Internal Borders:
Ethnic-Based Market Segmentation in Malawi

Amanda Lea Robinson∗

August 25, 2015

∗Assistant Professor of Political Science, The Ohio State University. Email: robinson.1012@osu.edu. I thank Augustine Harawa, Erin Pemberton, and Shem Yuda for their assistance in data collection, transcription, and coding, and Invest in Knowledge Initiative in Zomba, Malawi for institutional and logistical support. I am also grateful to the Malawi Ministry of Agriculture, FEWS Net Malawi, and Wouter Zant for providing data on maize prices in Malawi, and to the National Statistics Office of Malawi and Kim Yi Dionne for sharing the 2008 census data on ethnicity. Institutional review board approval for the human subjects component of this research was approved by the Ohio State University Behavioral and Social Sciences IRB (Protocol # 2014B0192) and Malawian National Commission for Science and Technology’s Committee on Research in the Social Sciences (Protocol # P.06/14/12).
Abstract:
Ethnic diversity is associated with poorer economic development, but why? While existing explanations focus on top-down mechanisms of elite coordination failure, I propose an alternative bottom-up explanation: when ethnic groups are geographically segregated and trust is concentrated within groups, markets will be tend to be segmented along ethnic lines. I evaluate this argument using maize price data from seventy Malawian markets over fourteen 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 and geographic barriers into account. The effect is substantively quite large, as market pairs with no ethnic overlap are segmented to the same degree, on average, as ethnically similar markets separated by an additional 245 kms. These statistical findings are complemented by interview data from farmers and traders in three markets across Malawi. The interviews confirm that trust is necessary for trade and that trust is greater among coethnics. Together, these findings suggest that ethnic diversity, and ethno-regional segregation in particular, can have a negative impact on market integration, an important driver of food security and long-term economic development. (WC: 201)

Manuscript Word Count: 10,253

Keywords: Ethnic diversity; Trade; Trust; Market Segmentation
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 five percent of the per capita incomes in North America (Heston, Summers, and Aten, 2012). This underdevelopment translates into real welfare consequences, with Sub-Saharan Africa having the highest rates of malnutrition (Meerman, Carisam, and Thompson, 2012), the most extreme food insecurity (Rosen et al., 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, linguistic, and cultural 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 societies (Zak and Knack, 2001; Alesina and La Ferrara, 2005).

But how does ethnic diversity thwart economic development? Existing explanations tend to focus on top-down mechanisms of elite behavior, including macroeconomic policy distortions (Easterly and Levine, 1997), the under provision of public goods (Alesina, Baqir, and Easterly, 1999; Alesina and La Ferrara, 2005), divergent policy preferences (Lieberman and McClendon, 2012), competitive rent-seeking (Shleifer and Vishny, 1993), and opposition buy-off (Annett, 2001). In contrast, I propose a bottom-up mechanism linking ethnic diversity to poor economic growth via mass-level behavior. In particular, I argue that ethnic segregation and ethnic based trust lead to the 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 and Zhuravskaya, 2011; Matuszeski and Schneider, 2006). While trust tends to be concentrated within ethnic groups in Africa, this is especially so when groups are geographically segregated (Robinson, 2013a). 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 and 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 segregation and ethnic-based trust on market segmentation in the context of Malawi, an ethnically diverse country in southern Africa. Past research has shown that markets are poorly integrated in Malawi (Goletti and Babu, 1994; Fafchamps, Gabre-Madhin, and Minten, 2005; Zant, 2012; Nyongo, 2014), 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 and Gabre-Madhin, 2006; Jayne et al., 2010). I add to this literature by arguing that the 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 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 245 kms. This effect is robust to controlling for potential omitted variables, including sub-national administrative borders and geographic separation, which are likely to be correlated with both ethnic geography and market segmentation.

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 qualitative data resulting from the interviews is 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 risk inherent in trading maize without formal contract enforcement, and the importance of shared ethnicity in reducing those risks.

In sum, the findings of this paper suggest that within-country ethnic diversity, and ethno-regional 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 conditional on shared ethnicity, and markets rely on informal contract enforcement. Given the ubiquity of these conditions in much of Sub-Saharan Africa, the bottom mechanism proposed here may help account for economic under-development and food insecurity across the continent, as well as offering a link between ethnic diversity and economic growth more broadly.

**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 and Christy, 2008; Sanogo and Amadou, 2010). Thus, barriers to trade, and, as a result, barriers to market integration, are detrimental to development (Frankel and Romer, 1999; Keller and Shiue, 2007a).

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 and 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 and 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 are barriers to trade (e.g., Engel and Rogers, 1996; Helliwell, 1997; Nitsch, 2000; Parsley and Wei, 2001; Anderson and Van Wincoop, 2002; Engel, Rogers, and Wang, 2003; Engel and Rogers, 2004; Broda and Weinstein, 2008; Gopinath et al., 2011; Aker et al., 2014).

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 and 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 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, Gabre-Madhin, and Minten (2005) finds 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 leads 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 (see Goletti and Babu, 1994; Dercon, 1995; Badiane and Shively, 1998, on Malawi, Ethiopia, and Ghana, respectively).

Third, most trade in Sub-Saharan Africa operates in the absence of formal avenues for contract enforcement. Fafchamps (2004) attributes this to the facts 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 that carry little risk, or to transactions in which business partners trust one another to complete a transaction in good faith. The resulting small-scale and very localized nature of trade means that markets are fragmented and increasing returns to scale are not realized.

All three of these barriers to trade are likely to be operating in the agricultural markets of Sub-Saharan Africa. In the next section, I focus on how one solution to the lack of formal contract enforcement – namely, ethnically defined trade networks – combined with the regional segregation of ethnic groups within diverse states is itself an additional barrier to market integration.
Ethnic Barriers to Market Integration in Africa

Interpersonal trust is crucial for the operation of agricultural trade within Sub-Saharan African countries,\(^1\) because most transactions are not protected by formal contracts (Lyon, 2000). Small scale trade is 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, Gabre-Madhin, and Minten, 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 and Minten, 2001; Fafchamps, 2003, 2004). 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 (Miguel and Gugerty, 2005; \(^1\)Along with Fafchamps (2003), I define trust as the belief that an agreement will not be breached in bad faith.)
Habyarimana et al., 2009), and public opinion data show that across most African countries, coethnics enjoy a trust premium (Robinson, 2015).

Because trust lowers the transaction costs of trade, and trust tends to be concentrated within ethnic groups in Africa, then we should expect that trade will be more common among coethnics. Perhaps not surprisingly then, there is ample evidence that ethnicity is a central component of trade relations in Sub-Saharan African markets (e.g., Marris, 1971; Macharia, 1988; Himbara, 1994; Fafchamps, 2004). But, the implications of this link between ethnicity and trade for economic growth are dependent on the geographic distribution of ethnic groups. For non-indigenous minorities, such as the Lebanese in West Africa (Khuri, 1965) or Asians in East Africa (Kristiansen and 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, the majority of ethnic groups are regionally concentrated with a high degree of ethnic segregation (Alesina and Zhuravskaya, 2011).

