The persistence or reversal of subnational fortune in South Africa[1]

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Does wealth persist over time despite historical shocks like colonisation? One strand of literature suggests no: Acemoglu et al. argue that colonisation brought bad institutions to most of sub-Saharan Africa that caused a 'reversal of fortune'. Another strand of literature suggests the opposite: despite several centuries of colonialism in Latin America, Valencia and Caicedo argue, 'persistence dominate'. This paper uses the case of South Africa to show that while populations persist, wealth does not. Densely populated regions before colonialism are still densely populated. But institutional differences imposed by the colonial authorities caused a subnational divergence in the fortunes of the indigenous population, reflected in unemployment outcomes today.

KEYWORDS: colonization, labor, institutions, history

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INTRODUCTION

In a now seminal contribution to African economic history, Acemoglu, Johnson and Robinson (2002) argue that among countries colonized by European powers during the past five centuries, those that were rich in 1500 are now relatively poor. They do this by correlating preindustrial population density with modern-day income per capita and finding a negative relationship: higher population density in 1500 results in lower GDP per capita growth today. The result holds even if only African countries are included.

The reason for this negative correlation, they argue, is because of the institutions brought by Europeans. In densely populated regions, fewer Europeans settled and instead of imposing 'good' institutions such as private property rights, the colonial powers imposed 'bad', extractive institutions. The poor institutional environment – in contrast to the innate geography of the region – is the reason these countries are relatively poorer today than those areas where 'good' institutions were set up. The 'reversal in relative incomes', they argue, occurred during the late eighteenth and early nineteenth centuries, and 'resulted from societies with good institutions taking advantage of the opportunity to industrialise'.

Not everyone accepts the validity of this 'reversal of fortune'-hypothesis. Most recently, Maloney and Caicedo (2015) use pre-colonial population density at the subnational level for eighteen countries in the Western hemisphere to show that population density persists until today: those areas that had higher levels of concentration in 1500 remain the most densely populated. Importantly, those areas also have higher levels of income today, refuting the 'reversal of fortune'-hypothesis and arguing instead for wealth persistence.

We test the persistence versus reversal hypothesis by considering the case of South Africa over the last two hundred years. Our paper expands the debate in two ways. First, population

density is often assumed to be correlated with income, at least for the pre-colonial period. We complicate this assumption by arguing that the slave trade and internal warfare may have resulted in suboptimal settlement patterns even before colonial settlement. Second, both papers include descendants of European settlers in their current-day estimates of population density and income. This may introduce causal mechanisms in addition to geography and institutions, such as 'culture' or genetic determinants, for which the authors cannot account. Our focus is only on the descendants of the indigenous, Bantu-speaking inhabitants of South Africa. The persistence or reversal of density and income that we find must therefore be as a result of either geography or institutions.

We use several new data sources to test our hypotheses. Because we lack accurate data on the settlement patterns of Bantu-speaking people following a series of conflicts at the start of the nineteenth century, we use the trek routes of the descendants of European settlers during the 1830s as a proxy for regions less densely inhabited by Bantu-speaking peoples. We show that, including several environmental controls, this is strongly correlated with settlement patterns in 1911, the year of the first full census of the Union of South Africa (and including Basutoland and Swaziland). Finally, we use the 2011 South African census (as well as recent censuses for Lesotho and Swaziland) to reflect recent settlement patterns.

Our results show, firstly, that the settlement of Bantu-speakers is highly persistent: those areas that were densely populated in the 1830s and 1911 remain densely populated today. This seems to support the conclusions of Maloney and Caicedo (2015) and others that locational advantage determine path dependence.

Yet when we consider income, our results reverse. We use both the Census 2011 and the South African Labour Force Survey to show that those areas where population density was

high at the start of the nineteenth and twentieth centuries are today some of the poorest regions in South Africa. This seems to support the 'reversal of fortune'-hypothesis posited by Acemgolu et al (2002). Geography explains the persistence of settlement, we argue, while institutions – notably the property right regime – seem to play a larger role in determining prosperity.

GEOGRAPHY VS INSTITUTIONS

There is little doubt that both geography – the climate, terrain, disease and other environmental conditions – and institutions – the formal and informal 'rules of the game' – determine a region's development trajectory. The pertinent question is which of these two determinants act as a binding constraint towards further development. The answer would allow policy makers to design policies that address these most urgent needs; if geography, then infrastructure investment or anti-malaria campaigns might be more appropriate, but if institutions, then the rule of law or protecting private property rights would matter more.

