribution of ethnic groups across Malawi, I show that markets are indeed segmented along ethnic lines. In particular, the results show that price dispersion—a common indicator of market segmentation—is higher when markets are separated by an ethnic border and when the degree of ethnic overlap between markets is small. This effect does not appear to be driven by the political mobilization of ethnicity, as the association between price dispersion and ethnic difference is not stronger for politically salient ethnic divisions. In contrast, greater cultural distance between ethnic groups is associated with greater market segmentation, perhaps because cultural differences reduce trust (Guiso *et al.*, 2009). Qualitative data from farmers and traders in Malawi support the interpretation that ethnic market segmentation is driven, at least in part, by the risks inherent in trade, the greater willingness to trust coethnics, and the resulting preference for coethnic trading partners.

What can these results tell us about the integration of markets more broadly? While this study has focused on maize, research on market integration across the continent has found that markers for less perishable, staple crops such as maize tend to be the most integrated (Balchin, Edwards, & Sundaram, 2015; Versailles, 2009). Therefore, we might expect that the effect of ethnic difference on the trade of maize represents a lower bound on the potential effect of ethnicity on market integration in general. With the rapidly increasing availability of fine-grained price data on a number of different goods, future research should evaluate whether and how ethnicity influences the trade of different types of goods.

While the findings are also based on data from only one country, Malawi, we should expect to observe similar ethnoregional market segmentation whenever ethnic-based trust is combined with ethnic segregation. Unfortunately, these two conditions typically occur together, as ethnic group segregation is strongly associated with ethnic-based trust across African states (Robinson, 2016b). Given that most African states, while extremely diverse at the aggregate level, are made up of multiple ethnically homogeneous regions, and that coethnicity is a strong predictor of trust, market segmentation along ethnic lines is likely to be a contributing factor in the weak integration of markets across Sub-Saharan Africa.

NOTES

1. Following Fafchamps (2003), I define trust as the belief that an agreement will not be breached in bad faith.

2. Each Afrobarometer respondent was asked, "How much do you trust each of the following types of people: People from your own ethnic group? [Ghanaian/Kenyan/etc.] from other ethnic groups?" Response categories were "not at all," "just a little," "I trust them somewhat," and "I trust them a lot."

3. While in some regions rice or cassava is also grown, reducing demand for maize, these maize alternatives are regionally rather than ethnically concentrated, and should not produce ethnic differences in maize consumption within the same locality.

4. ADMARC, a parastatal, was established as the sole buying agent of agricultural products in Malawi. However, with its acceptance of structural adjustment loans in the 1980s, Malawi was forced to slowly

liberalize its agricultural markets. The maize trade was officially liberalized beginning in 1987, and while ADMARC continued to dominate the market for sometime thereafter (Fafchamps *et al.*, 2005; Goletti & Babu, 1994), it has played a decreasing role in the maize trade since the early nineties (Jayne *et al.*, 2010). While ADMARC still operates as the seller of last resort, most farmers do not sell to ADMARC because it offers a lower price than private buyers and because it only begins buying late in the season, while most farmers prefer to sell immediately after harvest. In 2008, only 8% of the excess maize sold by small-scale farmers was sold to ADMARC (Jayne *et al.*, 2010).

5. The effect of ethnic differences on market segmentation is robust to limiting the geographic distance between markets to between 50 km and 250 km (see Table B.1 of the appendix). The effect size decreases with distance, and in radii above 250 km the results lose statistical significance at conventional levels. The fact that the results do not hold across long distances suggests that the mechanism producing price dispersion is, in fact, ethnic difference between proximate markets and not differences in preference across ethnic groups.

6. Because additional markets were added to the dataset over time—increasing from 24 markets in 1998 to 70 markets in 2011—the number of observations increases with time for a total of 31,040 observations over the fourteen years. While the expansion of market price data most likely reflects the addition of existing markets to data collection efforts rather than the creation of new markets, I nevertheless replicate the main results on the sample from 2005 to 2011 (Table B.2 of the appendix), by which point most markets appear in the dataset, to ensure that the expanding dataset is not biasing the results.

