Ethnic Favoritism in Democracy:
The Political Economy of Land and Labor in South Africa*

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November, 2016

JOB MARKET PAPER
Latest version available here

Abstract

How does ethnic favoritism emerge in new democracies? In ethnically diverse societies, democracy generates the scope for strategic interactions between politicians and traditional chief leaders, where the latter are granted control over resources in exchange for votes. This paper investigates these issues in democratic South Africa. We exploit quasi-random variation in municipality electoral outcomes and test for whether the labor market outcomes of individuals belonging to different ethnicities change differentially and discontinuously with the identity of the ruling party. Comparing Zulus with non-Zulus across municipalities, we find the former to be significantly and discontinuously less likely to be unemployed when the Zulu-based Inkatha Freedom Party (IFP) reaches the majority of the votes. We find that Zulus are significantly more likely to be employed in agriculture, and systematically more likely to identify traditional leaders as responsible for allocating land. These results are consistent with the hypothesis that IFP politicians engage in strategic interactions with traditional Zulu leaders and grant them control over agricultural land. To evaluate the welfare implication of this practice, we build a macro model featuring ethnic-based discrimination in land access. Ethnic bias affects the distribution of land and labor across ethnicities and sectors, with a negative impact on welfare. The model reconciles the results of our reduced-form analysis. Combining the latter with the calibrated model, we calculate that eliminating ethnic bias in land allocation would increase welfare by 13%.

JEL Codes: J15, J70, O10, P26, Q15.

*We thank Lauren Wustenberg for excellent research assistance. We are thankful to the following people for helpful comments and discussion: Francisco Alvarez-Cuadrado, Matteo Cervellati, Elena Esposito, Sonia Laszlo, Stelios Michalopoulos, Theodore Papageorgiou, Elias Papaioannou, Markus Poschke, and all seminar participants at McGill University, ISID, Montreal Applied Micro Day, London Business School, University of Ottawa. We also thank Lynn Woolfrey from DataFirst for her assistance with South Africa Census data. Errors remain our own.

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1 Introduction

The way in which resources and wealth are distributed across the population has fundamental implications on welfare. Recent studies show that inequality across ethnic lines is a strong correlate of underdevelopment in Africa (Alesina, Michalopoulos, and Papaioannou 2015) and that contemporary economic differences across ethnic groups are related to their ethnic institutions (Gennaioli and Rainer 2007; Michalopoulos and Papaioannou 2013). The role of ethnic-specific institutional legacies in many African countries is reinforced by the weakness of state institutions that have limited control of rural areas throughout the continent (Herbst 2000). Moreover, traditional leaders continue to assert their authority over land allocation, tenure and redistribution (Economic Commission Africa 2007). According to Afrobarometer 2008 survey, more than half of Africans believe that traditional leaders are important in governing the local community (Michalopoulos and Papaioannou 2015a). In nascent democracies formal and traditional forms of governance interact in a strategic way forming the basis of ethnic politics. What are the economic consequences of these strategic interactions? Does the emergence of democracy affect the interaction between formal and traditional institutions? Understanding whether and how ethnic politics affects the allocation of resources and welfare is crucial in the study of African development.

Ethnic politics often manifests itself as ethnic favoritism. This can be referred to as a situation in which a disproportional amount of benefits accrue to individuals who share the same ethnicity of the individual or groups who hold political power.[1] Several studies have shown evidence of ethnic favoritism in the provision of public goods such as roads, schools, and hospitals (Franck and Rainer 2012; Kramon and Posner 2014). Burgess, Jedwab, Miguel, Morjaria, and Padró i Miquel (2015) show that such evidence of ethnic favoritism disappears when democratic transitions occur, and leaders face constraints on the executive. But, the arrival of democracy also generates the scope for new, non-trivial forms of strategic interactions between ethnic institutions and political leaders. Politicians need to gain votes in order to achieve or retain power. Traditional ethnic leaders can turn into political agents, mobilizing individual under their authority for political support (de Kadt and Larreguy 2015). Politicians have therefore the incentive to recruit traditional leaders as political brokers, ceding control over productive resources in exchange for votes (Baldwin 2014).[2]

[1] Alesina, Michalopoulos, and Papaioannou (2015) stress that ethnic inequality may lead to political inequality on ethnic basis creating discriminatory policies of one group towards another ethnic enclave.

[2] Evidence from developed and democratic countries shows that firms connected to politicians enjoy a certain degree of competitive advantage (Goldman, Rocholl, and So 2013; Cingano and Pinotti 2013).

This paper studies the emergence of ethnic favoritism in democracies, its impact on the allocation of economic resources, and its welfare consequences. We explore these issues in the context of contemporary South Africa. Several historical and institutional features make South Africa a suitable setting to approach these questions and a role model for Sub-Saharan countries. First, South Africa is a recent democracy, consolidating itself after the democratic transition of the early 1990s. Democratization process led to the decentralization of provision of local public good enhancing the importance of local governance in the country. Second, appointments in the local tiers of government are the outcome of regularly held democratic elections. We can thus exploit variation in electoral outcomes across local districts within the country. Third, the two largest political parties differ in their degree of ethnic affiliation.[3] On the one hand, the African National Congress (ANC) is a multi-ethnic party dominating the national election since 1994. On the other hand, the Inkatha Freedom party (IFP) historically represents the largest ethnic group in South Africa, the Zulus. Contrasting the strong ethnic affiliation of the IFP with the ethnic neutrality of the ANC we can therefore precisely identify the effect of ethnic bias. Finally, South Africa is by far the most industrialized country in Sub-Saharan Africa, and the level of ethnic identification *vis-a-vis* national identification is one of the lowest in the continent (Michalopoulos and Papaioannou 2015a). If any evidence of ethnic favoritism emerges in this setting, one can conclude that the phenomenon is at least as prominent in other African democracies.

We combine data on election results at the local municipality level from the year 2000 with 2001 Census data, and test for whether the economic outcomes of individuals belonging to different ethnicities change discontinuously and differentially with the identity of the ruling party at the municipality level.[4] Specifically, we compare those local municipalities where the IFP Zulu party won by a narrow margin with those where it barely lost, and look at whether the labor market outcomes of Zulus in comparison with other ethnic groups are systematically different across these two groups of municipalities. That is, we implement a *Regression Discontinuity (RD)* design with heterogeneity in outcome across two population groups: Zulus and non-Zulus (Calzolari, Ichino, Manaresi, and Nellas 2016; Grembi, Nannicini, and Troiano 2015).[5] This

The same is true for individuals on the labor market (Gagliarducci and Manacorda 2015).

[3]Evidence shows that, during the transition from the apartheid regime to democracy, black political parties strategically mobilized individuals along ethnic lines (Amodio and Chiovelli 2015).

[4]The availability of Census data ensures that individual information on socio-economic characteristics and labor market outcomes of individuals belonging to different ethnicities can be retrieved consistently.

[5]Our approach is similar to a *difference-in-discontinuity* research design. One difference from Grembi, Nannicini, and Troiano (2015) is that we do not have time variation in our framework. In fact, we combine the feature of a *regression discontinuity* with a (spatial) *difference-in-difference* of Zulu vs non-Zulus across municipalities with different electoral outcomes.

approach relies on the possibility of framing the outcome of close elections as the result of a quasi-experiment. The focus on close elections ensures that municipalities around the election-winning cutoff are comparable according to observable and unobservable characteristics. We can therefore credibly identify the causal effect of IFP Zulu party winning on the outcomes of Zulus vs. non-Zulus in the neighborhood of the election winning threshold.

We find evidence of ethnic favoritism in the labor market. Our results suggest that the differential unemployment probability of Zulus is 4.8 to 8.8 percentage points lower in IFP-winning districts. This corresponds to a 50% decrease in the baseline difference between Zulus and non-Zulus. We also use data from the 1996 Census to show that these estimates are not confounded by time-invariant differences across districts at the IFP-winning threshold, nor differential migration rates.

What is the mechanism behind this effect? Following our argument on strategic empowerment of ethnic traditional leaders and their importance for the allocation of land, we hypothesize that different electoral outcomes map into differences across ethnicities in agricultural land access. To test the validity of our argument, we explore heterogeneity in differential employment probabilities across sectors. We find evidence of differential reallocation of Zulus towards the agricultural sector. The differential employment probability in agriculture for the Zulu is 90% higher in IFP-winning districts, eliminating the baseline difference between Zulus and non-Zulus. This result is corroborated by both anecdotal and qualitative evidence. First, the IFP ran on a political platform which stated the need of preserving the traditional ethnic power structure and give land to Zulus (Amodio and Chiovelli 2015). Second, evidence from 2008 Afrobarometer survey data supports the link between electoral outcomes and the power of traditional leaders. Adopting the same regression discontinuity identification strategy, we find that Zulus are systematically and discontinuously more likely to identify the traditional chief leader as the main responsible for allocating land in those municipalities where the IFP won in 2000.

Reduced-form evidence shows how ethnic favoritism takes place in democracies through providing discriminatory access to markets for private goods: land and labor. Ethnic favoritism therefore distorts the allocation of productive resources, with a negative impact on welfare. To clarify the mechanism at play and estimate its welfare consequences, we develop a macro model that incorporates ethnic bias in a general equilibrium framework. Our model features two sectors - agriculture and manufacturing - and two population groups. Land is exchanged in a centralized market, but access

to this market is heterogeneous across the two groups. A given exogenous parameter captures the extent of such differential distortion, or ethnic bias. This parameter captures the ability of traditional leaders to provide discriminatory access to agricultural land to individuals from a specific group. The magnitude of this distortion parameter affects the allocation of land across groups, the employment choice of individuals between sectors, and their relative unemployment probabilities.

The model reconciles the empirical findings on differential unemployment and employment across sectors. Where the IFP rules, Zulu traditional leaders are given power to allocate agricultural land. Zulu chiefs favor co-ethnics, while non-Zulus face discrimination in land access. As a result, the differential unemployment probability of Zulus decreases, and their differential employment probability in agriculture increases. Perhaps more importantly, the model delivers a one-to-one mapping between the parameter capturing discrimination in land access and differential unemployment probabilities across groups. We can therefore combine our reduced-form estimates to recover the size of distortions, and calculate, within the calibrated model, the increase in welfare that could be obtained if these distortions were brought to zero. Our calculations suggest that eliminating ethnic bias in land access would increase welfare by 13%.

Our paper provides empirical evidence on the causal effect of ethnic favoritism in the labor and land market in democracy. In this respect, our study contributes to a vibrant body of research studying ethnic favoritism. This literature has focused on targeted provision of public good to those ethnic groups aligned with the identity of the ruler. Franck and Rainer (2012) find prevalence of ethnic favoritism on education for a panel of 18 African countries. Kramon and Posner (2014) uncover similar patterns for health outcomes. Burgess, Jedwab, Miguel, Morjaria, and Padró i Miquel (2015) show that expenditure on roads and the length of paved roads built are twice and five times respectively higher in those Kenyan districts that share the ethnicity of the president as compared to other districts. They do not find any evidence of ethnic favoritism when democratic transitions occur.[6] In contrast, De Luca, Hodler, Raschky, and Valsecchi (2016) find evidence of a correlation between ethnic favoritism and timing of election.