A vast literature has made a case for both. Poor geography, such as the presence of natural resources, a tropical climate or landlockedness, was shown to have large, negative coefficients on income in early cross-country regressions (Sachs and Warner 1997a; Sachs and Warner 1997b; Sachs and Warner 2001). Africa has few navigable rivers and Africans live far from the coast (Collier and Gunning 1999). Africans also are more likely to live in rugged areas, a consequence, Nunn and Puga (2012) argue, of the slave trade, a trade that itself had been influenced by climate shocks (Fenske and Kala 2015). Poor access to waterways and the rugged terrain inhibit trade, lowering the profitability of surplus production, providing no incentive for economic growth.

A bad disease environment, such as the presence of malaria, also found early empirical support as an explanation for Africans' persistently low relative incomes (Gallup and Sachs 2001). Better identified empirical strategies have confirmed these earlier correlations for several diseases, many of them unique to Africa: river blindness (Kaziango, Masters and McMillan 2014), the tsetse fly (Alsan 2015), and a range of diseases caused by the intensity of UV radiation (Anderson, Dalgaard and Selaya 2015; Fedderke, Klitgaard, MacMurray and Napolioni 2015).

Geography also matters for Acemoglu, et al. (2002); indeed, their instrument is the disease environment. Yet the mechanism through which they believe effects of the past persist into the present is institutional characteristics. A bad disease environment, Acemoglu et al. argues, has little effect on the indigenous populations who have had time to build up immunities. Instead, a bad disease environment severely effects the arriving European settlers. In areas where tropical diseases decimate the European colonisers, extractive formal institutions are imposed that have detrimental consequences for economic development. In areas where Europeans do not suffer the consequences of a bad disease environment – like South Africa – they settle and impose institutions that are growth promoting.

The precise mechanism through which institutions explain Africa's poor economic performance has varied. Acemoglu, et al (2005: 397) somewhat vaguely refers to good institutions as those that promote 'private property', which is a 'cluster of good economic institutions, including the rule of law and the enforcement of property rights'. Elsewhere, they pin the mechanism down more explicitly. The 'process of states formation' was delayed in Africa relative to Eurasia, and 'state institutions appear to have been intensely absolutist and patrimonial'. These precolonial institutions:

> interacted in a perverse way with a series of shocks that hit Africa, in particular the slave trade in the early modern period, and colonialism in the 19th and 20th centuries. Africa countries emerged at independence with a complex path dependent set of institutions that were probably even worse than those which they had at the time of colonization (Acemoglu and Robinson 2010).

Some have tried to empirically verify political institutions as the mechanism through which effects in the African past effect the present (Gennaioli and Ilia Rainer 2007). Michalopoulos and Papaioannou (2013) compare the spatial distribution of ethnicities before colonisation with contemporary information on economic performance at the regional level. Even when controlling for local geographic features and other observable ethnic-specific variables, they find a strong link between pre-colonial ethnic political centralisation and regional development.[4] But centralisation, according to Osafo-Kwaako and Robinson (2013), was not the result of high population density and trade as in Eurasia. In fact, higher population density in Africa was correlated with weaker centralization, and thus poorer development outcomes today, an African reversal of fortune.

Political centralisation, though, is not uncorrelated with other types of institutions. Colonial powers brought different legal systems (La Porta, Lopez-di-Silanes & Shleifer 2008). Missionaries brought education (Gallego and Woodberry 2010; Frankema 2012; Fourie and Swanepoel 2015). Even the introduction of new crops affected land property rights; Fenske (2014) shows how the introduction of Brazilian rubber during the colonial period transformed land property rights and land disputes in the Benin region of Nigeria. Rubber trees raised the

[4] See also Michalopoulos and Papaioannou (2014) for further evidence.

value of land relative to labour, increasing farm sizes and creating both sale and rental markets.

The distinction between geographic and institutional explanations has therefore become blurred. Although Alsan (2015) show that ethnic groups that inhabited tsetse-suitable areas were less likely to use domesticated animals and the plough and thus attained lower population densities, the mechanism through which these past effects persist into the present is, similar to what others suggest, precolonial political centralisation. But in new, unpublished work, Michalopoulos, Papaioannou and Weil (2014) argue that political centralisation may itself be a consequence of geography: they find that the descendants of precolonial pastoralists are today more likely to be poorer than the descendants of agriculturalists. The mechanism through which this effect persists is the inferior treatment of women among those of pastoral ancestry.