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 impacts of diversity on economically-relevant behavior. Thus, the goal of this paper is to evaluate the degree to which ethno-regional 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
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, Aker et al. (2014) applies the border effects literature to market integration in Africa, by evaluating 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 northern Niger. By identifying markets with high ethnic diversity that separate markets with low ethnic diversity in the northern region of 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 two studies provide evidence that ethnic differences do indeed pose a barrier to economic integration in Africa. My study of market integration in Malawi builds on these studies in three important ways. First, my use of fine-grained census data on ethnic demographics allows for more precise measures of ethnic differences between market places than either of these studies, both of 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. 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.
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. 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.

Further, survey data suggest that trust in Malawi is particularly ethnically-defined. The third round of the Afrobarometer public opinion surveys asked individuals in several Africans states about their degree of trust in different types of individuals, including co-ethnics and members of other ethnic groups within the country (Afrobarometer, 2006). 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. 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. Maize is the primary staple crop in Malawi, with an estimated 97% of households growing maize each year (Jayne et al., 2010). There is one maize harvest per year, typically in late April or early May. While most farmers grow maize only for their

---

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.”
Internal Borders

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).\(^3\)

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, and Minten, 2005; Fafchamps and Gabre-Madhin, 2006). 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, Fafchamps, Gabre-Madhin, and Minten (2005) reports that average distance between the purchase and sell of maize

\(^3\)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 (Goletti and Babu, 1994; Fafchamps, Gabre-Madhin, and Minten, 2005), 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).
is only 55 kms, with around a fifth of traders’ transactions occurring within the same market. Almost all traders focus their operations on a single market, although a majority also operate in other markets, too (Fafchamps and 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 and Babu, 1994; Zant, 2012). Lack of trust may be one reason for such poor market integration (Fafchamps and 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 plus the cost of transport. 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 amongst 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 and Gabre-Madhin, 2006), when it does occur farmers must simply trust that 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 small-scale 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 will-
ing 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 and Minten, 2001; Fafchamps and Gabre-Madhin, 2006).

In sum, interpersonal trust is central to the functioning of the maize trade in Malawi. Because trust tends to be concentrated within ethnic groups, and ethnic groups are geographically segregated, I have argued that maize market integration is likely to be ethnically bounded.

**Empirical Approach**

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 between 1998 and 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. Following common approaches in the study of market integration, I use a market pair regression analysis to determine the degree to which ethnic differences precipitate maize market fragmentation, controlling for the distance between markets.


Geographic Location of Malawian Markets

Geographic location data are made available for over 10,000 locations in Malawi by the National Geospatial-Intelligence Agency. From this list of places, I reduced the dataset to the 70 places that matched the location of markets for which price data is available (see below). This resulted in a dataset of the latitude and longitude of the main maize markets in Malawi. Figure 1 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. With 70 markets there are 2,451 possible market pair dyads ($n(n - 1)/2$). The average geodesic distance between pairs of markets is 253 kms (SD=165), ranging from 8 kms to 830 kms. However, because the maize trade in Malawi is extremely localized and small-scale, analyses are limited to the 478 market pairs within 100 kms of each other. Limiting the geographic scope of the analyses reduces the number of unobserved heterogeneities between markets – geography, climate, production, demand, etc. – 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 transports costs surely outweigh price differences, and, thus, whose price differences are less informative about market integration (Brenton, Portugal-Perez, and Régolo, 2014).

Monthly Price of Maize in Malawian Markets

Monthly maize price data is made available by the Famine Early Warning System Network from data collected by the Malawi Ministry of Agriculture and Food Security. Toponymic information is based on the Geographic Names Database, containing official standard names approved by the United States Board on Geographic Names and maintained by the National Geospatial-Intelligence Agency. More information is available at the Maps and Geodata link at www.nga.mil.
I use monthly maize prices between January 1998 and December 2011 (168 months) for 70 different markets. The starting date of 1998 was chosen for two reasons. First, many additional markets were added to the data collection efforts in 1998. Second, while agricultural markets were officially liberalized beginning in 1987, the parastatal
ADMARC dominated the markets until the early to mid-1990s (Goletti and 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 within each market.

From these market-level price data, I produce a dataset of market pair dyads with maize price data for both markets in each month. However, this a high degree of missingness: for the 478 market pairs within 100 kms of each other, of the 80,304 possible monthly observations, there are only 31,040 actual observations. This missingness comes from markets being added to the price data collection efforts over the 13 years, from 24 markets in 1998 to 70 markets in 2011. To make sure that results are not driven by this missingness, robustness tests are also run on the sample from 2005–2011, in which most markets had been added to the dataset and missingness is less of a problem.

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 Malawian Kwacha) in market $i$ in month $t$ and $p_{jt}$ is the price in market $j$ for the same month.\(^5\) The greater the price difference,\(^5\)

\(^5\)Price dispersion could be measured in a number of different ways. This particular measure of price dispersion was chosen because it has been employed in much of the existing literature, deals well with change in the real value of the kwacha over time, and is not directional (the price dispersion between $p_{it}$ and $p_{jt}$ remains the same if you switch the assignment of $i$ and $j$ to the two markets).
the less integrated are the two markets. Across the 478 market pairs in the dataset, the average price dispersion is 0.185 ($s = 0.16$), which translates into a 20% difference in price.

**Ethnic Composition of Malawian Markets**

Data on the distribution of ethnic groups across Malawi is made available by the National Statistics Office of Malawi and is based on the 2008 Malawian census. 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.\textsuperscript{6} The EA is the smallest unit of observation within the census data: on average, EAs have 1,036 residents (SD = 550) residents and cover six square kilometers (SD = 7.5). Figure 2 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 2 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. Slightly over 40% of markets within 100 kms of each other, are located in different ethnic regions, meaning that goods and/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\textsuperscript{6}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.
Figure 2: Ethnic Groups and Ethnic Borders in Malawi

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.\textsuperscript{7} 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:

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

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.\textsuperscript{8} Among markets within 100 kms of each other, the average degree of ethnic difference is 0.64 (SD = 0.30) meaning that, on average, individuals randomly selected from two different markets will be from different ethnic groups 64% of the time. This measure of ethnic difference also

\textsuperscript{7}The ethnicity of maize sellers (farmers) is very likely to match the ethnicity of the market’s EA given that most farmers sell locally. I use data on traders in a subset of Malawian markets, provided by Fafchamps and Gabre-Madhin (2006), to estimate ethnic similarity between traders and the market’s surrounding population. Only 34 of the markets in Fafschamps data match the markets in my sample, and only 29 have data for 5 or more traders. But, among this subsample, the degree of ethnic similarity, calculated using a Herfindahl index, is 0.43.

\textsuperscript{8}This is essentially the same formula as the more commonly used Ethno-Linguistic Fractionalization (ELF), which calculates probabilities within a single unit instead of between two units.
validates the ethnic regions determined above: the average degree of ethnic difference is 0.45 within ethnic regions and 0.85 for market pairs separated by an ethnic border.

Regression Framework

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:

$$ PD_{ijt} = \beta_0 + \beta_1 EthBorder_{ij} + \beta_2 Distance_{ij} + \mu_i + \delta_j + \eta_t + \epsilon_{ijt} $$ (1)

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 $j$, $\mu_i$ and $\delta_j$ are market fixed effects for market $i$ and $j$, $\eta_t$ is the monthly time effect, and $\epsilon_{ijt}$ is the error term. Because the key independent variable – separation by an ethnic border – does not vary over time, a market dyad fixed effect cannot be included. However, standard errors are clustered by market pair dyad in order to account for dependence between observations of the same market pair over time. 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 trade.