Our contribution to this body of research is novel in several ways. First, we document the presence of ethnic favoritism in democracy. We depart from the focus on public goods provision and provide causal evidence that favoritism of co-ethnics takes place through discrimination in the access of markets for private goods: land and labor. We also show additional evidence that market distortions originate from strategic interac-

[6] Mueller and Tapsoba (2016) confirm this finding and qualify the intensive margin of the relationship between access to power and ethnic patronage.

tions between politicians and traditional chief leaders in the allocation of land. Second, by exploiting the electoral race between the ANC and IFP, we are able to contrast an ethnic biased party against a neutral one. This is different from previous studies, where the ethnic bias of all parties can arise as equilibrium outcome. Finally, our study complements the reduced-form evidence on ethnic patronage by developing a novel general equilibrium framework to quantify the welfare consequences of ethnic favoritism. Our results show that ethnic patronage has a sizable negative effect on welfare.

Our results also speak to the literature on ethnic voting (Posner 2005). Eifert, Miguel, and Posner (2010) find evidence that political competition reinforces ethnic identification. Acemoglu, Reed, and Robinson (2014) and Baldwin (2014) show, for Sierra Leone and Zambia respectively, how local chiefs trade their ability to mobilize local community in exchange for public good provision from the national government. We add to this literature by studying further the interaction between political parties and ethnic chiefs in democracy. The paper by de Kadt and Larreguy (2015) is closely related to ours. They document the importance and effectiveness of traditional leaders in the former Bantustans of South Africa to increase the electoral support of the ANC. While our analysis builds on the role of traditional leaders as "vote-brokers," we highlight the potential costs linked to the mobilization of ethnicity. In this sense, our findings show the welfare cost and perils of decentralization in the presence of strong regional (ethnic) groups.

Finally, our paper is linked to the empirical literature on African state capacity. The inability of projecting power from the centre to the periphery and rural areas is key in the challenge to improve state capacity in Africa (Herbst 2000). Michalopoulos and Papaioannou (2014) find evidence of state capacity in Africa is positively correlated with distance from the capital. At the same time, there is a growing appreciation of the role of ethnic chiefs for the functioning of the local economies in rural Africa (Michalopoulos and Papaioannou 2015a; Acemoglu, Reed, and Robinson 2014). Our contribution to these literatures is to shed light on the relationship between national level and ethnic-specific institutional actors. As democratization takes place in several African countries and national level institutions improve, would one expect this trend to weaken or strengthen the role of local chiefs? The prevailing view is that the strength of these local ethnic-specific actors is a legacy of a weak-institutionalized past of African countries. In this respect, improvements in institutions should make local chiefs irrelevant. Our findings show, however, that the role of local chiefs is enhanced as a result of democratization making ethnic chiefs important local players in the new institutional scenario.

The rest of the paper is organised as follows. In Section 2, we provide a short overview of the historical context, focusing on the period of the democratic transition and its aftermath. We introduce the data in Section 3, while in Section 4 we carry out the first part of the empirical analysis. Section 5 sheds light on the relevant mechanism. In Section 6, we present the model and the results of the calibration. Section 7 concludes.

2 South Africa and the Democratic Transition

The history of South Africa's democratic transition starts with the end of the *apartheid* regime.[7] In the late 1980s, the government decided to repeal several apartheid laws under the pressure of both internal and international opposition. A turning point for the democratization process was the liberation of ANC leaders like Nelson Mandela. The aim of these reforms was to freeze the protests and to start negotiations with the black majority. Negotiations taking place in 1991-1992 were everything but smooth: while Mandela and de Klerk (NP) were signing official agreements, fightings kept going on. Free national elections were held in 1994, with Mandela becoming the first black president of the Republic of South Africa. Since then regular presidential elections have been held on a 5 year basis.

Political Parties and Democratic Transition. The political scenario of democratic South Africa has been dominated by the African National Congress (ANC). The ANC, founded in 1912, was the historical black party representing almost all the black population until its ban in 1950s. Later on, the exile of ANC leaders and the party alignment with the socialist cause created the space for new political representation on the ground. The party that emerged as challenger of ANC was the Inkatha Freedom Party (IFP). Mangosuthu Buthelezi, a former member of ANC and member of the Zulu royal family, founded the IFP in 1975. With the rising prospects of democratization, violent confrontations between the ANC and IFP strarted to spike. The armed struggle between the two parties ended with the consolidation of the democratic process in 1996.

[7] Started by the white National Party (NP) government in 1948, Apartheid - meaning *apartness* in Afrikaans - was a form of government based on physical separation of blacks and whites achieved through racial discrimination and political disenfranchisement of the black majority (Clark and Worger 2011). The push towards ethnic identification was seen as the milestone of the disenfranchisement process of the blacks in South Africa. Blacks were further classified into native ethnicities on the basis of the first language they spoke. Divisions along racial lines were thought to be the fundamental organizing principle for the allocation of all resources and opportunities, the boundary for all social interactions, and the basis of all spatial demarcation, planning and development, (Posel 2001).

The political divisions between the IFP and the ANC were deep and related to several fundamental aspects of South Africa society. The ability to gather electoral support from the ethnic institutions of the Zulu ethnic groups allowed the IFP to secure control of the KwaZulu-Natal province from the 1994 to 2004 period (Mathis 2007). Moreover, the IFP was running on strongly conservative political platform aligned with large business interests in the province. On the other hand, most urban youth and working class supported the ANC, drawn by their vision of a non-racial unitary state in contrast with traditional ethnic power. Another striking difference between the two parties was about how to reform the rural sector. ANC had in its political agenda the objective of reforming land allocation and land tenure. The IFP aimed instead to recognize and preserve the role of traditional Zulu leaders in the allocation of land.[8] The political stance of ANC towards traditional chiefs evolved in a complex way. The party was initially against the recognition of their role in the new democracy, but changed its position in 2003 and 2004, when the national parliament (controlled by an ANC majority) passed the Traditional Leadership and Goverment Framework Act. The aim of the Act was to recognized formally the role of traditional leaders in lights of the decentralization process supported by the ANC government.

Ethnic Institutions in rural South Africa. As common in several African countries, traditional authorities are important political stakeholders in South Africa. South Africa has 774 chiefdoms and around 14 millions of South Africa citizens live under the jurisdiction of a traditional leader. During the apartheid period, they served as *de facto* local governments for local rural communities (Costa 2000).

The province of KwaZulu-Natal is no exception. In the Zulu dominated province there are 280 chiefs under the rule of the Zulu king Goodwill Zwelethini. Zulus account for a fourth of the South Africa population, making it the largest ethnic group in South Africa (Census, 2001). The structure of Zulu ethnic institutions is highly hierarchical: Zulu king rules over several *amakhosi* (chiefs), who can count over their *izinduna* headmen. Each *amakhosi* is in charge of his own *ubukhosi* (chieftainship).

Under customary law provisions, a chief is responsible to provide security, to solve dispute in the community and, most importantly to allocate land for its members (Williams 2010). Traditional chiefs in South Africa play a central role in the land tenure system. Their centrality derives from a combination of both cultural ties between the community and its land as well as an effective management of land rights (Center for Law

[8] One of the political slogan for the 1999 and 2000 election for the IFP was “Land to our people”.

and Society 2015). Along with the *de facto* power, traditional leaders have gained increasing institutional recognition since 1994. The creation of the Ingonyama Trust Act in 1994 assigned to the Zulu King the trusteeship of 2.8 million hectares in Kwazulu-Natal, which correspond to roughly one third of the province (Economic Commission Africa 2007). Moreover, the 1996 Constitution foresaw the possibility of recognizing traditional leader in the institutional setting of South Africa. The relevance for land allocation is regarded by chiefs as a definitory function of their role: "[..] the control of land is a primary responsibility of traditional leaders. Even if *amakhosi* are unable to perform a number of other roles with which they are currently concerned, the allocation of land is a central responsibility that most traditional leaders are determined to keep" (Butler 2002).

During elections, traditional leaders play the role of "vote-brokers". Given their control and influence over their communities, chiefs have the ability to channel votes for a specific party. Political parties can empower traditional leaders by ceding control over resources and recognizing their institution in their platforms (de Kadt and Larreguy 2015).

Local Institutions in South Africa. After the first presidential election in 1994, the new democratic regime started to face the issue on how to establish control on rural communities. The 1995-1996 local elections were the first step towards the establishment of formal local institutions. In this phase, the most local tier of government started to become relevant for the political arena. In fact, several institutions were created to implement policies at the local level. A notable example is the creation of transitional rural councils. These councils were intended to be responsible for the allocation of land. In spite of their potential relevance, those local councils failed in assigning competences over land tenure to elected officials, introducing uncertainty over the jurisdiction of land between elected municipality and ethnic chiefs (Williams 2010).

The Municipal Structure Act in 1998 consolidated the role of local institutions. While the 1996 Constitution designed the general framework, the Municipal Act reshaped municipalities boundaries and defined the exact competences of local government. Municipalities were held responsible for the provision of several local public goods (electricity, roads, and public transportation) and for collecting taxes. At the same time, the Act contained a first recognition of the role of traditional leaders. The roles listed in the Act were intended to set up the basis for an institutional cooperation between elected institutions and chiefs. Yet, a clear repartition of competences over

land was not formalized, leaving a legislative vacuum regarding responsibilities over of land allocation. The 2000 local elections were held within this new contradictory framework.

3 Data

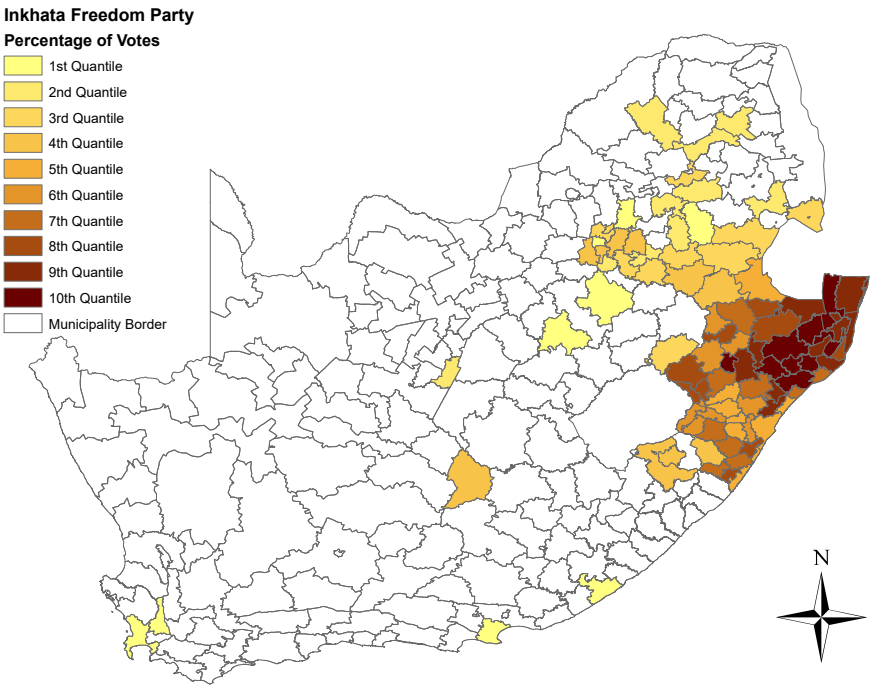
For the purpose of this paper, we combine several different data sources. Our fundamental unit of analysis is the South African local municipality. Local municipalities are administrative units and represent the most local tier of local government. There are 234 local municipalities in South Africa. These include 226 proper local municipalities and 8 metropolitan municipalities.