Isolating the exact mechanism across a range of countries may not be a fruitful exercise: there are many likely explanations, contingent on the local environmental, political and economic context, for why geography or institutions persist or not. We therefore investigate one country that has somehow escaped the attention of economic historians despite it exhibiting many of the features described in the literature. Did wealth in South Africa persist because of locational advantages as Maloney and Caicedo (2015) found for most Latin American countries, or did fortunes reverse, much like Acemoglu et al (2001) argues for Africa? And can we empirically untangle the complex geographic or institutional mechanisms that underpin such persistence or reversal?

THE GREAT DIVERGENCE WITHIN SOUTH AFRICA

One advantage we have in investigating South Africa is that the descendants of the European settlers have remained, to a large extent, a separate community from the indigenous, Bantu-speaking peoples. Integration between the Bantu-speaking Africans and the descendants of Europeans were minimal during the first two centuries of settlement, and criminilised during the twentieth century. Even after legalisation and democracy, inter-ethnic marriages remain uncommon.

This feature of South African history and society allows us to investigate the persistence or reversal of wealth *within the Bantu-speaking population*. As far as we can tell, none of the earlier studies could do this: in Latin America, European settlers intermixed with indigenous and slave populations. Any measure of wealth today would include the descendants of European immigrants. Similarly, the reversal of fortune-hypothesis that Acemoglu et al. advances includes the descendants of European settlers. The majority of the neo-Europes of Australia, New Zealand, Canada and the United States are today populated by descendants of Europeans; where the indigenous populations have remained a separate community, they are a poorer minority. The decline in relative and absolute number of the indigenous populations over several centuries is due to a combination of diseases like smallpox that decimated populations without immunity, the seizing of land and resources and, often, violence and warfare perpetrated by the European immigrants. We take the view that comparing the initial indigenous populations with the descendants of European immigrants may ascribe a misleading causal mechanism for the persistence or reversal observed. South Africa, where the descendants of Bantu-speaking people survive and constitute the majority of the population, we believe, provides a relatively uncontaminated case study of how wealth persist or reverse over two centuries of settlement within the indigenous population.

Although European immigrants settled South Africa already in the mid-seventeenth century, they did not immediately confront Bantu-speaking peoples. They instead settled at the southwestern tip of the continent, in the Mediterranean, winter-rainfall climiate of the Western Cape that was inhabited by Khoesan, a heterogenous group of pastoralists and hunter-gatherers. Under Dutch East India Company rule, the settlement expanded to cover most of this winter-rainfall region, with settler farmers expanding east until they met, towards the end of the eighteenth century, the agriculturalist, Bantu-speaking isiXhosa at what became the eastern boundary of the Colony (Fourie 2013).

Bantu-speaking peoples had migrated into southern Africa around two millennia ago, reaching the modern-day northern border – the Limpopo river – of South Africa around 300 AD. In a slow but haphazard process of separation into smaller groups and augmentation, often with indigenous hunter-gatherer people, Bantu-speakers spread across modern-day South Africa, except for the semi-arid western half and the Mediterranean southwest. These settlement patterns were in continuous flux, however, especially during the first decades of the nineteenth century. Around 1815, a series of conflicts erupted within and between the Bantu-speaking communities of South Africa. The cause of the conflicts, now known as the Mfecane in Zulu or Difaqane in Sesotho, remain unsolved (Eldredge 1992); historians have variously attributed it to the leadership of Shaka, conflict with the European farmers on the frontier, the slave and gold trade and, in very recent contributions, to the eruption of a volcano on an Indonesian island which caused resource constraints across southern Africa. But the reason why the Mfecane happened is less important here; we are more concerned, instead, about its consequences.

Starting in modern-day Kwazulu-Natal, or Zululand, the Mfecane led to large-scale resettlements of people across southern Africa. One defecting group of Zulu, the AmaNdebele

under Mzilikazi, migrated northwest and west and finally settled in modern-day Zimbabwe (Matabeleland), causing widespread disruption on its way. Those resisting the Zulu, like the Ndwandwe, were forced to flee east into modern-day Mozambique, displacing the Tsonga who in turn fled over the Lubombo Mountains into the northernmost region of South Africa. Others, like the Makololo, moved north, displacing several Tswana-speaking groups (in modern-day South Africa and Botswana), and settling for three decades amongst the Luyi in Barotseland, part of modern-day Zambia and Angola. From here they would later move into modern-day Malawi. And others, dislocated from their former location by repeated Zulu warfare, moved west, settling between the amaXhosa and becoming known as the Mfengu.