---

9I use the natural log of distance with the expectation that the marginal effect of distance on price dispersion is decreasing with distance. The main results are robust to including distance and distance squared instead (Table B.1 of the Online Appendix).
The coefficient of interest is $\beta_1$, which estimates the percent change in the price ratio for markets within the same ethnic region compared to markets separated by an ethnic boundary, controlling for the road distance between those two markets. If ethnic borders do impede market integration, as hypothesized, then we expect the estimate of $\beta_1$ to be positive.

We can similarly estimate the impact of the degree of ethnic difference with the following equation:

$$PD_{ijt} = \beta_0 + \beta_1 EthDiff_{ij} + \beta_2 Distance_{ij} + \mu_i + \delta_j + \eta_t + \epsilon_{ijt}$$  \hfill (2)

where $EthDiff_{ij}$ is the degree of ethnic difference between markets $i$ and $j$. Here $\beta_1$ estimates the percent 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 road distance between those two markets. Again, we expect $\beta_1$ to be positive.

**Results**

Table 1 presents the estimates of the market pair regression analyses. Model 1 estimates that ethnic boundaries have a positive and statistically significant impact on price dispersion, increasing price dispersion by 8% or one percentage point, compared to markets of equal distance apart but within a single ethnic region. This intra-national ethnic border effect is on par with the effect of national borders in East Africa (Brenton, Portugal-Perez, and Régolo, 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 150 kms.
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 \((EthDiff = 0)\), markets in which there is no commonality in ethnic group make-up \((EthDiff = 1)\) 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 245 kms of geographic separation.

### Table 1: Ethnic Difference and Market Segmentation, 1998–2011

<table>
<thead>
<tr>
<th>DV=Price Dispersion</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Border</td>
<td>0.012***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Difference</td>
<td></td>
<td>0.022**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.009)</td>
</tr>
<tr>
<td>Ln of Distance (100 kms)</td>
<td>0.008**</td>
<td>0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.159***</td>
<td>0.147***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.011)</td>
</tr>
</tbody>
</table>

Observations 31,040 31,040
Adjusted \(R^2\) 0.163 0.163

OLS regression coefficients.
Market and month fixed-effects included (coefficient estimates not shown).
Robust standard errors, clustered by market pair, in parentheses.

\* \(p < 0.10\), \** \(p < 0.05\), \*** \(p < 0.01\)

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 greater market segmentation. First, if intra-national administrative borders pose barriers to trade, and different administrative districts are associated with different ethnic groups, then we will observe a spurious correlation between ethnic differences and price dispersion. There is some historical evidence that subnational administrative bound-
aries inhibited trade in Europe (Wolf, 2009), and Zant (2012) presents evidence that subnational units are associated with greater market fragmentation within Malawi. In Malawi, the 28 districts represent the lowest level of administration, with each headed by a district commissioner. Maize trade may be hampered across these district lines through exclusive access to stalls in the main district markets or by local authorities who grant permission for traders to operate in a given area. In line with previous studies, I too find that markets that are separated by an district border are less integrated (Table B.3, Model 1 of the online appendix).

There are also good reasons to expect that district borders will also tend to fall along ethnic lines. The division of countries into ethnically distinct subnational units has long been believed to be a strategy for combatting ethnic conflict (Suberu, 1991; Hale, 2004), and colonial powers preferred to demarcate administrative units along ethnic lines (Berman, 1997). In addition, recent trends towards greater political and economic decentralization have encouraged the creation of new subnational units for local ethnic minorities (Treisman, 2007; Grossman and Lewis, 2014). Malawi has not seen the same kind of rapid proliferation as many other African states, with only four new districts being created since 1998, but ethnicity may have been an important component of the original district delineation. Using the 2008 census data underlying my measures of both $\text{EthBorder}_{ij}$ and $\text{EthDiff}_{ij}$, I find that the 77 markets out of 478 that are 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 ($t = 4.7, df = 476, p < 0.001$).

Because there is a large degree of overlap in administrative and ethnic borders, and administrative borders are associated with less market integration, then I may be incorrectly attributing price dispersion to ethnic differences. To make sure this is not the case, I re-estimate the main results controlling for administrative borders.
Models 2 and 3 of Table B.3 in the online appendix show that the results presented in Table 1 are robust to controlling for administrative borders, with the coefficients only decreasing very slightly in size. Thus, while district borders do appear to segment markets, the impact of ethnic borders and ethnic differences pose additional barriers to market integration.

A second omitted variable worth considering is the role of geographic barriers to trade. Geographic heterogeneity may give rise to both ethnic differences (Michalopoulos, 2012) and difficulty trading (Keller and Shiue, 2007b). For example, imagine two contemporary markets that are separated by a mountain range. The historical separation of these two areas by mountains would likely give rise to linguistic and cultural divergences, observed today as ethnic differences, and would make trade between areas on either side of the range very difficult. If most ethnic differences result from geographic isolation, then we would observe a correlation between ethnic difference and market segmentation today, but that correlation would be spuriously driven by the independent effects of isolation on both cultural differences and market segmentation.

One way to operationalize geographic barriers is to look at the degree to which travel distances are farther than geodesic distances, based on the assumption that geographic features pose barriers to trade by effectively increasing travel time between markets. Using this approach, I calculate the actual travel distance between markets along roadways using Google’s mapping software. As expected, I find that geographic barriers are indeed related to ethnic differences. Among the 478 market pairs within 100 kms of each other, the ratio of geodesic distance to travel distance is significantly lower in the 194 market pairs separated by an ethnic border than in the 284 market pairs within

---

10 In particular, I use the `travel time` command within Stata, which interfaces with Google Maps, to measure both the road distance (in kms) and travel time (in minutes) between each market pair.
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 replicate the main analyses presented in Table 1 using the natural log of travel distance, rather than geodesic distance, in Table B.4 of the online appendix. The results are remarkably similar, increasing our confidence that ethnic differences produce market segmentation, even after controlling for geographic barriers.

The results of this section suggest that the principal finding of this paper – that ethnic differences are associated with greater market segmentation – is not driven by the division of ethnic groups and markets into administrative units, or by geographic barriers causing both ethnic difference and market divergence.

**Qualitative Data on Ethnic Barriers to Trade**

The results above show that the maize market in Malawi tends to be fragmented along ethno-regional lines. However, while the mechanism that I propose deals with differential trust in coethnics versus non-coethnics, the price data does 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. This data allows me to better understand how the aggregate patterns described above emerge from the behavior of key individuals engaged in rural maize trading.

**Data Collection**

Data were collected 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 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 both ethnic groups about interacting with traders from their own group and the other group. In July and August 2014, 18 traders were interviewed and 114 farmers in 12 focus groups took part in discussions across the three field sites. All interviews and focus group discussions were digitally recorded, transcribed, translated into English, and systematically coded.