Electoral Data. The first piece of information pertains to electoral outcomes at the local municipality level. The Electoral Commission of South Africa provides the the corresponding data for each local municipality from the year 2000. The data carry information on the total number of votes, the absolute number of votes obtained by each party in each municipality, its derived percentage of votes and the number of seats obtained in the local municipality council. In the 2000 municipality election, voters cast their votes under an electoral rule combining both proportional representation and a first-past-the-post representation. The number of elected politicians in each municipality council mapped almost exactly to the votes obtained with the proportional system.[9] The IFP presented electoral candidates in 94 of the 260 municipality in South Africa. Figure 1 shows the spatial distribution of the municipalities where the IFP participated in the elections. Almost 60% of these municipalities were located in Kwazulu-Natal, and 15% and 11% in Mpumalanga and Guateng respectively. The remaining 20% was distributed across the remaining 6 provinces. IFP achieved the majority of the votes in 36 municipality, all based in Kwazulu-Natal. The strongest political competitor of the IFP in this province was the ANC. Overall, in KwaZulu-Natal, the IFP won twice as many seats as the ANC on local councils, achieving 57% of the vote for local councils; while the ANC reached a 30% in local councils. Consistent with the narrative in previous section, the IFP support comes rural areas, while the ANC is dominant in the urban areas.[10] Figures 2 plots the distribution of votes of IFP at the electoral turnout in 2000.

[9] "The PR allocation takes into account how many ward seats a party has already won to make sure that the final number of seats a party has does not exceed the percentage of votes which they won"

[10] A significant example is the one of Durban, where it won almost half the seats (with 47% of the vote) and several small towns.

Figure 1: Spatial Distribution of IFP Votes



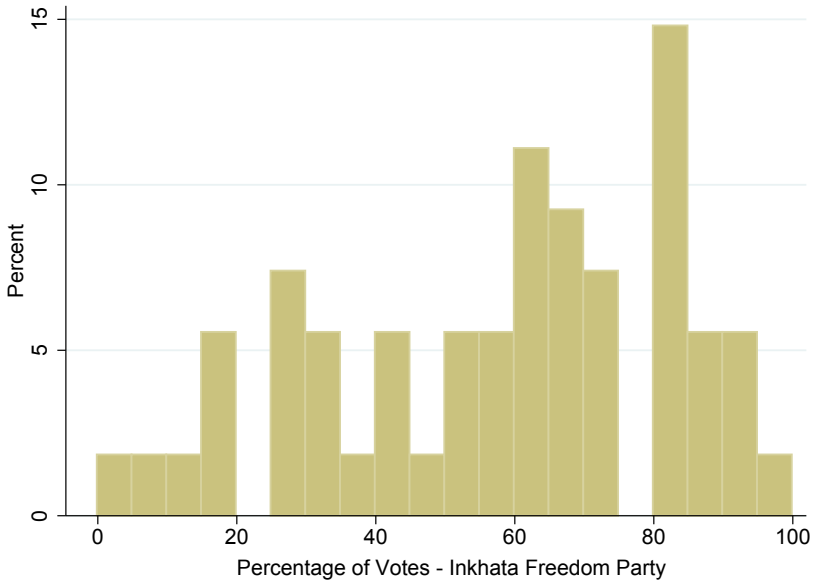
Notes. The Figure plots the spatial distribution of votes for the Inkatha Freedom Party at the municipality election of 2000. (Source: Elections 2000).

Census Data. We gather information on individual labor outcomes from the 2001 Census.[11] For each individual in the Census database, we derive both demographic and socio-economic information. The data specifies both the labor market status and the population ethno-linguistic group the individual belongs to (White, Afrikaan, Xhosa, Zulu, Venda, Sotho, Swazi, Tswana, Tsonga).[12] Moreover, the data provide information on the local municipality of residence of respondents. We can therefore combine individual-level information from Census data with electoral information at the local municipality level in our search for a causal relationship between electoral outcomes and labor market outcomes of individuals belonging to different ethnicities. To validate further our identification approach, we also use data from the 1996 Census data in the implementation of a *placebo* test. From Census data, we also derive a number of aggregate socio-economic characteristics at the local municipality level. We use data on population, rural population, number of individuals reporting no education. In addition to Census data and Electoral data, we employ different geographical controls. We measure agricultural suitability from Ramankutty, Foley, Norman, and McSweeney (2002).

[11] Data are made available by DataFirst through its web portal.

[12] In Amodio and Chiovelli (2015), we rely extensively on these data to study the evolution of the ethnic distribution at the local level.

Figure 2: Distribution of IFP Votes in KwaZulu-Natal



Notes. The Figure plots the distribution of percentage votes for the Inkatha Freedom Party in KwaZulu-Natal province. (Source: Elections 2000).

Afrobarometer. In order to provide evidence on the mechanism behind our reduced-form results, we use information contained in the 2008 Afrobarometer survey data. Afrobarometer is non-partisan research consortium conducting regular surveys on public attitudes over democracy, governance and economic situation in 37 African countries. For South Africa, 2400 individuals in voting age were surveyed in 2008. We match the location of each respondent in the Afrobarometer survey to the corresponding municipality. In particular, we use information on the ethno-linguistic group respondents belong to, and their beliefs on the role and responsibility of traditional chief leaders in: allocating land, maintaining law and order, governing the community, and partisanship.

Land Use Satellite Data. Finally, to differentiate between patterns of reallocation and expansion of agricultural land, we use data from the NASA Landsat program to derive a measure of the amount of cropland available in each local municipality. We use data from land cover obtained via the MODerate Resolution Imaging Spectroradiometer sensor (Friedl, Sulla-Menashe, Tan, Schneider, Ramankutty, Sibley, and Huang 2010).

MODIS land cover data divide the earth surface is into cells of size 500m x 500m. To derive information for cropland usage, we employ the International Geosphere-Biosphere Programme (IGBP) classification that splits the earth land usage in 17-type land usage categories (Loveland and Belward, 1997). For each 500m x 500m cell, we generated an indicator variable with value 1 if the land is used for crop cultivation and zero otherwise. This makes possible to identify the amount of cropland in each given local municipality in each year.[13]

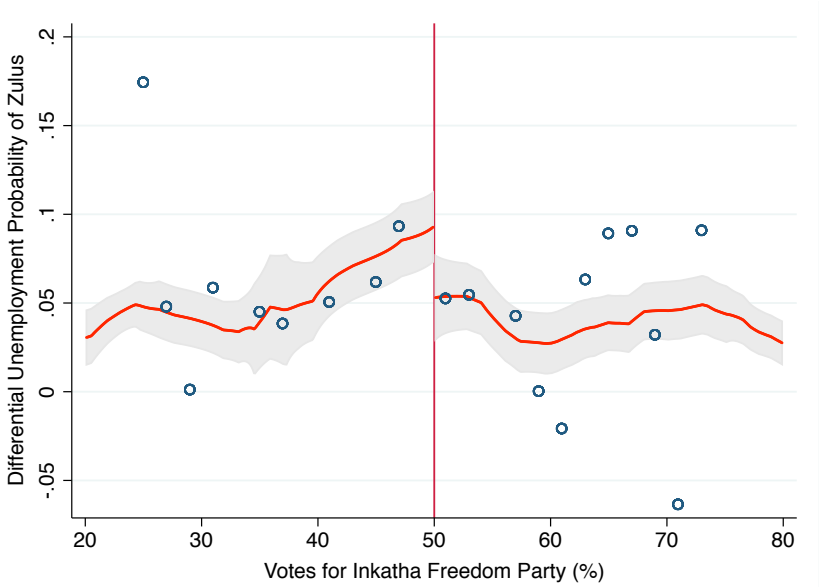
4 Baseline Results

As a first step in our analysis, we test whether labor market the outcomes of Zulu individuals change differentially when the Inkatha Freedom Party achieves the majority of the votes and wins the municipal elections. A simple correlation between electoral outcomes and labor market outcomes of individuals belonging to different ethnicities is not necessarily evidence of a causal relationship. Indeed, differences in electoral outcomes across municipalities may be driven by unobservable characteristics that are themselves correlated with the employment probabilities. For instance, it could be that the sectoral composition of the economy is correlated with political outcomes, and individuals belonging to different ethnicities have skills that are heterogeneous across sectors. If so, differences in employment outcomes between Zulus and non-Zulu across districts with different political outcomes could be solely driven by the sectoral composition of the economy, with no role played by ethnic favoritism. To overcome these identification challenges, we implement a a *Regression Discontinuity* (RD) design with heterogeneity in the outcome (Calzolari, Ichino, Manaresi, and Nellas 2016; Grembi, Nannicini, and Troiano 2015). Following standard regression discontinuity, the outcome of close elections can be framed as a quasi-experiment. We can therefore compare local municipalities where the Zulu-based IFP party won by a narrow margin with those where it barely lost, being confident that these two groups of municipalities are highly comparable in terms of both observable and unobservable characteristics. At the same time, we would borrow from the logic of difference-in-difference methods and test whether the difference in labor market outcomes between Zulus and non-Zulus changes discontinuously with the identity of the ruling party, meaning when the IFP Zulu-based party reaches 50% of votes.[14]

[13] This information is available on the Land Process Distributed Active Archive Center website.

[14] Tables A.1 and A.2 reports descriptive statistics for the main variables used in the analysis.

Figure 3: Differential Unemployment Rate of Zulus Across Municipalities



Notes. The figure plots the smoothed average of the difference between the unemployment probabilities of Zulus vs. the other ethnic groups in 2001 against the voting share of their representative party, the IFP, in the 2000 local municipality elections. The shaded grey area shows the corresponding 95% confidence intervals. The differential unemployment probability of Zulus decreases discontinuously and significantly when the IFP wins the elections (Source: Elections 2000, Census 2001).