Some moved pre-emptively. The Ngwane, hoping to escape Zulu attacks, moved to higher elevations and established the Swazi kingdom in what is now Swaziland. Moshoeshoe I also resorted to rugged mountains of the Drakensberg to create an alliance of Sotho groups against the Zulu, which later became known as Basutoland, and still later, the Kingdom of Lesotho.

As a consequence of the need to secure access to food and other resources and to provide protection against the Zulu, several political entities were born throughout southern Africa, most notably the Swazi and Basuto kingdoms. But protection necessitated not just more centralised states; the refugees consolidated their new kingdoms in *rugged areas* that provided defence against outsiders. This concentration in rugged areas is found elsewhere in Africa too. The Atlantic slave trade, Nunn and Puga (2012) show empirically, pushed Africans into rugged and less accessible regions to reduce the risk of being enslaved.

When the Mfecane fizzled out by the 1830s, the spatial distribution of Bantu-speakers had been irrevocably changed. The most densely populated areas were the high-rainfall, rugged areas of the east coast of South Africa, inhabited by a collection of amaXhosa clans like the

Pondo, the Thembu and the immigrant Mfengu, and further up along the coast, the Zulu of Zululand and the Swazi of Swaziland. The open, flat interior of the country, formerly home to mostly Sotho and Tswana, had been decimated by the conflicts, the survivors moving either north and into modern-day Botswana (like the Tswana) or finding refuge in the Drakensberg mountains (the Sotho).

This emptification of the countryside by the 1830s allowed bands of European settlers to move deeper into the interior of the country, at low risk. There is still little agreement on the reasons these Voortrekkers left the Cape Colony: the ongoing frontier conflicts with the amaXhosa (Africa's Hundred Years War, from 1789 to 1889), the arrival of large numbers of British settlers (roughly 5000 in 1820), a hostile British government (who had taken control of the Cape in 1806), and the emancipation of slaves (in 1834) are just several reasons touted for the migration, beginning in 1838, of several farmer frontier families into the South African interior. Although there is no doubt that these push-factors could have been important, the pull-factor that abundant land could be obtained at relatively low risk must have been appealing too, especially for those land speculators in debt in the Colony. Make no mistake: not everywhere these Voortrekkers arrived they were welcomed. There were several skrimishes, most notably when the Voortrekkers arrived in Zululand. In general, the Voortrekkers avoided those areas densely populated by Bantu-speaking groups and settled instead in those areas left vacant by the Mfecane (Etherington 2004).

The descendants of Europeans – the Voortrekkers, also known as Boers – that settled the interior quickly brought the political and economic institutions they had left behind to the new regions of settlement. The South African Republic, formally recognised by Britain with the Sand River Convention treaty in 1852, recognised the right of farmers across the Vaal River

to government themselves.[5] A second Boer republic – the Orange Free State – gained independence in 1854. The new states provided full rights to all citizens residing in the territory for six months. These rights included the right to own property and vote for legislative authority, the Volksraad or People's Council, every five years. Of course, there was one notable exception: only European immigrants and their descendants could be citizens.

It would be these whites that would benefit most from the discovery, in 1867, of vast quantities of diamonds on the Orange Free State and Cape Colony border. The discovery of diamonds, and of gold twenty years later, would reorientate the economic power of the region from the coast to the interior. Thousands of immigrants arrived from Europe and elsewhere, pulled by the promises of quick fortunes, and many profited. Some inhabitants of the region benefited too, like the Basuto farmers who suddenly had a ready market for their produce. But the construction of the railways to Kimberley and Johannesburg to supply the mines of equipment and the towns around it of foodstuffs and manufactures, abolished the Basuto farmers' advantage, dragging down the Basuto economy. The mines, of course, needed labour, and although many Bantu-speakers would flock to or be sent to the mines by their chiefs, their living conditions and bargaining power soon declined, making mining less attractive. The colonial governments responded by instituting head and other taxes to forcibly increase the supply of labour. Mines also imposed temporary accommodation for these migrating black mine workers, adapting a system of migrant labour, which in itself was a consequence, some would argue, of the Mfecane.