Small-Scale Maize Traders

In order to understand whether and how ethnicity influences maize traders’ behavior, small scale traders operating in the field site catchment areas were interviewed. Maize traders who were actively buying maize were recruited at the central market (Chulu, Balaka, and Julu) for each site. If necessary, additional traders were identified using referral sampling, with attention to recruiting small scale traders from both major ethnic groups in the vicinity of the market.\textsuperscript{11} 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. Most traders were male (72\%) and had, on average, almost 7 years of experience in trading maize ($x = 6.8, s = 4.3$). While we attempted

\textsuperscript{11}While the use of referral sampling likely produced a non-representative sample of maize traders, since the goal was to understand mechanisms rather than generalized patterns, a non-random sample is justified.
to focus on small-scale traders, the scale of business operations varied significantly ($x = 83$ 50kg bags/week, $s = 107$), with nine of the traders buying only 10-20 50kg bags of maize per week, seven buying 50-150 bags per week, and three larger scale traders buying 250-300 bags per week. Despite this variation, all traders reported that they primarily buy maize directly from farmers, and most work alone.

Each interview was conducted in Chichewa, an official language of Malawi, by a Malawian research assistant and lasted approximately 30-45 minutes. The interview covered questions on how the maize trade operates and their own background and experiences. In particular, the interviews focused on the trader’s organization, buying
and pricing strategies, trust in both sellers and other traders, and the role of ethnicity in the trade of maize (see the online appendix for specific questions asked).

**Rural Maize Farmers**

In order to understand how ethnicity and trust influence how and to whom maize farmers in rural Malawi sell their maize, focus group discussions were carried out in eleven different communities across the three field sites. Specific communities were selected randomly from a full list of all villages in each of the three market areas, stratified by ethnic make-up and distance from the market: two villages dominated by one ethnicity (one far and one close) and two villages dominated by the other ethnicity (one far and one close). The ethnic make-up of each village was measured based on the ethnic demographics of the 2008 census enumeration area in which it was located.\(^{12}\) Distance to the central market was dichotomized as either closer or farther than the median distance across all villages within the Traditional Authority.

Within each selected village, farmers were interviewed in groups of 10-11 using standard focus group discussion techniques. After all local authorities consented to allow us to work within a community, the village headman was asked to invite 10 farmers from his or her community who had sold maize in the last two years. Informed consent was obtained from each participant individually, and then farmers were interviewed as a group in sessions lasting between one and two hours. Discussions focused on several topics related to the selling of maize, including reasons for selling maize, selection of traders to sell to, determination of selling price, trust, and the role of ethnicity, if any, in selling to mobile traders (see the online appendix for specific questions asked).

\(^{12}\)Census enumeration areas are, on average, about 2.5 square miles and include about 1000 residents.
Qualitative Results

In this section, I present qualitative evidence on the segmentation of markets along ethnic lines, the necessity of trust in the trade of maize, and the ways in which shared ethnicity facilitates such trust. In each section, I rely heavily on direct quotations from both traders and farmers on these topics. The section concludes with a brief discussion of other, non-trust related mechanisms through which trade may also be inhibited by ethnic differences.

Ethnic Market Segmentation

We observed some hesitation among respondents in discussing explicitly the role that ethnicity plays in decisions about where to buy or to whom to sale maize, presumably because of social desirability bias. The most common initial response to questions about ethnicity’s role in maize trading was to suggest that such biases only exist in other parts of Malawi, an assertion that is nonetheless likely to reveal something about their own observations and preferences (Fisher, 1993). For example, a farmer said, “I can say that the way we live here, this is not happening, but other areas this is happening.” (FGD 8, Nyanja Village, Zomba, 7/3/2014). However, both farmers and traders were typically aware that the trade of maize was more common among coethnics than across ethnic lines. In fact, one trader (Trader 12, Ngoni, Balaka, 7/13/2014) described very well the exact pattern uncovered above using the price data: “Malawi as a country is small but we can also say it is big because of numerous ethnic groups that it has. When we talk of business in Malawi, especially that of maize, every trader has his own area where he freely does his business.” Other traders also pointed out that ethnicity poses as a barrier to trade, noting that “here it is very difficult for other tribes to do business” (Trader 1, Chewa, Kasungu, 7/16/2014) and that “most people believe that a tribe is like a family, so someone from his tribe is his relative and he prefers to sell to
Two traders in Jali market in Zomba, one Nyanja and the other Lomwe, both noted the difficulty in trading with the Yao, in particular. “If there is a Yao and you address him in Yao he knows that this is my group and I should trade with him. When Lomwes go there they cannot buy more maize just because they are Lomwes. Yaos will say (in Chiyao) ‘awa obwera tu abale anu ndife konkuno’ [these have just come, but we are your relatives here], and farmers just go to them” (Trader 16, Nyanja, Zomba, 7/2/2014). “For me to do business with Yao tribe is very difficult and also the Tumbuka are very problematic. If you do business with these people as the time goes by you will quarrel...because their culture is very different from ours the Lomwe” (Trader 6, Lomwe, Zomba, 7/2/2014).

Evidence of ethnic barriers to trade also emerged from the simple question about the extent of a trader’s area of operation. Within the same market (Balaka), Ngoni traders told us that they tend to buy around Balaka and to the west in Dedza and Ntcheu (Ngoni-dominant areas), while the Yao traders instead reported buying in areas to the east, including Machinga, Mangochi, and Zomba (districts dominated by Yao). Similarly, Chewa traders at Chulu market were more likely to mention areas to the south, such as Kasungu, Lilongwe, and Mchinji (Chewa areas), while Tumbuka traders were more likely to mention trading markets to the north, in areas dominated by Tumbuka. Thus, even in markets at the boundary of two ethnic regions, traders from different ethnic groups within that market tended to operate in areas on opposite sides of the “ethnic border.”

Maize farmers in the focus group discussions also mentioned ethnic constraints on trade, although less frequently than traders. For example, farmers in a Tumbuka village near Chulu market (FGD 6, 7/17/2014) said that while they sometimes sell their maize across the border in Zambia, where prices are better, when doing so they deal only
with Zambian Tumbukas and not Zambian Chewas, despite both groups being present just across the border. A farmer in Balaka felt constrained in where he could sell his product, noting that “if you go [to the north] with your business they will say ‘he is not from our tribe, we will be selling to ourselves’” (FGD 2, Yao Village, Balaka, 7/12/2014).

The examples given above suggest that many farmers and traders active in the trade of maize are aware of ethnic barriers to trade. In the next two sections, I report evidence that trust is necessary in trading maize and then that greater trust among coethnics thus facilitates trade.

**Necessity of Trust**

In general, both farmers and traders were very skeptical of each other: farmers felt they were often cheated by traders and traders report being cheated by both farmers and other traders. In all the stories that we heard about such exploitation and theft, there was not a single mention of any recourse or restitution through the formal legal system. This stark omission reinforces existing findings from the region (e.g., Fafchamps, 2004) that formal institutions, such as courts, are not at all used to enforce small scale trading transactions. In such a setting, interpersonal trust is thus an important facilitator of trade. In this section, I report the different ways in which both farmers and traders are at risk of exploitation as a way of establishing the need for trust in the trade of maize. As one trader observed, “it is necessary to be trusted in this business, because if the trader is not trustworthy a farmer will not come to sell to you. He concludes that you want to steal from him and goes to another trader...The farmer and the trader have to trust each other” (Trader 16, Nyanja, Zomba, 7/2/2014).