Figure 3 shows the first result in a non-parametric framework. The figure plots the smoothed average of the difference between the unemployment probabilities of Zulus vs. individuals from all other ethnic groups in 2001 against the voting share of the IFP Zulu party in the 2000 local municipality elections. The shaded grey area shows the corresponding 95% confidence interval. The differential unemployment probability of Zulus decreases discontinuously and significantly when the Zulu-based IFP wins the elections. We interpret this as evidence that Zulus enjoy a comparative advantage in the local labor markets of municipalities where the IFP rules.

We analyze these results in a more systematic way by implementing the following regression specification

$$\begin{aligned} Y_{id} = \alpha + \beta\,(X_d - c) + \gamma\; Zulu_{id} + \delta\; Zulu_{id} \cdot (X_d - c) \\ +\mathbb{1}\{X_d > c\} \cdot \{\theta + \kappa\,(X_d - c) + \lambda\; Zulu_{id} + \pi\; Zulu_{id} \cdot (X_d - c)\} + u_{id} \end{aligned} \tag{1}$$

where Y_{id} is the labor market outcome of interest for individual i in municipality d as reported in the 2001 Census. $Zulu_{id}$ is a dummy equal to one if the individual belongs to the Zulu ethnic group, and X_d is the voting share of the IFP in the municipality in the 2000 local elections. c is the election winning threshold (50%). $\mathbb{1}\{X_d > c\}$ is therefore

a dummy equal to one if the IPF won the 2000 local elections in municipality d. Finally, u_{id} captures any residual determinant of i's status on the labor market, which we allow to be correlated across individuals in the same local municipality.[15]

The coefficient γ captures the baseline differences in labor market outcomes between Zulus and individuals belonging to other ethnic groups. The inclusion of the interaction variable $Zulu_{id} \cdot (X_d - c)$ allows such differential to vary with the percentage of votes obtained by the Zulu-based IFP. Our coefficient of interest is λ. It captures whether the differences in labor market outcomes between Zulus and individuals belonging to other ethnic groups change discontinuously at the election-winning threshold.

We start by looking at unemployment status. We implement the above regression specification, but having as outcome Y_{id} a dummy equal to one if the individual reports to be unemployed. Table 1 reports the corresponding parameter estimates. Each column reports estimates from the same regression specification, but run over different subsamples as defined by the distance of included observations from the election-winning cutoff c. The third row reports the estimates of λ. Results are consistent with those pictured in Figure 3: the differential unemployment probability of Zulus is 4.8 to 8.8 percentage points lower in IFP-winning districts. When compared to the baseline difference, this corresponds to a 50% decrease in the differential unemployment probability of Zulus.

Robustness. In order to evaluate the robustness of our results, we run several alternative regression specifications. First, we include both geographic control at the municipality level as well as individual-level controls. Results in Table A.4 show that our estimates of λ are fairly stable across these specifications. The same is true when we experiment with their interaction with the entire set of election variables. Including controls at the municipality level allows us to mitigate concerns on the heterogeneity of geographical characteristics at the threshold, and improve the precision of our estimates. The R^2 of the regressions increases substantially when we also include the interactions of controls with election variables.

We then check for the robustness of results to different weighting of the observations around the electoral threshold. Results do not change when we use Kernel-weighting to increase the weight of observations that are closer to the election-winning cutoff (Table A.5), or when we use a 2nd order polynomial for the running variable (Table A.6). If

[15] Table A.3 in Appendix A reports the list of local municipalities in the vicinity of the 50% election-winning threshold, together with the percentage of votes for the IFP. Given that the number of municipalities around the threshold is lower than 40, we implement the wild bootstrapping procedure developed by Cameron, Gelbach, and Miller (2008) and report wild bootstrap p-values in parenthesis in all Tables.

Table 1: Unemployment - Local Linear Regression

	Unemployed				
	(1)	(2)	(3)	(4)	(5)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$	$h = 10$
Zulu	0.086***	0.094*	0.102***	0.140***	0.146***
	(0.00)	(0.06)	(0.00)	(0.00)	(0.00)
IFP Majority	-0.008	-0.006	-0.016	0.047	0.063
	(0.79)	(0.84)	(0.72)	(0.6)	(0.61)
IFP Majority × *Zulu*	-0.048	-0.056*	-0.056*	-0.089***	-0.088***
	(0.13)	(0.09)	(0.09)	(0.00)	(0.00)
IFP Votes	0.000	-0.000	0.000	-0.008	-0.011
	(1)	(.94)	(0.95)	(0.53)	(0.72)
IFP Votes × *Zulu*	0.002	0.003	0.004	0.010***	0.012***
	(0.14)	(0.20)	(0.10)	(0.00)	(0.00)
IFP Majority × *IFP Votes*	-0.001	-0.001	-0.000	0.005	0.007
	(0.85)	(0.81)	(0.95)	(0.69)	(0.65)
IFP Maj × *IFP Votes* × *Zulu*	-0.001	-0.002	-0.004*	-0.012***	-0.015***
	(0.51)	(0.40)	(0.07)	(0.00)	(0.00)
Constant	0.128	0.127	0.129	0.082	0.066
	(0.24)	(0.29)	(0.49)	(0.49)	(0.50)
Observations	251933	249561	201875	139197	101230
R^2	0.003	0.003	0.004	0.007	0.006

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2001 Census. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 2001 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

anything, results improve with these alternative weighting procedures, suggesting that we are using the most conservative specification in to produce our baseline results.

Our identification strategy relies on the assumption that the only relevant discontinuity over the support of the running variable is the one at 50%. In fact, this is the percentage of votes needed to achieve the majority of seats and thus control of the municipality council. In order to further validate this assumption, we run a falsification

test in which we implement the same regression specification, but set the discontinuity at different values of the IFP vote share variable. Table A.7 shows the results of this falsification exercise for the following thresholds: 35%, 40%, 60%, 65% and 70%. The coefficient of the interaction between the IFP Majority and Zulu variables is always insignificant. More importantly, the R^2 for the falsification test are always lower than the one of Column 4 of Table 1, indicating that the relevant structural break in the data occurs at the 50% threshold.

Placebo. One possible concern with the validity of these results is that those municipalities where the IFP won by a narrow margin are not comparable to those where the IFP barely lost in the 2000 local municipality elections. In particular, there could be unobserved time-invariant differences across the two groups of municipalities which make Zulus systematically and differentially less likely to be unemployed on the right side of the threshold. If that was the case, we should observe the same pattern of discontinuous and differential unemployment when looking at labor market outcomes in 1996, four years prior to the elections. We therefore use Census data from 1996, and implement the same regression specification. Table 2 shows the corresponding results. The coefficient of interest is insignificant. Perhaps more importantly, Column 4 shows that the coefficient is positive, and thus opposite sign with respect to the one in our baseline specification. We interpret this evidence as showing that unobserved time-invariant differences across municipalities at the threshold cannot account for the previous results.[16]

Notwithstanding these results, it could still be the case that municipalities on the two sides of the threshold experienced differential changes between 1996 and 1999, and these changes themselves determine both electoral outcomes in 2000 and differential unemployment probabilities in 2001. In particular, internal migration rates where exceptionally high in the period (Reed 2013). Differential immigration rates of Zulus vs. non-Zulus on the two sides of the threshold could in principle determine simultaneously electoral outcomes and differential unemployment rate. To address this concern, we implement the same baseline regression specification using 2001 Census data, but

[16]The boundaries of local municipalities were yet to be established in 1996. Therefore, Census data provide information on the magisterial district of residence of the respondent. To match 1996 individual-level outcomes with electoral outcomes in 2000, we match the centroids of the magisterial districts of residence of respondents with the local municipality they belong to. Such procedure may result in measurement error and thus attenuation bias. Notice that, according to our results in Column 4 of Table 2, the coefficient of interest is not only insignificant, but positive in sign. We are therefore confident that measurement error does not play a crucial role in our discard of problematic unobserved time-invariant differences across municipalities at the threshold.

Table 2: Unemployment in 1996 - Local Linear Regression

	Unemployed			
	(1)	(2)	(3)	(4)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$
Zulu	0.127*	0.145	-0.010	0.022***
	(0.06)	(0.04)	(0.52)	(0.00)
IFP Majority	0.094	0.096	-0.261***	-0.239***
	(0.63)	(0.70)	(0.00)	(0.00)
IFP Majority $\times$ *Zulu*	-0.064	-0.083	0.063	0.048
	(0.34)	(0.25)	(0.1)	(0.23)
Interactions	Y	Y	Y	Y
Observations	275386	273757	216937	119845
R^2	0.004	0.004	0.008	0.004

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 1996 Census. The centroids of Magisterial District of residence of respondents are matched with the Local Municipality they belong to. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 1996 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 1996).

replacing as outcome a dummy equal to one if the individual reports to have moved to current location in between 1996 and 1999. Table A.8 shows the corresponding results. The insignificant estimates of the coefficient of interest indicate that the differential immigration rates of Zulus are not discontinuous in the vicinity of the election-winning threshold. Evidence altogether suggests that election results are not driven by pre-existing differences in labor maker outcomes or migration trends, ruling out the most pressing identification concerns.

5 Agricultural Employment and Land Allocation

The previous results show that unemployment among the Zulus differentially and discontinuously drops in those districts where the IFP wins the local elections. In order to shed light on the mechanism behind this result, we restrict our sample to the pool of

Table 3: Employment Across Sectors - Local Linear Regression

	$h = 15$					
	(1)	(2)	(3)	(4)	(5)	(6)
	Pub Sector	Agric	Mining	Manuf	Constr	Transp
Zulu	0.165***	-0.915***	0.000	0.183***	0.049	0.064***
	(0.00)	(0.00)	(0.89)	(0.00)	(0.52)	(0.00)
IFP Majority	0.189***	-1.046*	0.017	0.150	0.073***	0.048***
	(0.00)	(0.05)	(0.76)	(0.33)	(0.00)	(0.00)
IFP Majority × *Zulu*	-0.130	0.905***	-0.009	-0.127	-0.049	-0.039***
	(0.11)	(0.00)	(0.84)	(0.16)	(0.36)	(0.00)
Interactions	Y	Y	Y	Y	Y	Y
Observations	17186	17186	17186	17186	17186	17186
R^2	0.005	0.124	0.006	0.030	0.003	0.002

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2001 Census who reports to be employed. Dependent variable is a dummy equal to one if the individual is employed in the corresponding sector. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 2001 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

employed individuals, and look at differential employment probabilities across sectors. That is, we run the same specification as in equation 1, but having as outcome a dummy equal to one if the individual reports to be employed in a given sector. For instance, if we were to find public sector employment to increase discontinuously in favor of Zulus in IFP-winning municipalities, we would infer that ethnic favoritism in the allocation of public sector jobs is driving the pattern we found on unemployment in the previous section. If instead we were to find that the biggest changes are in the construction sector, we could make the case of an uneven allocation of procurement jobs to Zulu-owned construction firms.