The political and economic institutions that favoured growth a la Acemoglu et al. were thus embedded in the new Boer republics to the benefit of the white community. Attempts were

[5] A Boer republic had earlier been created in Natal, but was annexed by Britain in 1843.

made to extend such institutions to the Bantu-speaking groups, such as the Glen Grey Act of 1894 which extended individual land holdings to areas in the Cape Colony then under communal ownership, but these policies were mostly sinister attempts at racial segregation, hoping to increase the supply of labour on the mines or boost fiscal revenue. It seldom had the benefit of boosting participating in the market economy. Although 'coloured' (descendants of slave, Khoesan, black and European liaisons) and Bantu-speaking (black) property owners could vote in the Cape Colony, the unification of the two British colonies (Cape and Natal) with the two former Boer republics into the Union of South Africa in 1910 slowly abolished these rights. The two British protectorates, Basutoland and Swaziland remained separate political entities, becoming independent countries in 1966 and 1968 respectively.

Over the course of the twentieth century, coloured and black inhabitants lost increasingly more political and economic rights in 'white South Africa'. The Bantu Land Act of 1913 was the first policy of the Union to formally regulate the acquisition of land by blacks. It created black 'reserves' in those areas where black settlement was most dense, an area less than 10% of the Union, and introduced certain restrictions on blacks owning land outside the reserves. The purpose was ostensibly to reduce the status of black sharecroppers to tenant farmers, increasing black tenant labourers on white farms, and to limit the possibility that blacks could repurchase white-owned land. The law was amended in 1936, increasing the proportion of reserve land to 13%.

After the National Party victory of 1948, apartheid policies were introduced that not only segregated whites from other races within towns and cities, but, through the Grand Apartheid policies of 'separate development' of the 1950s and 1960s, created homelands – or Bantustans – for the different black ethnic groups present in South Africa. These homelands often matched the borders of the reserves established earlier, but now with the intent of establishing

self-governing, semi-independent states. The ultimate aim was to make blacks living within the borders of South Africa nationals of the homelands instead of the newly formed Republic of South Africa, a policy which was eventually pushed through by the Black Homelands Citizenship Act of 1970. Four of the homelands – Transkei (Xhosa), Bophuthatswana (Tswana), Venda, and Ciskei (Xhosa) – were declared independent states, while three others, KwaZulu (Zulu), Lebowa (North Sotho) and Qwaqwa (South Sotho) received partial independence, although independence was never recognised outside South Africa. Separate development also affected the spatial distribution of people: to adhere to the ethnic restrictions placed on settlement, large numbers of blacks were relocated, almost all from white South Africa to the homelands – up to 3.5 million according to one estimate.

The policy of segregation and, later, separate development was an attempt by the apartheid government to push back against the large-scale urbanisation of blacks that had followed the high economic growth rates of South Africa from the mid-1930s until the early 1970s. Although apartheid policies prevented blacks from benefiting directly from the political and economic institutions, the rapid growth in the urban areas created economic opportunities on a scale much bigger than those on offer in the overcrowded reserves or homelands. Attempts at industrial policy were largely ineffective at relocating industry to the peripheries of the homeland borders.

It would only be in the early 1990s that the apartheid government and its economic institutions of ownership would be replaced by democracy and the ability of all South Africans to acquire and own property without restrictions. While this was indeed true in the former 'white South Africa', the economic institutions of the former homelands remained largely the same.[6]

[6] Some commentators have recently suggested that the power of traditional chiefs have even increased as support for the African National Congress has wavered in urban areas.

The persistence of these institutional differences between the formerly 'white' and 'black' regions of South Africa is, we argue here, one important reason for what we believe happened in South Africa: a persistence of settlement but a reversal of fortune amongst black South Africans over nearly two centuries. After the Mfecane, Bantu-speaking groups had settled in high-rainfall but rugged areas, opening the interior to opportunistic property speculators and pastoral farmers to occupy. These white migrants brought new institutions that would, especially after the discovery of minerals, result in rapid increases in living standards for whites. Attempts to prevent black migrants from sharing these benefits were two-fold: 1) deny blacks access to the political and economic institutions, most notably voting and property rights, that would allow whites to benefit from the mineral revolution and industrialisation that was to follow, and 2) isolate those areas where blacks were densely settled under communal ownership from the advances in transport and other infrastructure that would have allowed blacks access to the market economy.