The farmers in our focus groups had no shortage of examples of the ways in which they had been cheated by traders when selling their maize in the past. Because of
this, there was widespread skepticism about traders, in general, as summarized by one farmer: “those vendors, they are crooks you can’t trust them. They come with plastic smiles and sweet talk to cheat you” (FGD 1, Yao Village, Balaka, 7/12/2014). The most commonly reported risks to farmers were the manipulation and misreading of scales used to weigh maize, the modification of receptacles used to measure the volume of maize, and asymmetric information on market prices.

Maize is most frequently bought from farmers by weight, with traders supplying their own scales. Consistent with past research in Malawi (e.g., Jayne et al., 2010), the manipulation of such scales was the most commonly reported way in which farmers felt they had been cheated. “Scales of vendors are adjusted. We know that when we fill chigoba [a plastic bucket] with maize it is 5kg, but when we take that same maize put on their scales it weigh 4kg” (FGD 3, Ngoni Village, Balaka, 7/13/2014). One trader admitted to adjusting his scales before going to market (Trader 12, Ngoni, Balaka, 7/13/2014), while another describe a more low-tech way to reduce the scale’s reading: “They put a foot on the bottom of bag when it is hanged on the scale like a block. And they make sure it is at least six inches from the ground to enable the foot to touch the bag so that a farmer should not notice. If the maize was really 20kg it will show 15kg which means 5kg has been stolen” (Trader 9, Tumbuka, Kasungu, 7/17/2014). This trick of lifting the maize slightly to reduce the weight was also known to farmers, with one noting that “they lift the bag using their foot so that the reading on the scale should be lower than the true figure” (FGD 8, Nyanja Village, Zomba, 7/3/2014) and another suggesting that “some do it with their knee supporting the bag like a jack” (FGD 10, Lomwe Village, Zomba, 7/4/2014). Traders may also misreport the reading on the scale, and rely on the farmers’ illiteracy or distraction to hide the fact. One trader explained that “when calculating or when reading kilograms on the scale, if it is 20kgs you can tell the farmer that it is 15kgs. As you know most farmers are illiterate.
Or the moment they are calculating what the total amount should be make sure to give him money fast so that a farmer should be interested with money not kilograms” (Trader 9, Tumbuka, Kasungu, 7/17/2014). In addition, one group of farmers explained that the trader will give an inaccurate scale reading, but “if you want to check properly, he will deliberately shake it so that you do not get the exact weight” (FGD 10, Lomwe Village, Zomba, 7/4/2014).

Maize is also bought and sold by volume using plastic cups and buckets. Here, too, traders are able to manipulate the receptacles in order to increase their profit. One farmer told us that “the basin which they use to buy our maize is not original, they modify it. They seep that basin in hot water so that it expands in order to hold more maize when buying from us” (FGD 8, Nyanja Village, Zomba, 7/3/2014). Another confirmed that “when you take a full cup of yours and put in their cup you will find that it is only three quarters full...[because] they put very hot water inside the cup and it expands so that it can hold more maize than an original cup” (FGD 1, Yao Village, Balaka, 7/12/2014). Indeed, several traders admitted to increasing the size of the standard plastic bucket (referred to locally as a *chigoba*) when buying, using hot water or fire (Trader 2, Yao, Balaka, 7/13/2014; Trader 10, Yao, Balaka, 7/12/2014). When selling maize, traders instead fill a portion of the *chigoba* with another object to reduce its volume, as experienced by one farmer in our sample: “one time I went to the market and when I was buying he [the trader] was very fast when putting maize in the basin so that I should not notice that he put another plate on top of the other to decrease the space in the basin, but I realize this very late after I paid money” (FGD 8, Nyanja Village, Zomba, 7/3/2014).

Finally, traders also take advantage of the fact that farmers typically have less information about the current market price for maize. This asymmetric information is consequential in both the buying and the selling of maize. One farmer explained
that “they tell us that the price they are giving us has been set by the government but when we check with others we find that they are selling at a higher price so we just get confused on the prices” (FGD 7, Chewa Village, Kasungu, 7/18/2014). Another farmer had a similar experience when buying maize: “one day someone came at my house and said he is buying maize at one hundred and thirty kwacha a basin and I sold to him. When I went to the market the same day I found that they are buying at one hundred and forty kwacha and it hurt me” (FGD 8, Nyanja Village, Zomba, 7/3/2014).

Traders were less likely than farmers to report being cheated in the past, but more likely than farmers to have been exploited by the failure to pay back credit given. Sometimes a trader would give another trader money for maize just out of sight, only to have that trader then disappear with the money. For example, one trader recounted that “one day another trader came here saying ‘I have ten bags of maize, give me money and follow me.’ My fellow trader and I gave him money but as we were following him he went between two houses and disappeared in a high density area” (Trader 10, Yao, Balaka, 7/12/2014). In other cases, maize is transferred but never paid for: “Sometimes someone will come and tell you to pack your maize in their truck and go together to get the money in town. When you get to town, the person disappears” (Trader 18, Chewa, Kasungu, 7/16/2014). Prices there were already negotiated may also be changed once the maize has been moved, with one trader explaining “sometimes you find an order in town and you agree that the price will be K100 per kilogram but you get maize from here to town and that person changes and now says he will buy at K70 or even K50 per kilogram” (Trader 7, Chewa, Kasungu, 7/16/2014).

We also heard accounts of traders being cheated by farmers when buying their maize. This typically occurred when a trader failed to properly inspect the maize being bought. For example, one trader recounted that “a farmer told me ‘don’t open my bags, I have already weighed them, they are 50kgs per bag, just take them’, but
when we opened the bags we found that one bag was rotten” (Trader 10, Yao, Balaka, 7/12/2014). Farmers may also cheat traders by failing to fully fill 50kg bags (Traders 17, Ngoni, Balaka, 7/13/2014; Trader 14, Yao, Balaka, 7/13/2014), or by mixing in other substances, such as sand, in with the maize and then filling with fresh maize on top (Trader 17, Ngoni, Balaka, 7/13/2014; FGD 9, Nyanja Village, 7/3/2014). A farmer explained the strategy: “someone can bring a bag of maize and say ‘I am in hurry just hang my bag and weigh on scale and give me another empty bag for exchange with mine’ then after the farmer has gone the trader will find the bag has river sand” (FGD 9, Nyanja Village, Zomba, 7/3/2014). Another trader admitted that “there are some farmers who do mix maize with small stones so that it weighs more...Sometimes there are other farmers who bring maize that has been soaked in water” (Trader 11, Lomwe, Zomba, 7/2/2014).

Traders occasionally lend money to farmers in exchange for repayment in maize after harvest, but sometimes the loan is not repaid. One trader recounted one such experience: “It was the year which there was hunger. People were coming to my house to take money as a credit in exchange for maize to be paid back after the harvest. When harvest period came some people didn’t come to give me my maize up to today” (Trader 14, Yao, Balaka, 7/13/2014). Another trader, this time in Jali market, had a similar experience, telling us “I had a customer who sells me maize and he asked me to give him two bags and he will repay me tomorrow. So I gave him money and up to now he has never given me either maize or money” (Trader 6, Lomwe, Zomba, 7/2/2014).