Table 3 shows the corresponding coefficient estimates, with results for each sector reported in different columns. Estimates of λ are again reported in the third row. Evidence shows that the discontinuity in differential employment probabilities between Zulus and non-Zulus at the IFP election-winning threshold is heterogeneous across sectors. The employment probabilities of Zulus decrease differentially and systematically at the discontinuity in all sectors (including public sector) but agriculture. Evidence thus unambiguously points in the direction of investigating closely issues related to the

agricultural sector and the allocation of land.

Table 4: Role of Traditional Chief Leaders

	Allocating Land	Maintaining Law & Order	Governing Community	Should Be Partizan
Zulu	-0.144	-0.217	-0.470*	0.154**
	(0.179)	(0.284)	(0.249)	(0.068)
IFP Majority	-0.938***	-0.253	0.655**	0.039
	(0.264)	(0.248)	(0.309)	(0.028)
IFP Majority × *Zulu*	0.871***	0.216	-0.945***	-0.075
	(0.277)	(0.286)	(0.318)	(0.077)
Interactions	Y	Y	Y	Y
Observations	529	529	529	529
R^2	0.073	0.015	0.045	0.024

Notes. Standard errors in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2008 Afrobarometer Survey. Dependent variable is a dummy equal to one if the individual identifies the Traditional Chief Leaders as primary responsible for the task indicated in each column. *Zulu* is a dummy equal to one if the individual indicates Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the Afrobarometer Survey. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Afrobarometer 2008).

In Sub-Saharan Africa, formally appointed political leaders and traditional chief power structures often interact in the allocation of de facto rights to cultivate land (Michalopoulos and Papaioannou 2013). Baldwin (2014) shows how political parties in Africa recruit traditional ethnic leaders as political brokers to mobilize the individuals under their authority for political support and voting (de Kadt and Larreguy 2015). In exchange, traditional leaders are given the power to allocate agricultural land and favor co-ethnics. In our context, IFP leaders strategically empower traditional Zulu leaders, ceding control over land allocation and redistribution. When the IFP wins the elections, Zulus have preferential access to land, and enjoy comparative advantages in the agricultural labor market. We claim that this mechanism accounts for the differential employment patterns identified above.

We provide additional evidence supporting this claim using Afrobarometer survey data. In the 2008 round, surveyed individuals are asked a number of questions about local politics and the authority of traditional chief leaders in society. We merge the

Afrobarometer data with data on the 2000 local municipality elections, and test for whether the answers to such questions are systematically discontinuously differential across individuals belonging to different ethnicity across municipalities where the IFP won or lost by a narrow margin.

Table 4 shows the corresponding results. We implement the same regression specification we use for labor market variables, but use as outcome variables a number of dummies derived from Afrobarometer data. In Column 1, the outcome is a dummy equal to one if the individual reports that the traditional chief leader is the main responsible for allocating land. Although surveyed eight years later, Zulus are systematically and discontinuously more likely to identify the traditional chief leader as the main responsible for allocating land in those municipalities where the IFP won in 2000. The same individuals are instead discontinuously less likely to identify the chief leader as the one responsible for governing the community, suggesting a patter of division of power between traditional leaders and formally appointed politicians in IFP municipalities. This finding seems to point out the existence of a "duality" in the governance structure, split between formally appointed political leaders and traditional ethnic chiefs.

Our hypothesis is that the way ethnic favoritism takes place in democracies is through discrimination in the access of markets for agricultural land. The allocation of existing land plots to co-ethnics is different from a situation in which new land plots are assigned to them. Differentiating between the two scenarios is important in setting the ground for the evaluation of the welfare consequences of this phenomenon. Using satellite images (LP DAAC 2012), we build an original dataset with information on land use at the local municipality level from the years 2001 to 2011. We employ our framework to evaluate whether the area devoted to cropland expanded differentially and discontinuously at the IFP-winning threshold. Having as unit of observation each 500m x 500m area cell i located in district d, we define a dummy variable equal to one if the cell was devoted to cropland. We then take the difference in such dummy between 2001 to 2005, and regress it over the voting share of the IFP in the municipality in the 2000 local elections, a dummy equal to one if the IPF won, and the interaction between the two. The coefficient of interest is now the one of the IFP majority dummy, as it captures whether the amount of land devoted to cropland expands differentially and discontinuously in those municipalities where the IFP rules. Table 5 shows the corresponding results. The coefficient of the IFP majority dummy is insignificant across all specifications. This indicates that in this context ethnic favoritism takes place through a reallocation of land which favor Zulus rather than to a differential expansion of Zulu land.

Table 5: Changes in Cropland Area 2001-2005 - Local Linear Regression

	Δ Cropland Usage				
	(1)	(2)	(3)	(4)	(5)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$	$h = 10$
IFP Majority	0.064	0.075	0.082	0.027	-0.072
	(0.32)	(0.29)	(0.23)	(0.75)	(0.25)
IFP Votes	-0.003	-0.004	-0.004	0.002	0.018
	(0.30)	(0.27)	(0.306)	(0.74)	(0.22)
IFP Majority × *IFP Votes*	0.004	0.005	0.003	-0.002	-0.018***
	(0.22)	(0.18)	(0.38)	(0.82)	(0.00)
Observations	247602	238965	207860	113394	64143
R^2	0.004	0.005	0.003	0.006	0.018

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is a grid of 500m x 500m. Dependent variable is a dummy equal to one if the land usage in the grid is dedicated to crop cultivation. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

6 Theoretical Framework and Welfare Analysis

Evidence suggests that the above patterns of differential unemployment may originate through a process of land allocation which favor Zulus. We investigate this specific mechanism by mean of a formal model. Our objective is, first, to show that all the above empirical findings can be reconciled within the logic of a general equilibrium framework. Second, we want to use the model to run counterfactual policy analyses and quantify the welfare consequences of ethnic favoritism in the allocation of land. To capture the intuition behind the mechanisms at work, we model an economy with two population (ethnic) groups and two sectors, agriculture and manufacturing. Ethnic-specific distortions in land access distort the allocation of land across ethnic groups, and the allocation of labor across sectors within each group. Our model shares some of the features of Adamopoulos and Restuccia (2014).

Consider two ethnic groups $i \in \{1, 2\}$ with mass equal to one. Production is carried out in two sectors: agriculture a an manufacturing m. Let the fraction of individuals from group i employed in sector s be given by n_{is}. Production in the manufacturing sector is carried out by a single firm which operates according to the following production

technology

$$Y_m = A(n_{1m} + n_{2m})^{1-\alpha} \tag{2}$$

where A is the economy-wide total factor productivity. Notice that individuals from both groups are perfect substitute in the production technology of the manufacturing sector.

In the agricultural sector, each ethnic group produces separately in its own agricultural farms according to

$$\begin{aligned} Y_a^1 &= A\kappa(n_{1a})^{\gamma} L_1^{1-\gamma} \\ Y_a^2 &= A\kappa(n_{2a})^{\gamma} L_2^{1-\gamma} \end{aligned} \tag{3}$$

where κ is the agricultural-specific total factor productivity, and L_i is the land endowment of group i. We ignore for now differences in agricultural ability across the two groups. These can be easily incorporated by having a group-specific terms in the total factor productivity of the agricultural farms. Incorporating those does not change the main predictions of the model.

The profits of these three production units are given by

$$\begin{aligned} \Pi_m &= A(n_{1m} + n_{2m})^{1-\alpha} - w_m(n_{1m} + n_{2m}) \\ \Pi_a^1 &= p_a A\kappa(n_{1a})^{\gamma} L_1^{1-\gamma} - q(1+\tau)L_1 - w_a^1 n_{1a} \\ \Pi_a^2 &= p_a A\kappa(n_{2a})^{\gamma} L_2^{1-\gamma} - qL_2 - w_a^2 n_{2a} \end{aligned} \tag{4}$$

where w_m, w_a^1, w_a^2 are wages in the three units respectively, p_a is the relative price of the agricultural good, and q is rental price of land. Importantly, τ captures differential ethnic-specific distortions in land access. When τ is positive, the marginal cost of land is effectively higher for individuals of group 1 with respect to individuals of group 2. An increase in distortions in land access decreases the demand for land, and increases its marginal product.

The consumption side is given by a single representative household with utility

$$u = \phi \log(c_a - \bar{a}) + (1 - \phi) \log(c_m) \tag{5}$$

where $\bar{a}$ is the subsistence level of agriculture, and ϕ captures the relative preferences for the agricultural good. The household maximizes utility subject to the following

budget constraint

$$p_a c_a + c_m = w_m(n_{1m} + n_{2m}) + w_a^1 n_{1a} + w_a^2 n_{2a} + qL \tag{6}$$

A **competitive equilibrium** is a set of allocation for: the household $\{c_a, c_m, n_{1a}, n_{2a}\}$, the manufacturing firm $\{n_{1m}, n_{2m}\}$, the two farms $\{L_1, L_2, \}$ and a set of prices $\{p_a, q, w_m, w_a^1, w_a^2\}$ such that: (i) given prices, the consumption and labor allocations of the household solve the household's maximization problem; (ii) given prices, the allocation of the manufacturing firm and farms in agricultural sector solve their problems; and (iii) markets clear for labor, for land, and for agricultural and non-agricultural goods.

Individuals from the two groups are perfect substitute in the manufacturing sector, but they are not in the agricultural sector. The need of satisfying the no-arbitrage condition for labor simultaneously for the two groups allows us to introduce differential unemployment. Specifically, let e be the differential employment probability of individuals from group 1 outside agriculture. That is, when individuals from group 1 leave agriculture, they find a job in manufacturing with probability e. They remain unemployed and earn no wages otherwise. The no-arbitrage condition is therefore given by

$$w_a^1 = e w_m = e w_a^2 \tag{7}$$

Solving the farms' maximization problems and equalizing $w_a^1 = e w_a^2$, it can be shown that

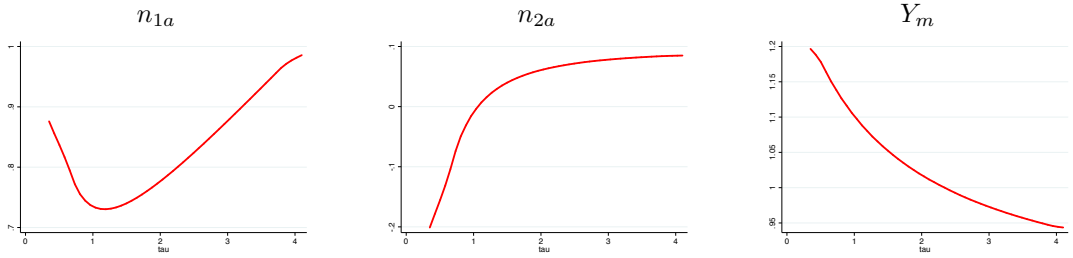
$$e^* = \left[\frac{1}{(1+\tau)^{1-\gamma}} \right]^{\frac{1}{\gamma}} \tag{8}$$

That is, a one-to-one mapping exists between the level of differential distortions in land access across groups, and their differential employment (unemployment) probabilities outside agriculture. As distortions in land access increase, employment probabilities in manufacturing decrease.