And yet, despite these overt attempts at segregation, blacks in 'white South Africa' profited from higher wages and job opportunities in comparison to those living under communal land tenure in the rural areas. Because of a lack of quantitative sources, it is not yet clear when this divergence in living standards between blacks in 'white South Africa' and those in the homelands occur. But a reasonable supposition is to look towards the large strike actions of the newly legal black trade unions of the 1970s. Black migration into the cities, despite their inability to own property, also intensified during this period.

This case study of South Africa thus complicates the stylised narrative of either persistence (put forward by Maloney and Caicedo 2015) or reversal (put forward by Acemoglu et al. 2002). Instead, we believe a distinction should be made between the persistence or reversal of

population density and wealth. Acemoglu et al. (2002) ignore this distinction; Maloney and Caicedo (2015) find a consistently positive relationship between population density and wealth. By considering only the indigenous population and the political and economic institutions that govern them, we believe, persistence of settlement and fortune may be inversely correlated. The effects of colonisation on settlement and wealth may be contradictory.

DATA

To measure the persistence of population density across two centuries, we make use of two new datasets. Firstly, we infer 19th century (post-Mfecane) settlement patterns by way of settler migration routes. We digitise these from historical maps which provide authoritative indications of the movements of the settler population. Because no early-nineteenth century maps exist to accurately plot population density of Bantu-speaking peoples in what is today South Africa, we use the migration routes that the Voortrekkers took as a proxy for land that was less densely settled. The bands of Voortrekker migrants moved somewhat arbitrarily into the interior, attempting to circumvent densely-populated areas to avoid conflict, with no obvious end destination in mind. They could do this because of the devastation caused by the Mfecane which left large tracts of land in the interior only sporadically inhabited by Bantu-speaking people at the time of their migration. Our evidence below is consistent with this assumption, as white settlers did not migrate to the best agricultural land, which was (in later years for which figures are available) also densely populated by Bantu-speaking groups.

Figure 2 provides (inter alia) a map of the routes that these migrants followed. These are the routes, we argue here, which best describes where Bantu-speaking groups were least densely settled after the Mfecane. The inverse distance from these routes serves as our proxy for population density in the 1830s.

Because these trekker routes started on the eastern border of the then Cape Colony, our analysis excludes most of the western parts of what would become the unified South Africa, as historical sources suggest that almost no Bantu-speaking people ever inhabited this sparsely-populated and semi-arid region.

Secondly we use the population estimates for the 1911 census districts. This census was the first census to cover the full territory that encompasses modern-day South Africa.[7] Again we exclude the semi-arid western half of South Africa. Finally, we obtain population estimates and unemployment rates for similar regions from the 2011 South African census.

We are interested in the correlations between population density at the start of the nineteenth century, at the start of the twentieth century and the start of the twenty-first century. Does population density persist over two centuries of remarkable societal change in South Africa? Our empirical analysis attempts to distinguish between geographic and institutional explanations for the observed patterns. To this end, we collate multiple data sources, matching them with the geographic units of analysis of the 1911 census.

Firstly, we obtain district-level geographic and environmental indicators. We incorporate long-run rainfall data made publically available by climatologists (Maatsura & Willmot, 2012). These data are gridded at 0.5 x 0.5 degree points for all terrestrial areas across the globe. Their long-run rainfall estimates provide spatial variation in usual precipitation patterns, indicating the potential of the land to be fruitful. We aggregate these grids onto 1911 census demarcations to incorporate into our empirical models. Similarly, we draw in crop suitability indices to understand whether populations moved to regions that provided food

[7] Future versions of this research will include estimates from the 1911 Lesotho and Swaziland censuses, as these regions were also potential places where moving populations could settle.

security in the long run. In particular, we follow Galor and Özak (2014), who develop a 0.5 x 0.5 degree caloric suitability index, which adjusts lands' potential crop yields to reflect the nutritional value that could be produced in gridded regions.

Following Nunn & Puga (2012), we study district-level indicators of terrain ruggedness. This particular feature does not consider the benefits of location for *food* security, but for *physical* security in the context of early political conflicts. This indicator therefore represents the interaction of geography with institutional upheaval.

More direct institutional shocks are also spatially defined. In particular, we study the legacy of the 1913 Land Act. These areas were designated by the new Union government as reserves for blacks. Within the confines of these areas, blacks could own property subject to the communal law systems of traditional chiefs. More importantly, these regions laid the foundation for the apartheid-era Bantustans, whose long-run welfare and social effects persist to this day (Abel, 2015; Pienaar & von Fintel, 2014). The homelands or Bantustans, created in 1959, were designed to facilitate the 'separate development' of South Africa's different ethnicities. We trace the borders of these homelands and then consider the proportion of the area of each of the 1911 districts that eventually became an apartheid homeland. This serves as an indicator of 20th century institutional shocks that affected the black population in different locations.