Given all these different ways in which both farmers and traders are open to risk, 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, 7/12/2014). In the next section,
I present evidence that shared ethnicity is one way in which those engaged in maize trade make decisions about who is trustworthy.

Ethnic-Based Trust

When asked why there was less trade between members of different ethnic groups than among members of the same group, all 12 groups of farmers and 77% of traders suggested that weak trust between ethnic groups is a main cause for the market barriers. In fact, low trust between groups was ranked higher, on average, than any other possible explanation given.

One trader admitted that he himself preferred to do business primary 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 they cannot trust each other” (Trader 2, Yao, Balaka, 7/13/2014). An 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, 7/13/2014). That same trader also acknowledged little trust between the two groups: “Like here the Ngoni and the Yao they do not really go together well [samwerana 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 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, 7/17/2014).

Such trust manifests as an assurance that the types of “tricks” outlined above are less likely to be used. On 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, 7/14/2014).

Much of this trust difference – the “coethnic trust premium” (Robinson, 2015) – 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, 7/17/2014) and a 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. We the Tumbukas we do avoid Yao traders” (FGD 5, Tumbuka Village, Kasungu, 7/17/2014). However, some respondents attributed the difference to strategic considerations. Consistent with Habyarimana et al.’s (2009) findings from 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 (in Southern region) 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, 7/12/2014)

Many traders and farmers noted that weak interethnic trust limited lending and credit. Traders noted that “the same group will give each other more loans” (Trader 2, Yao, Balaka, 7/13/2014), “if they are from different tribes then they cannot trust, and so there cannot be credit amongst them” (Trader 4, Lomwe, Zomba, 7/2/2014), 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 the will borrow from each other without problems” (Trader 8, Tumbuka, 7/17/2014). 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, Kasungu, 7/17/2014). 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 agreed to pay back after harvesting next season” (FGD 3, Ngoni Village, Balaka, 7/13/14).

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 form of “selling low and buying high” as a form of high interest loan (Stephens and Barrett, 2011; Burke, 2014). 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, 7/4/2014). 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, 7/17/2014). In a country that experiences a “hunger season” each year, and full fledged famines in recent memory (Ellis and 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, the ones you sold your maize to” (FGD 7, Chewa Village, Kasungu, 7/18/2014).

Other Mechanisms

While ethnic-based trust was cited most often as the cause of ethnic market segmentation, many other explanations were offered as well. Many farmers and traders pointed to the possibility for language difficulties across ethnic lines: put simply, “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, 7/2/2014). One trader also explained that lack of information resulting from weaker social ties across ethnic boundaries also contributes to market segmentation, saying that there is a problem of “communication, in terms of knowing that there is maize somewhere in another group’s area” (Trader 18, Chewa, Kasungu, 7/16/2014). Finally, others cited stereotypes – for example, one trader told us that “the Lomwe and Yao are known for stealing money by using mysterious magic” (Trader 17, Ngoni, Balaka, 7/13/2014) – and past hostilities between groups.

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 and La 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 and 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 in a top-down manner, because ethnically diverse politicians cannot cooperate to enact growth-enhancing policies.

In contrast, this paper lays out a mechanism relating diversity to poor growth from the bottom-up, based on the economic behavior of regular citizens. This mechanism is expected to operate when three conditions are met: trust is ethnically conditioned, with individuals trusting 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, with substantively large effects equal to 150-245 kms of geographic separation. Qualitative data from 114 farmers and 18 traders in Malawi supports the interpretation that such segmentation is driven, at least in part, to the risks inherent in trade, the greater willingness to trust coethnics, and the resulting preference for coethnic trading.
partners.

While the empirical evidence presented comes from Malawi, we should expect to observe ethno-regional market segmentation whenever ethnic-based trust is combined with ethnic segregation. Unfortunately, these two conditions typically occur together—ethnic group segregation is strongly associated with ethnic-based trust across African states (Robinson, 2013b). Given that most African states, while extremely diverse at the aggregate level, are made up of multiple ethnically homogeneous regions, and that coethnicty 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.
References


Online Appendix:
Internal Borders:
Ethnic-Based Market Segmentation in Malawi

Contents

Appendix A  Maize Price Data by Market  53
Appendix B  Robustness Tests  55
Appendix C  Data Collection Instruments  59
  Key Informant Interviews with Traders  59
  Focus Group Discussions with Producers  61
# Appendix A  Maize Price Data by Market