Comparative Statics. We compute the equilibrium and show the basic comparative statics by setting $\phi \to 0$. This implies that the equilibrium consumption of the agricultural good equals the subsistence level, meaning $Y_a^* = \bar{a}$. The model passes some basic plausibility checks. Indeed, at equilibrium, the weighted sum of agricultural workers

$$\tilde{n}_a^* = n_{1a}^* e + n_{2a}^* \tag{9}$$

Figure 4: The Equilibrium Effect of Distortions in Land Access



$L = 3.5, A = \kappa = 1, \bar{a} = 1.5, \gamma = 0.54, \alpha = 0.33, \phi \to 0.$

decreases with economy-wide and agricultural productivity A, κ, decreases with the overall land endowment L, decreases with the labor intensity of the manufacturing production technology $1 - \alpha$, and increases with the labor intensity of the agricultural production technology λ.

After calibrating the exogenous parameters of the model, we can ask how the equilibrium allocation of labor across sectors and ethnicity changes as differential ethnic-specific distortions in land access increase. Figure 4 shows how the equilibrium fraction of individuals from the two groups and output from manufacturing change when differential distortions in land access increase for group 1.

As τ goes from zero to positive, the marginal productivity of labor in the agricultural farm of group 1 decreases. Therefore, individuals from group 1 leave the agricultural sector and move to manufacturing, where their probability of finding employment e is still high (although lower than 1) as τ is low. Moreover, individuals from group 2 are pulled into agriculture in order to maintain the subsistence level of agricultural production. However, as τ continues to increase, the productivity of the agricultural farm of group 1 is so low that the need of fulfilling the subsistence requirement pulls individuals from group 1 back into agriculture, while continuing to pull individuals from group 2 in the same direction. All this is detrimental to manufacturing output and welfare (remember that $c_a = \bar{a}$ and constant throughout), as valuable labor is kept away from the manufacturing sector.

Our framework is capable of reconciling the empirical evidence we presented in the previous sections. When the IFP wins, distortions in land access for non-Zulus go from zero to positive. As a result, the differential employment probability of Zulus decreases, and their differential employment probability in agriculture increases.

To conclude, we can use the model to implement counterfactual policy analyses. Equation 8 shows that a complete mapping exists between differential distortions in land access τ and differential employment probabilities e. We can thus use our reduced-form results and the model expression for differential employment to back up what is the change in τ that can generate differential unemployment patterns of the size we observe in the data. According to the reduced form estimates in column (5) of Table 1, when IFP wins the differential unemployment probability between Zulus and Non-Zulus changes by 8.8 percentage points. Within our calibrated model, this corresponds to a τ of 0.11. Our calculations reveal that eliminating such distortions and bringing the value of τ to zero would increase welfare by 13.3%.

7 Conclusions

This paper studies the extent and forms through which ethnic favoritism takes place in democracies. We investigate these issues in the context of post-apartheid South Africa. Combining election and Census data, our results show that individuals sharing the same ethnicity of appointed leaders enjoy comparative advantages on the local labor markets, and in the agricultural sector in particular. Our argument is that strategic interactions between formally appointed politicians and traditional chief leaders trigger differential access to agricultural land across individuals belonging to different ethnicities. Evidence from survey data is consistent with this hypothesis. We also develop a simple macro model which features differential land access, and reconciles the main empirical facts. Combining reduced-form estimates and the structural equations of the model, we are able to calculate the welfare consequences of ethnic favoritism. We show that a reduction of distortions in land access due to ethnic favoritism can increase welfare up to 13% in our calibrations.

Our results call for additional works on this agenda. First, combining causal evidence from South Africa with our calibrated model, we show that ethnic favoritism is detrimental to welfare. Future research is needed to assess the external validity of this finding in the African context. Second, our theoretical framework has the potential of being extended and used to study the implications of ethnic favoritism, discriminatory land markets and distortion in land access on the process of structural transformation and urbanization in Africa.

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Appendix A - Additional Tables and Figures

Table A.1: Summary Statistics - Left Side of the Threshold $h = 15$

	Descriptive Statistics				
	N	Mean	Standard Deviation	Min	Max
Unemployed (dummy)	46930	0.194	0.396	0	1
Employed (dummy)	46930	0.146	0.353	0	1
Agriculture (dummy)	46930	0.012	0.110	0	1
Mining (dummy)	46930	0.001	0.033	0	1
Manufacturing (dummy)	46930	0.041	0.198	0	1
Construction (dummy)	46930	0.006	0.075	0	1
Trade (dummy)	46930	0.018	0.135	0	1
Transport (dummy)	46930	0.005	0.074	0	1
Public Employees (dummy)	46930	0.020	0.139	0	1
Zulu (dummy)	46930	0.971	0.168	0	1
Xhosa (dummy)	46930	0.007	0.081	0	1
Swazi (dummy)	46930	0.003	0.052	0	1
Sotho (dummy)	46930	0.011	0.105	0	1
Rural (dummy)	46930	0.484	0.500	0	1
Education Primary (dummy)	46.930	0.068	0.252	0	1
Age	46930	24.655	18.855	0	103
Female (dummy)	46930	0.548	0.498	0	1
Agricultural Production (t/ha)	46930	559.021	111.668	468.365	710.121
Area (km)	46930	2105.102	698.891	914.857	2964.751
Elevation (m)	46930	1206.724	237.679	510.600	1498.400
Suitability of Agriculture	46930	0.741	0.019	0.694	0.754

Notes. The Table reports the summary statistics for the left side of the threshold ($h = 15$). All varibles are discussed in Section 3.

Table A.2: Summary Statistics - Right Side Threshold $h = 15$

	Descriptive Statistics				
	N	Mean	Standard Deviation	Min	Max
Unemployed (dummy)	92267	0.145	0.352	0	1
Employed (dummy)	92267	0.112	0.315	0	1
Agriculture (dummy)	92267	0.017	0.130	0	1
Mining (dummy)	92267	0.001	0.038	0	1
Manufacture (dummy)	92267	0.018	0.132	0	1
Construction (dummy)	92267	0.005	0.072	0	1
Trade (dummy)	92267	0.013	0.114	0	1
Transport (dummy)	92267	0.004	0.067	0	1
Public Employees (dummy)	92267	0.017	0.129	0	1
Zulu (dummy)	92267	0.979	0.143	0	1
Xhosa (dummy)	92267	0.010	0.098	0	1
Swazi (dummy)	92267	0.001	0.034	0	1
Sotho (dummy)	92267	0.002	0.045	0	1
Rural (dummy)	92267	0.925	0.263	0	1
Education Primary (dummy)	92267	0.061	0.239	0	1
Age	92267	24.002	19.099	0	120
Female (dummy)	92267	0.548	0.498	0	1
Agricultural Production (t/ha)	92267	511.681	173.274	286.236	805.916
Area (km)	92267	1303.707	666.028	581.880	3538.720
Elevation (m)	92267	472.570	406.560	33.273	1382.479
Suitability of Agriculture	92267	0.809	0.066	0.685	0.950

Notes. The Table reports the summary statistics for the right side of the threshold ($h = 15$). All varibles are discussed in Section 3.

Table A.3: Municipalities Around the Threshold

Election Code	Municipality Name	% of IFP Votes
KZ223	Mooi Mpofana	24.85
KZ216	Hibiscus Coast	27.53
KZ212	Umdoni	28.89
KZ5a2	Kwa Sani	30.01
KZ221	uMshwathi	31.32
KZ241	Endumeni	34.67
KZ224	Impendle	36.03
KZ232	Emnambithi/Ladysmith	40.18
KZ252	Newcastle	44.29
KZ226	Mkhambathini	46.56
KZ282	uMhlathuze	50.43
KZ5a5	Ubuhlebezwe	52.47
KZ234	Umtshezi	53.55
KZ214	uMuziwabantu	56.61
KZ291	eNdondakusuka	56.78
KZ5a1	Ingwe	59.81
KZ213	Umzumbe	61.04
KZ253	Utrecht	61.95
KZ245	Umvoti	62.79
KZ211	Vulamehlo	63.12
KZ215	Ezingoleni	64.15
KZ275	Mtubatuba	66.71
KZ261	eDumbe	67.1
KZ236	Imbabazane	68.84
KZ263	Abaqulusi	69.24
KZ254	Dannhauser	69.45
KZ235	Okhahlamba	69.89
KZ262	uPhongolo	71.95
KZ281	Mbonambi	72.96
KZ293	Ndwedwe	73.75

Notes. The Table shows the percentage of votes for the Inkatha Freedom Party (IFP) in those municipalities where the latter was between 20 and 80%, thus around the election-winning threshold of 50% (Sources: Elections 2000).

Table A.4: Unemployment - Local Linear Regression with Controls

	Unemployed			
	(1)	(2)	(3)	(4)
	$h = 15$	$h = 15$	$h = 15$	$h = 15$
Zulu	0.139***	0.157***	0.031***	0.301***
	(0.000)	(0.000)	(0.000)	(0.000)
IFP Majority	0.033	0.053	0.095***	0.805***
	(0.72)	(0.62)	(0.00)	(0.00)
IFP Majority × *Zulu*	-0.090***	-0.105***	-0.056**	-0.317*
	(0.00)	(0.00)	(0.04)	(0.08)
Interactions	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y
Individual Controls	N	Y	Y	Y
Individual Interactions	N	N	Y	Y
Geography Interactions	N	N	N	Y
Observations	139197	139197	139197	139197
R^2	0.008	0.036	0.150	0.151

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2001 Census. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. $Geography$ is a set of controls at the municipality level including: land area (log), elevation (log), and suitability of agriculture (log). $Individual$ is a set of controls at the individual level including: female (dummy), age, age squared, and primary education (dummy). Observations are weighted according to their original weight in the 2001 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

Table A.5: Unemployment - Local Linear Regression with Kernel Weighting

	Unemployed				
	(1)	(2)	(3)	(4)	(5)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$	$h = 10$
Zulu	0.093**	0.100***	0.123***	0.152***	0.177***
	(.03)	(0.00)	(0.00)	(0.00)	(0.00)
IFP Majority	-0.006	-0.004	0.029	0.070	0.186***
	(0.82)	(0.83)	(0.58)	(0.71)	(0.00)
IFP Majority × *Zulu*	-0.050	-0.054**	-0.074***	-0.095***	-0.123***
	(0.10)	(.04)	(0.00)	(0.00)	(0.00)
Interactions	Y	Y	Y	Y	Y
Observations	251933	249561	201875.000	139197.000	101230.000
R^2	0.004	0.004	0.006	0.006	0.005

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2001 Census. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 1996 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 1996).