7. This measure of price dispersion was chosen because it is by far the most common measure used in past research, it deals well with global changes in the cost of maize over time, and it is not directional (the price dispersion between p_i and p_j remains the same if you switch the assignment of i and j to the two markets).

8. It is not clear, *a priori*, how the expansion of mobile phone coverage would influence the effect of ethnic difference on market segmentation. Given that mobile phone coverage increases market integration in general (Aker, 2010; Aker & Fafchamps, 2014), it could counteract the effect of shared ethnicity by providing easy access to objective information about prices. However, if mobile phones are primarily used to contact coethnics (Eubank, 2016), then mobile phone coverage could actually amplify the effect of ethnic differences on market segmentation.

9. The use of these data to explore market integration over time implicitly assumes that ethnic geography is relatively stable. Unfortunately, ethnicity was not recorded in previous Malawian censuses, so I cannot evaluate this assumption empirically. However, I do not anticipate drastic changes to the ethnic landscape, because rural to rural migration in Malawi is constrained by land scarcity and customary land tenure systems (Kishindo, 2004), and because rural-rural migrants typically move for marriage and most marriages occurs within ethnic groups (Englund, 2002). Rural to urban migration, which is much more common and increases diversity around urban markets, may mean that some market pairs are more or less ethnically similar than the data suggest. This potential mismeasurement only makes it more difficult to observe any real effect of ethnic difference on market integration.

10. Of the over thirteen million people in the census, only 2.5% chose “other” for their ethnic group rather than one of the eleven main groups. For the calculations of ethnic difference between markets, these individuals are dropped.

11. The results are largely robust to clustering standard errors by time in addition to market dyad (see Table B.3 of the appendix).

12. Table B.4 reports the results of estimating a model that includes both measures together. However, given the high degree of collinearity between the two measures of ethnic difference, the main results present estimates for each indicator separately.

13. For market pairs within 100 km of each other, the ethnic difference quintiles are $EthDiffQ1 = [0.01, 0.23]$, $EthQuin2 = [0.24, 0.61]$, $EthDiffQ3 = [0.62, 0.80]$, $EthDiffQ4 = [0.81, 0.88]$, and $EthDiffQ5 = [0.88, 1.00]$.

14. The distance equivalent is calculated as the additional distance one would need to add to the average distance between markets (63 km) in order to generate as much price dispersion as the ethnic border (Parsley & Wei, 2001).

15. I use the Stata *traveltime* command, which interfaces with Google Maps.

16. Table B.8 shows the results when all control variables are included in the same model.

17. In particular, two individuals from different ethnic groups are treated the same as individuals from the same ethnic group if either or both of the individuals’ ethnic groups is considered politically irrelevant or if both individuals’ ethnic groups are considered part of the same political alliance.

18. Following Fearon (2003) and Desmet *et al.* (2009), the cultural distance between ethnic groups i and j (τ_{ij}) is calculated as $\tau_{ij} = 1 - \frac{l_{ij}^\delta}{m}$, where l is the number of language classifications in common between the languages spoken by those two ethnic groups, m is the maximum number of common classifications between any two languages, and δ is the rate at which distance declines with additional shared classifications. Within Malawi, l varies between 8 and 10, $m = 10$, and $\delta = 0.5$. Table A.4 in the appendix presents the degree of cultural distance for all ethnic dyads.

19. The index is calculated as $\sum_{a=1}^{11} \sum_{b=1}^{11} 1 - (p_{ai} p_{bj} \tau_{ab})$, where p_{ai} is the proportion of market i made up of members of ethnic group a , p_{bj} is the proportion of market j made up of members of ethnic group b , and τ_{ab} is the degree of cultural distance between ethnic groups a and b .

20. The Chewa-Tumbuka and Ngoni-Yao ethnic divides are both considered politically salient, while the Lomwe-Nyanja is not. The cultural distance between the Chewa-Tumbuka ($\tau = 0.051$) is smaller than the distance between each of the other two pairs ($\tau = 0.106$). However, these differences are not exploited in analyzing the qualitative data, since the research site selection and research methodology were designed to elucidate the mechanisms linking ethnic difference to trade rather than to establish differences across the three market regions.

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.worlddev.2016.07.006>.

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