Table A.1: Maize Prices by Market, in MWK

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Market</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>Chitipa</td>
<td>Chitipa</td>
<td>160</td>
<td>20.15</td>
<td>14.81</td>
<td>2.78</td>
<td>66.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Misuku</td>
<td>77</td>
<td>22.83</td>
<td>8.70</td>
<td>9.51</td>
<td>51.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nthalire</td>
<td>66</td>
<td>29.59</td>
<td>10.89</td>
<td>11.07</td>
<td>56.75</td>
</tr>
<tr>
<td></td>
<td>Karonga</td>
<td>Karonga</td>
<td>144</td>
<td>19.88</td>
<td>15.29</td>
<td>3.83</td>
<td>64.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chilumba</td>
<td>51</td>
<td>31.68</td>
<td>10.73</td>
<td>17.33</td>
<td>56.88</td>
</tr>
<tr>
<td></td>
<td>Mzimba</td>
<td>Embangweni</td>
<td>82</td>
<td>26.14</td>
<td>13.32</td>
<td>7.00</td>
<td>55.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jenda</td>
<td>49</td>
<td>30.80</td>
<td>12.56</td>
<td>13.17</td>
<td>62.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mzimba</td>
<td>154</td>
<td>22.96</td>
<td>15.42</td>
<td>3.44</td>
<td>62.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mzuzu</td>
<td>159</td>
<td>22.57</td>
<td>14.52</td>
<td>3.88</td>
<td>60.75</td>
</tr>
<tr>
<td></td>
<td>Nkata Bay</td>
<td>Chintheche</td>
<td>78</td>
<td>32.64</td>
<td>12.02</td>
<td>15.91</td>
<td>56.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mpamba</td>
<td>70</td>
<td>31.40</td>
<td>15.10</td>
<td>11.72</td>
<td>67.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nkhatabay</td>
<td>110</td>
<td>27.80</td>
<td>14.11</td>
<td>5.12</td>
<td>58.46</td>
</tr>
<tr>
<td></td>
<td>Rumphi</td>
<td>Hewe</td>
<td>75</td>
<td>26.57</td>
<td>12.28</td>
<td>11.50</td>
<td>57.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rumphi</td>
<td>162</td>
<td>23.90</td>
<td>17.45</td>
<td>2.81</td>
<td>89.33</td>
</tr>
<tr>
<td>Central</td>
<td>Dedza</td>
<td>Bembeke</td>
<td>71</td>
<td>33.00</td>
<td>15.53</td>
<td>11.76</td>
<td>77.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mtakataka</td>
<td>81</td>
<td>33.23</td>
<td>18.64</td>
<td>9.39</td>
<td>82.59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thete</td>
<td>93</td>
<td>26.62</td>
<td>14.19</td>
<td>9.00</td>
<td>78.25</td>
</tr>
<tr>
<td></td>
<td>Dowa</td>
<td>Bowe</td>
<td>40</td>
<td>35.98</td>
<td>13.95</td>
<td>14.13</td>
<td>60.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dowa</td>
<td>147</td>
<td>24.17</td>
<td>15.72</td>
<td>3.11</td>
<td>66.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Madisi</td>
<td>58</td>
<td>33.23</td>
<td>13.37</td>
<td>15.00</td>
<td>80.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mponela</td>
<td>90</td>
<td>29.05</td>
<td>13.10</td>
<td>12.21</td>
<td>69.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nambuma</td>
<td>70</td>
<td>31.92</td>
<td>14.22</td>
<td>12.30</td>
<td>69.87</td>
</tr>
<tr>
<td></td>
<td>Kasungu</td>
<td>Chamama</td>
<td>4</td>
<td>30.91</td>
<td>4.84</td>
<td>24.58</td>
<td>35.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kasungu</td>
<td>97</td>
<td>23.86</td>
<td>16.03</td>
<td>4.16</td>
<td>69.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nkhamenya</td>
<td>49</td>
<td>30.36</td>
<td>14.29</td>
<td>13.03</td>
<td>68.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nkhoma</td>
<td>89</td>
<td>28.23</td>
<td>14.51</td>
<td>9.83</td>
<td>74.78</td>
</tr>
<tr>
<td></td>
<td>Lilongwe</td>
<td>Kasiya</td>
<td>58</td>
<td>38.18</td>
<td>14.77</td>
<td>13.23</td>
<td>80.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lilongwe</td>
<td>119</td>
<td>24.65</td>
<td>15.53</td>
<td>5.82</td>
<td>72.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mitundu</td>
<td>162</td>
<td>19.97</td>
<td>14.53</td>
<td>2.29</td>
<td>68.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nanjiri</td>
<td>94</td>
<td>29.89</td>
<td>15.14</td>
<td>10.56</td>
<td>72.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Santhe</td>
<td>71</td>
<td>29.66</td>
<td>12.05</td>
<td>12.40</td>
<td>60.13</td>
</tr>
<tr>
<td></td>
<td>Mchinji</td>
<td>Mchinji</td>
<td>166</td>
<td>22.69</td>
<td>14.38</td>
<td>3.94</td>
<td>63.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mkanda</td>
<td>38</td>
<td>28.38</td>
<td>12.10</td>
<td>11.00</td>
<td>57.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nsunwe</td>
<td>91</td>
<td>28.86</td>
<td>13.76</td>
<td>10.77</td>
<td>65.82</td>
</tr>
<tr>
<td></td>
<td>Nkhotakota</td>
<td>Dwangwa</td>
<td>83</td>
<td>31.08</td>
<td>15.96</td>
<td>12.68</td>
<td>81.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mwansambo</td>
<td>54</td>
<td>33.19</td>
<td>18.32</td>
<td>7.81</td>
<td>85.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nkhotakota</td>
<td>153</td>
<td>23.69</td>
<td>15.90</td>
<td>5.73</td>
<td>79.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chimbiya</td>
<td>156</td>
<td>22.35</td>
<td>14.97</td>
<td>3.53</td>
<td>69.21</td>
</tr>
</tbody>
</table>

Ntcheu
<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Market</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lizulu</td>
<td></td>
<td></td>
<td>165</td>
<td>21.24</td>
<td>15.93</td>
<td>1.98</td>
<td>76.39</td>
</tr>
<tr>
<td>Ntcheu</td>
<td></td>
<td></td>
<td>90</td>
<td>30.84</td>
<td>17.08</td>
<td>10.36</td>
<td>88.55</td>
</tr>
<tr>
<td>Ntonga</td>
<td></td>
<td></td>
<td>46</td>
<td>33.97</td>
<td>17.83</td>
<td>12.00</td>
<td>80.00</td>
</tr>
<tr>
<td>Sharpevaley</td>
<td></td>
<td></td>
<td>28</td>
<td>37.89</td>
<td>19.07</td>
<td>13.13</td>
<td>77.08</td>
</tr>
<tr>
<td>Tsangano Turn Of</td>
<td></td>
<td></td>
<td>65</td>
<td>32.03</td>
<td>16.63</td>
<td>11.80</td>
<td>81.21</td>
</tr>
</tbody>
</table>

Ntchisi

| Malomo | 49 | 35.96 | 19.21 | 11.54 | 83.63 |
| Ntchisi | 157 | 24.30 | 16.52 | 6.42  | 75.49 |

Salima

| Salima | 149 | 22.74 | 17.20 | 2.59  | 81.04 |

Balaka

| Balaka | 88  | 31.88 | 15.51 | 13.47 | 80.46 |

Blantyre

| Limbe  | 88  | 31.13 | 19.79 | 4.55  | 106.62|
| Lumzu  | 146 | 24.52 | 17.15 | 4.38  | 79.86 |

Chikwawa

| Chikwawa | 88 | 32.58 | 14.50 | 13.30 | 79.92 |
| Chikwa | 157 | 23.45 | 16.60 | 2.25  | 78.63 |
| Ngabu  | 91  | 33.14 | 16.39 | 10.99 | 77.86 |

Chiradzulu

| Chiradzulu | 90 | 29.94 | 13.92 | 9.25  | 70.00 |

Machinga

| Liwonde | 164 | 23.82 | 16.39 | 3.49  | 75.94 |
| Ntaja  | 147 | 22.23 | 14.91 | 2.35  | 74.19 |

Mangochi

| Mangochi | 154 | 23.11 | 16.66 | 4.29  | 81.83 |
| Monkey Bay | 66  | 35.99 | 18.37 | 10.36 | 82.52 |
| Namwera | 117 | 26.12 | 15.55 | 9.05  | 95.00 |

Mulanje

| Muloza | 75  | 34.69 | 15.42 | 11.80 | 78.18 |

Mwanza

| Mwanza | 91  | 34.33 | 17.01 | 13.39 | 92.04 |

Neno

| Neno  | 58  | 33.83 | 14.49 | 11.11 | 82.32 |

Nsanje

| Bangula | 141 | 23.08 | 18.04 | 2.21  | 94.84 |
| Nsanje | 106 | 29.51 | 17.80 | 4.45  | 91.30 |

Phalombe

| Migowi | 46  | 27.46 | 13.08 | 8.40  | 64.42 |
| Phalombe | 74 | 35.07 | 16.16 | 10.92 | 85.12 |

Thyolo

| Bvumbwe | 76  | 36.49 | 15.27 | 16.50 | 79.00 |
| Luchenza | 157 | 22.37 | 16.93 | 3.77  | 95.45 |

Zomba

| Jali  | 62  | 31.02 | 15.20 | 10.75 | 69.47 |
| Thondwe | 57  | 35.82 | 16.02 | 11.50 | 81.60 |
| Zomba | 94  | 26.43 | 17.73 | 4.29  | 78.78 |
Appendix B  Robustness Tests


<table>
<thead>
<tr>
<th>DV=Price Dispersion</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Border</td>
<td>0.012*** (0.004)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Difference</td>
<td></td>
<td>0.022** (0.009)</td>
</tr>
<tr>
<td>Distance (100 kms)</td>
<td>0.039 (0.030)</td>
<td>0.037 (0.030)</td>
</tr>
<tr>
<td>Distance Squared (100 kms)</td>
<td>−0.018 (0.024)</td>
<td>−0.016 (0.025)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.138*** (0.011)</td>
<td>0.126*** (0.013)</td>
</tr>
</tbody>
</table>

Observations 31,040 31,040
Adjusted $R^2$ 0.163 0.163

OLS regression coefficients.
Market and month fixed-effects included (coefficient estimates not shown).
Robust standard errors, clustered by market pair, in parentheses.