Table A.6: Unemployment - Local 2nd-Order Polynomial

	Unemployed				
	(1)	(2)	(3)	(4)	(5)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$	$h = 10$
Zulu	0.195***	0.167***	0.189***	0.219***	0.174***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
IFP Majority	0.072	0.067	0.150	0.227	0.374***
	(0.47)	(0.54)	(0.24)	(0.21)	(0.00)
IFP Majority × *Zulu*	-0.132***	-0.104***	-0.135***	-0.153*	-0.127***
	(0.00)	(0.00)	(0.00)	(0.08)	(0.00)
Interactions	Y	Y	Y	Y	Y
Observations	251933	249561	201875	139197	101230
R^2	0.004	0.004	0.006	0.008	0.007

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined 2-nd order polynomial regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 2001 Census. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 1996 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 1996).

Table A.7: Unemployment - Falsification with Different Threshold

	Unemployed				
	(1)	(2)	(3)	(4)	(5)
Threshold :	35%	40%	60%	65%	70%
	$h = 15$	$h = 15$	$h = 15$	$h = 15$	$h = 15$
Zulu	-0.000	0.195*	0.008	0.028	0.041***
	(0.97)	(.06)	(0.77)	(0.37)	(0.00)
IFP Majority	0.038	0.148	-0.003	0.072	-0.008
	(0.52)	(0.16)	(0.91)	(0.24)	(0.89)
IFP Majority $\times$ *Zulu*	-0.016	-0.133	0.002	-0.015	0.004
	(0.76)	(0.18)	(0.96)	(0.76)	(0.91)
Interactions	Y	Y	Y	Y	Y
Observations	79712	734656	176428	172221	230562
R^2	0.002	0.001	0.002	0.002	0.003

Notes. Wild bootstrap p-values in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. Different cut-off are chosen: 35%, 40%, 60%, 65% and 70%. The unit of observation is an individual surveyed in the 2001 Census. Dependent variable is a dummy equal to one if the individual is unemployed. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 2001 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

Table A.8: Immigration in 1996-1999 - Local Linear Regression

	Unemployed				
	(1)	(2)	(3)	(4)	(5)
	$h = 30$	$h = 25$	$h = 20$	$h = 15$	$h = 10$
Zulu	-0.030**	-0.026*	-0.042***	-0.075***	-0.077***
	(0.014)	(0.014)	(0.014)	(0.009)	(0.013)
IFP Majority	0.045***	0.046***	0.032**	-0.004	0.016
	(0.012)	(0.012)	(0.013)	(0.012)	(0.011)
IFP Majority × *Zulu*	-0.050***	-0.053***	-0.041**	-0.001	-0.004
	(0.015)	(0.015)	(0.016)	(0.010)	(0.015)
IFP Votes	-0.003***	-0.003***	-0.001	0.005**	0.004***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
IFP Votes × *Zulu*	0.003***	0.004***	0.001	-0.005***	-0.005**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
IFP Majority × *IFP Votes*	-0.000	-0.000	-0.003	-0.008***	-0.010***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
IFP Maj × *IFP Votes* × *Zulu*	-0.001	-0.001	0.002	0.006***	0.008**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Constant	0.067***	0.066***	0.082***	0.115***	0.105***
	(0.010)	(0.011)	(0.011)	(0.010)	(0.006)
Observations	251933	249561	201875	139197	101230
R^2	0.007	0.007	0.003	0.005	0.006

Notes. Standard errors in parenthesis. The table reports estimates from a combined local linear regression specification at both size of the cutoff. The unit of observation is an individual surveyed in the 1996 Census. The centroids of Magisterial District of residence of respondents are matched with the Local Municipality they belong to. Dependent variable is a dummy equal to one if the individual reports to have moved to current location in between 1996 and 1999. *Zulu* is a dummy equal to one if the individual reports Zulu as her first language. *IFP Majority* is a dummy equal to one if the Inkatha Freedom Party (IFP) achieved at least 50% of the votes in the 2000 Local Municipality Elections. *IFP Votes* is the percentage of votes for the IFP in the same elections. Observations are weighted according to their original weight in the 2001 Census. Standard errors are clustered at the local municipality level (Sources: Elections 2000; Census 2001).

Appendix B - Model Derivations

B.1 Competitive Equilibrium

This Appendix integrates Section 6 and shows the main steps in the computation of the model equilibrium.

The solution to the household's maximization problem implies

$$c_m = (1-\phi)(I - \bar{a}p_a)$$

$$c_a = \bar{a} + \frac{\phi}{p_a}(I - \bar{a}p_a)$$

where I is income as given by the household budget constraint.

Solving for the firm's maximization problem, by taking the FOC we get the demand for labor

$$w_m = \frac{(1-\alpha)Y_m}{n_{1m} + n_{2m}} = \frac{A(1-\alpha)}{(n_{1m} + n_{2m})^{\alpha}}$$

Solving for the farms' maximization problem, we get the demand for land and labor for individuals belonging to the two ethnic groups

$$L_1 : \frac{p_a(1-\gamma)Y_a^1}{L_1} = q(1+\tau)$$

$$L_2 : \frac{p_a(1-\gamma)Y_a^2}{L_2} = q$$

$$n_{1a} : \frac{p_a\gamma Y_a^1}{n_{1a}} = w_a^1$$

$$n_{2a} : \frac{p_a\gamma Y_a^2}{n_{2a}} = w_a^2$$

From which we get the relative demand of land and labor in the two farms

$$\frac{L_1}{n_{1a}} = \frac{1-\gamma}{\gamma}\frac{w_a^1}{q(1+\tau)}$$

$$\frac{L_2}{n_{2a}} = \frac{1-\gamma}{\gamma}\frac{w_a^2}{q}$$

Notice that an increase in τ makes the agricultural farm of group 1 more labor inten-

sive. From the above we can derive the demand for land for each farm as a function of their demand of labor. Given the land clearing condition $L = L_1 + L_2$ we get

$$L = \frac{1-\gamma}{\gamma}\frac{1}{q}\left[n_{1a}\frac{w_a^1}{1+\tau} + n_{2a}w_a^2\right]$$

We can also replace the same expression for L_i in the corresponding production function and get the agricultural production of the two farms and thus total agricultural production as

$$Y_a = A\kappa\left[\frac{1-\gamma}{\gamma}\frac{1}{q}\right]^{1-\gamma}\left[n_{1a}\left(\frac{w_a^1}{1+\tau}\right)^{1-\gamma} + n_{2a}(w_a^2)^{1-\gamma}\right]$$

The no arbitrage condition implies that *expected* wages are equalized across sectors. We allow for unemployment of members of group 1. If they leave the agricultural sector, their employment probability in the non-agricultural firm is given by $e = n_{1m}/(n_{1m} + n_{1u})$, where n_{1u} is the fraction of individuals from group 1 which is unemployed. It follows that

$$w_a^1 = ew_m = ew_a^2$$

Given $w_a^1 = ew_a^2$, substituting the demand for labor in the two farms we get

$$\frac{Y_a^1}{n_{1a}} = e\frac{Y_a^2}{n_{2a}}$$

and substituting the relative demand $L_i/N_i n_{ia}$ in the production function and again $w_a^1 = ew_a^2$ we get

$$e^* = \left[\frac{1}{(1+\tau)^{1-\gamma}}\right]^{\frac{1}{\gamma}}$$

Notice that an increase in the distortions in the accessibility of land increases unemployment for group 1.

Going back to the expressions for L and Y_a, we can substitute $w_a^1 = ew_a^2$ and get

$$L = \frac{1-\gamma}{\gamma}\frac{w_a^2}{q}\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]$$

$$Y_a = A\kappa\left[\frac{1-\gamma}{\gamma}\frac{w_a^2}{q}\right]^{1-\gamma}\left[n_{1a}\left(\frac{e}{1+\tau}\right)^{1-\gamma} + n_{2a}\right]$$

From the expression for L, we can derive relative prices

$$\frac{w_a^2}{q} = L\frac{\gamma}{1-\gamma}\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]^{-1}$$

and substitute them into the expression for Y_a to get

$$Y_a = A\kappa L^{1-\gamma}\frac{n_{1a}\left(\frac{e}{1+\tau}\right)^{1-\gamma} + n_{2a}}{\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]^{1-\gamma}}$$

which can be rewritten as

$$Y_a = A\kappa L^{1-\gamma}\frac{n_{1a}e + n_{2a}}{\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]^{1-\gamma}}$$

We can then replace the above expression for e^* and finally get

$$Y_a = A\kappa L^{1-\gamma}\frac{n_{1a}\left(\frac{1}{(1+\tau)^{1-\gamma}}\right)^{\frac{1}{\gamma}} + n_{2a}}{\left[n_{1a}\left(\frac{1}{1+\tau}\right)^{\frac{1}{\gamma}} + n_{2a}\right]^{1-\gamma}}$$

At equilibrium it must be that

$$\begin{aligned} p_a &= \frac{\phi c_m}{(1-\phi)(c_a - \bar{a})} \\ c_m &= Y_m = A(n_{1m} + n_{2m})^{1-\alpha} \\ c_a &= Y_a = A\kappa L^{1-\gamma}\frac{n_{1a}e + n_{2a}}{\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]^{1-\gamma}} \\ w_m &= \frac{(1-\alpha)Y_m}{n_{1m} + n_{2m}} = w_a^2 = \frac{w_a^1}{e} \end{aligned} \tag{10}$$

We also know that

$$L = \frac{1-\gamma}{\gamma}\frac{w_a^2}{q}\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]$$

Therefore, from the household's budget constraint we get

$$\frac{\phi Y_m}{(1-\phi)(Y_a-\bar{a})}Y_a + Y_m = \frac{(1-\alpha)Y_m}{n_{1m}+n_{2m}}\left[1+n_{1m}+en_{1a}+\frac{1-\gamma}{\gamma}\left(n_{1a}\frac{e}{1+\tau}+n_{2a}\right)\right]$$
$$\frac{\phi Y_a}{(1-\phi)(Y_a-\bar{a})}+1 = \frac{(1-\alpha)}{e+1-en_{1a}-n_{2a}}\left[e+1+\frac{1-\gamma}{\gamma}\left(n_{1a}\frac{e}{1+\tau}+n_{2a}\right)\right] \tag{11}$$

The above equations uniquely define the equilibrium of the model. In particular, by substituting the expression for total agricultural productivity in the budget constraint we get an equation where n_{1a} and n_{2a} are the only endogenous variables. Using the equality between wages across sectors in the last equation of 10, we can substitute to w_a^2 the marginal productivity revenue of labor in agricultural farm 2, and use the expressions for p_a, L_2 and w_a^2/q to also finally get an equation where n_{1a} and n_{2a} are the only endogenous variables. We therefore have a system of two equations in two unknown that we can solve.

B.2 Comparative Statics

B.2.1 The case of $\phi \to 0$

We now define the preference parameter and consider the case of $\phi \to 0$. From the solution to the household's maximization problem we get $c_a = \bar{a}$. From the expression for total agricultural production it follows that

$$\bar{a} = A\kappa L^{1-\gamma}\frac{n_{1a}e+n_{2a}}{\left[n_{1a}\frac{e}{1+\tau}+n_{2a}\right]^{1-\gamma}} \tag{12}$$

Consider the case of $\tau = 0$. In this case, no ethnic group faces distortions in land access. e^* is equal to 1, and equation 12 becomes

$$\bar{a} = A\kappa L^{1-\gamma}\left(n_{1a}+n_{2a}\right)^{\gamma}$$

$$n_{1a}+n_{2a} = \left(\frac{\bar{a}}{A\kappa L^{1-\gamma}}\right)^{\frac{1}{\gamma}}$$

Therefore, all (n_{1a}^*, n_{2a}^*) which satisfy the above will be an equilibrium of the model. All individuals are identical, therefore their relative allocation to agriculture does not matter as long as the total number of individuals allocated to agriculture is such that the

total agricultural and non-agricultural production meet their demand.

Consider now the case of $\tau > 0$. Individuals from group 1 face distortions in the accessibility of land. Equation 12 becomes

$$\bar{a} = A\kappa L^{1-\gamma} \frac{n_{1a}e + n_{2a}}{\left[n_{1a}e^{\frac{1}{1-\gamma}} + n_{2a}\right]^{1-\gamma}}$$

From the budget constraint we get

$$n_{1a}e^{\frac{1}{1-\gamma}} + n_{2a} = \frac{\gamma}{(1-\gamma)(1-\alpha)}\left[\alpha(e+1) - n_{1a}e - n_{2a}\right]$$

Let's define

$$x = n_{1a}e + n_{2a}$$

$$y = n_{1a}e^{\frac{1}{1-\gamma}} + n_{2a}$$

From the expression of total agricultural production we get

$$y = hx^{\frac{1}{1-\gamma}}$$

with

$$h = L\left(\frac{A\kappa}{\bar{a}}\right)^{\frac{1}{1-\gamma}}$$

which we can substitute into the budget constraint to get

$$hx^{\frac{1}{1-\gamma}} + \frac{\gamma}{(1-\gamma)(1-\alpha)}x - \frac{\gamma\alpha(e+1)}{(1-\gamma)(1-\alpha)} = 0$$

$$hx^{\frac{1}{1-\gamma}} = \frac{\gamma\alpha(e+1)}{(1-\gamma)(1-\alpha)} - \frac{\gamma}{(1-\gamma)(1-\alpha)}x$$

from which we can get $x^*(\alpha, \gamma, e, h)$. $x^* = n_{1a}^* e + n_{2a}^*$ can be interpreted as the efficiency-adjusted stock of agricultural workers. Indeed, it can be shown graphically that x^* increases with α (the more concave is the production function of the non-agricultural firm with respect to labor) and with γ (the less concave is the production function of the agricultural farms with respect to labor), provided that $A\kappa < \bar{a}$. Also, x^* decreases with h, which means it decreases with the overall amount of land L and productivity $A\kappa$, and increases with the level of subsistence agriculture $\bar{a}$.

By taking $x - y$ we get

$$n_{1a} = \frac{x - hx^{\frac{1}{1-\gamma}}}{e - e^{\frac{1}{1-\gamma}}}$$

so that once we get x^* we can get n^*_{1a} and n^*_{2a} as a function of the exogenous parameters $\{\alpha, \gamma, e, h\}$. Notice that in order for n^*_{1a} to be weakly positive, it must be that $x^* \in [0, 1]$ and $h \leq 1$. We also want to assume $\alpha \leq 1/2$ as otherwise we could have $x^* > 1$ as $\gamma \to 1$.

Substituting the equation for x^* in the above we get

$$n^*_{1a} = \frac{x^* \left(1 + \frac{\gamma}{(1-\gamma)(1-\alpha)}\right) - \frac{\gamma\alpha(e+1)}{(1-\gamma)(1-\alpha)}}{e - e^{\frac{1}{1-\gamma}}}$$

From the equation for x^* we can show that x^* increases with e, its value can be at most $\alpha(e + 1)$, and therefore the derivative of the numerator of the expression for n^*_{1a} with respect to e can be at most α. On the other hand, the derivative of the denominator is 1 when $e = 0$, decreases monotonically and becomes negative when e approaches 1. Therefore, as e increases, the denominator will grow faster than the numerator and n^*_{1a} will decrease when e is low (τ is high), and the opposite when e is high (τ is low).

Therefore, a U-shaped relationship exists between n^*_{1a} and e (n^*_{1a} and τ). We have $\partial n^*_{1a}/\partial e < 0$ and $\partial n^*_{1a}/\partial \tau > 0$ for low values of e (high values of τ), and $\partial n^*_{1a}/\partial e > 0$ and $\partial n^*_{1a}/\partial \tau < 0$ for high values of e (low values of τ). Moreover, the interval in which $\partial n^*_{1a}/\partial \tau < 0$ is larger the lower is γ.

The U-shaped relationship between n^*_{1a} and e is confirmed within the calibrated model, as depicted by Figure 4 in Section 6.

B.2.2 The case of $\phi > 0$

Consider now the case of $\phi > 0$. The budget constraint is

$$\frac{\phi Y_a}{(1-\phi)(Y_a - \bar{a})} + 1 = \frac{(1-\alpha)}{e + 1 - en_{1a} - n_{2a}} \left[e + 1 + \frac{1-\gamma}{\gamma}\left(n_{1a}\frac{e}{1+\tau} + n_{2a}\right)\right] \tag{13}$$

and the no arbitrage condition is

$$w_m = \frac{(1-\alpha)Y_m}{e + 1 - en_{1a} - n_{2a}} = \frac{p_a \gamma Y_a^2}{n_{2a}} = w_a^2 \tag{14}$$

These two equations form a system of two equations in two unknown n_{1a}, n_{2a}. We can therefore solve the system and get the equilibrium allocation of labor in the two groups.

We know that

$$p_a = \frac{\phi Y_m}{(1-\phi)(Y_a - \bar{a})}$$

$$Y_a^2 = A\kappa (n_{2a})^\gamma L_2^{1-\gamma}$$

$$\frac{L_2}{n_{2a}} = \frac{1-\gamma}{\gamma}\frac{w_a^2}{q}$$

$$\frac{w_a^2}{q} = L\frac{\gamma}{1-\gamma}\left[n_{1a}\frac{e}{1+\tau} + n_{2a}\right]^{-1}$$

so that we can substitute all the above into the RHS of the above equation. The no arbitrage condition reduces to

$$\frac{1-\alpha}{e+1-en_{1a}-n_{2a}} = \frac{\phi\gamma}{(1-\phi)(Y_a-\bar{a})} A\kappa L^{1-\gamma}\frac{1}{\left[n_{1a}\frac{e}{1+\tau}+n_{2a}\right]^{1-\gamma}}$$

We also know that

$$Y_a = A\kappa L^{1-\gamma}\frac{n_{1a}e + n_{2a}}{\left[n_{1a}\frac{e}{1+\tau}+n_{2a}\right]^{1-\gamma}}$$

so that we can multiply and divide the RHS of the no arbitrage condition by $(n_{1a}e+n_{2a})$ and get

$$\frac{\phi Y_a}{(1-\phi)(Y_a-\bar{a})} = \frac{(1-\alpha)(n_{1a}e+n_{2a})}{(e+1-en_{1a}-n_{2a})\gamma}$$

We can therefore substitute this expression into the budget constraint and get

$$\frac{(1-\alpha)(n_{1a}e+n_{2a})}{(e+1-en_{1a}-n_{2a})\gamma}+1 = \frac{(1-\alpha)}{e+1-en_{1a}-n_{2a}}\left[e+1+\frac{1-\gamma}{\gamma}\left(n_{1a}\frac{e}{1+\tau}+n_{2a}\right)\right]$$

from which we derive

$$y = \frac{\alpha\gamma(e+1)}{(1-\alpha)(1-\gamma)} + \frac{1-\alpha-\gamma}{(1-\alpha)(1-\gamma)}x \tag{15}$$

with $x = n_{1a}e + n_{2a}$ and $y = n_{1a}\frac{e}{1+\tau} + n_{2a}$.

Similarly, still from the no arbitrage condition we can explicit

$$\frac{1-\alpha}{e+1-en_{1a}-n_{2a}} = \frac{\phi Y_a}{(1-\phi)(Y_a-\bar{a})}\frac{\gamma}{n_{1a}e+n_{2a}}$$

and plug it into the budget constraint to get

$$\frac{\phi Y_a}{(1-\phi)(Y_a-\bar{a})}+1=\frac{\phi Y_a}{(1-\phi)(Y_a-\bar{a})}\frac{\gamma}{n_{1a}e+n_{2a}}\left[e+1+\frac{1-\gamma}{\gamma}\left(n_{1a}\frac{e}{1+\tau}+n_{2a}\right)\right]$$

and therefore

$$y=-\frac{\gamma(e+1)}{1-\gamma}+\frac{1-\frac{\bar{a}}{Y_a}(1-\phi)}{\phi(1-\gamma)}x \tag{16}$$

The equilibrium value of x and y is given by the intersection of the two curves in equations 15 and 16.

We know that $Y_a = A\kappa L^{1-\gamma}x/y^{1-\gamma}$. Substituting in equation 16 we get

$$y=-\frac{\gamma(e+1)}{1-\gamma}+\frac{x-ky^{1-\gamma}(1-\phi)}{\phi(1-\gamma)}$$

$$\phi(1-\gamma)y=-\phi\gamma(e+1)+x-ky^{1-\gamma}(1-\phi)$$

where $k=\bar{a}/A\kappa L^{1-\gamma}$. Moreover, after rearranging equation 15 we get

$$x=-\frac{\alpha\gamma(e+1)}{1-\alpha-\gamma}+\frac{(1-\alpha)(1-\gamma)}{1-\alpha-\gamma}y$$

which we can substitute in the above to finally get

$$ky^{1-\gamma}(1-\phi)=(1-\gamma)\left[\frac{1-\alpha}{1-\alpha-\gamma}-\phi\right]y-\gamma(e+1)\left[\frac{\alpha}{1-\alpha-\gamma}+\phi\right]$$

from which we can get $y^*(\alpha,\gamma,\phi)$.

By taking $x-y$ we get

$$n_{1a}=\frac{x-y}{e-e^{\frac{1}{1-\gamma}}}$$

and substituting the expression for x in equation 15 we end up with

$$n_{1a}^*=\frac{y^*\left(\frac{(1-\alpha)(1-\gamma)}{1-\alpha-\gamma}-1\right)-\frac{\alpha\gamma(e+1)}{1-\alpha-\gamma}}{e-e^{\frac{1}{1-\gamma}}}$$

$$n_{1a}^*=\frac{\frac{\alpha\gamma}{1-\alpha-\gamma}(y^*-e-1)}{e-e^{\frac{1}{1-\gamma}}}$$

We assume $1-\alpha-\gamma>0$ with $\alpha,\gamma\leq 1/2$.

Although we cannot derive closed-form solutions, results from model simulations indicate that a U-shaped relationship between n_{1a}^* and e (n_{1a}^* and τ) still exists in this more general case with $\phi > 0$.