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

<table>
<thead>
<tr>
<th>DV=Price Dispersion</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Border</td>
<td>0.007**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Difference</td>
<td></td>
<td>0.017**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.008)</td>
</tr>
<tr>
<td>Ln of Distance (100 kms)</td>
<td>0.010***</td>
<td>0.010***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.155***</td>
<td>0.144***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.010)</td>
</tr>
</tbody>
</table>

Observations 27,205 27,205
Adjusted $R^2$ 0.162 0.162

OLS regression coefficients.
Market and month fixed-effects included (coefficient estimates not shown).
Robust standard errors, clustered by market pair, in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

<table>
<thead>
<tr>
<th>DV=Price Dispersion</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Border</td>
<td>0.011**</td>
<td>0.010**</td>
<td>0.010**</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Ethnic Border</td>
<td></td>
<td>0.011***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Difference</td>
<td></td>
<td></td>
<td>0.020**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.009)</td>
</tr>
<tr>
<td>Ln of Distance (100 kms)</td>
<td>0.008**</td>
<td>0.004</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.156***</td>
<td>0.147***</td>
<td>0.137***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Observations</td>
<td>31,040</td>
<td>31,040</td>
<td>31,040</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.163</td>
<td>0.163</td>
<td>0.163</td>
</tr>
</tbody>
</table>

OLS regression coefficients.
Market and month fixed-effects included (coefficient estimates not shown).
Robust standard errors, clustered by market pair, in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Table B.4: Geographic Barriers, Ethnic Difference, Market Segmentation, 1998–2011

<table>
<thead>
<tr>
<th>DV=Price Dispersion</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Border</td>
<td>0.011***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Difference</td>
<td></td>
<td>0.021**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.009)</td>
</tr>
<tr>
<td>Ln of Travel Distance (100 kms)</td>
<td>0.009**</td>
<td>0.010***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.158***</td>
<td>0.147****</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.011)</td>
</tr>
</tbody>
</table>

Observations 31,040 31,040  
Adjusted $R^2$ 0.163 0.163

OLS regression coefficients.  
Market and month fixed-effects included (coefficient estimates not shown).  
Robust standard errors, clustered by market pair, in parentheses.  
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Appendix C  Data Collection Instruments

Key Informant Interviews with Traders

The following questions were asked for each trader during the semi-structured interview:

- **Trader’s experience**
  - How long have you been trading maize?
  - How much maize do you typically buy per week?
  - Does trading maize provide a good income?
  - How do you make a profit? Are there ways to increase your profit?
  - How big of an area do you operate in? Is that typical?

- **Walk me through the trade of maize from growing in a village to being consumed in town. How many hands/people does it pass through?**

- **Organization**
  - Do you work with others, or on your own?
  - Whom do you work with (family, friends, etc.)?
  - Are you a part of any organized traders’ association?
  - How do you depend on other traders in the course of your business, if at all?

- **Buying**
  - Where do you buy maize? Why?
  - Whom do you buy from?
  - How do you find new sources of maize?
  - Why do you think that sellers choose to sell to you (by chance, only choice, best price, they know you)?
  - Are there other places you’d rather buy? If so, why can’t you buy there?
  - Would you ever consider purchasing maize over the phone? Why/why not?

- **Prices**
  - How do you know what the right price is to pay?
  - Do prices vary across different areas? If so, why?

- **Trust**
  - Is trust necessary in your business? Why?
– Do sellers have to trust traders?
– Do buyers have to trust traders?
– Is it possible to get cheated in maize trading? How?
– How do you reduce the chance to get cheated?
– Have you ever been cheated in a transaction? What happened?

• Ethnicity

– What kinds of factors make your more or less likely to do business with someone? Region, language, ethnicity?
– Are people more likely to trade with someone from their own group? Why or why not?
– Are members of some ethnic groups more likely to trade across ethnic lines than others? Which groups and why?
– In another study, we found that in Malawi there is less maize traded between members of different tribes compared to trade between members of the same tribe. Why do you think that is the case? What is the explanation for this finding? AFTER they answer, ask about each of the following if not already mentioned:
  * Lack of trust? Why?
  * Difficult communication? Why?
  * Lack of contacts/networks? Why?
  * Lack of credit? Why?
  * Dislike between groups? Why?
  * Less information about maize availability/price in areas of other groups? Why?
  * Difficulty settling disputes, if they arise, when trading with other groups (role of chiefs?)?
  * Traders aren’t allowed into areas of other groups? Why? By whom?
– Which of the explanations/reasons do you think is the most important? Why?

• Demographics

– What is your home area (TA)?
– Do you stay in this area year round? If not, where do you typically stay?
– From which ethnic group do you come?
Focus Group Discussions with Producers

The following questions were asked during the semi-structured focus group discussions, broken down by topic:

- **Producers’ experiences**
  - Why do producers like you sell maize?
  - When are you most likely to sell maize?
  - Which maize do you typically sell (best quality, worse quality, etc.)?

- **Selling**
  - Where have you sold maize in the past (at your home, in the village, at market)?
  - Where do you prefer to sell maize? Why?
  - What kind of traders (small scale mobile, market-based, etc.) do you typically sell maize to? Why?
  - To whom do you prefer to sell your maize? Why?
  - When you want to sell your maize, how do you locate a buyer?
  - How do you think that most producers choose who to sell their maize to (by chance, only choice, best price, someone they know)?
  - Have you ever sold maize on credit (give the maize now for payment later)?
  - Would you ever consider selling maize on credit (give the maize now for payment later)? Why/why not?

- **Prices**
  - How do you know what the right price is to sell your maize for?
  - Do prices vary across different areas? If so, why?

- **Trust**
  - Is trust necessary in selling your maize? Why or why not?
  - Is it possible to get cheated in maize selling? How?
  - How do you reduce the chance to get cheated?
  - Have you ever been cheated in a transaction? What happened?

- **Ethnicity**
  - What kinds of factors make your more or less likely to sell your maize to a particular trader? Region, language, ethnicity?
– Are people more likely to trade with someone from their own group? Why or why not?
– Are members of some ethnic groups better buyers? Which groups and why?

• In another study, we found that in Malawi there is less maize traded between members of different tribes compared to trade between members of the same tribe. Why do you think that is the case? What is the explanation for this finding? AFTER they answer, ask about each of the following if not already mentioned:

  – Lack of trust? Why?
  – Difficult communication? Why?
  – Lack of contacts/networks? Why?
  – Lack of credit? Why?
  – Dislike between groups? Why?
  – Less information about maize availability/price in areas of other groups? Why?
  – Difficulty settling disputes, if they arise, when trading with other groups (role of chiefs?)?
  – Traders aren’t allowed into areas of other groups? Why? By whom?

• Which of the explanations/reasons do you think is the most important? [Have the participants rank the different reasons given]