This paper uses standard econometric techniques to illustrate three propositions. Firstly, we show that early 19th century black settlement patterns were driven in part by the nutritional potential of the land. Secondly, we illustrate that this pattern persists even after the migrations related to the Mfecane, the Great Trek, the frontier wars and the internal conflicts that led to the formation of a Union. Finally, we show that these settlement patterns persist into the 21st

century, partially facilitated by geographic fundamentals; however, due to insitutional shocks, this persistence cannot be equated with a static geographic distribution of welfare. Instead, regions that provided high potential for food security in the pre-industrial area became high unemployment regions in modern times. Even after two decades of unrestricted movement in democratic South Africa, the persistence of settlement but reversal of fortune remains a feature of the South African landscape.

EVIDENCE OF PERSISTENCE AND REVERSAL

Population persistence

Krugell (2014) illustrates the persistence of population distributions in South Africa between 1911 and 2011. Figures 1 and 2 show this connection, with the isiXhosa population remaining concentrated between the Fish and the Kei rivers, and the iziZulu population located largely around Shaka's early-nineteenth century centroid of power in the south-east of the country. Additionally, Figure 2 indicates that Voortrekker migration routes tended to avoid regions that would be densely populated by indigenous inhabitants in later years. This serves as an indication that these patterns were already in place as early as the 19th century, so that populations have persisted over many centuries. These highly populated regions also correspond to the homelands borders that were imposed in the middle of the 20th century.

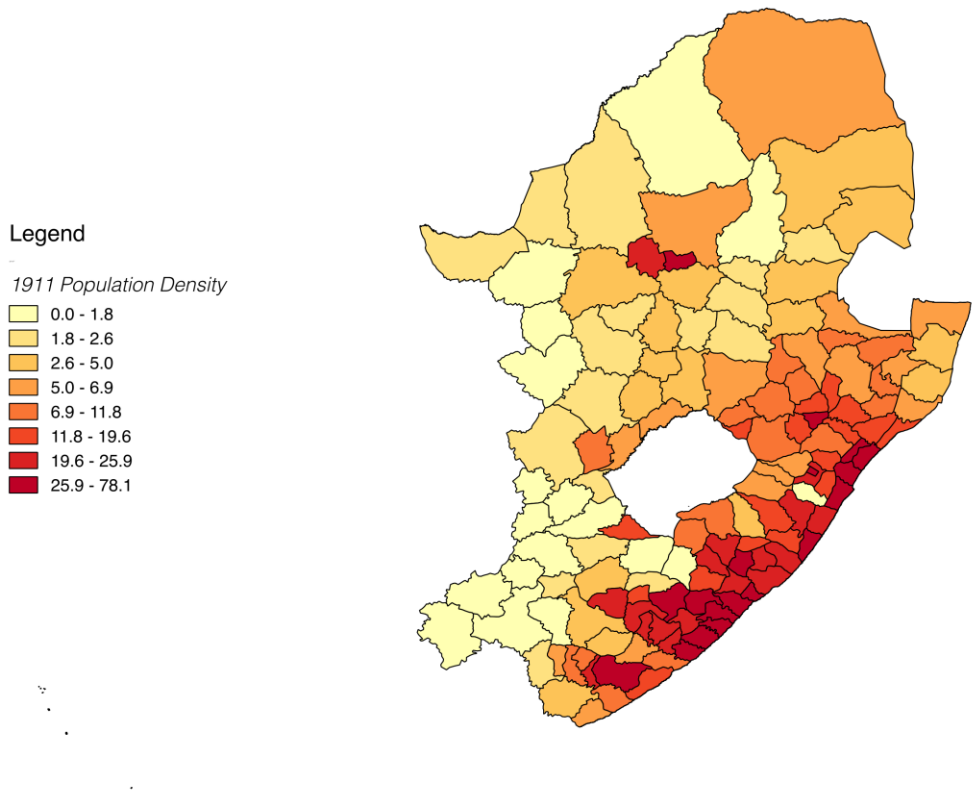

Figure 1 Population Density per square kilometre. Source: 1911 Census, mapped on 1911 district boundaries.

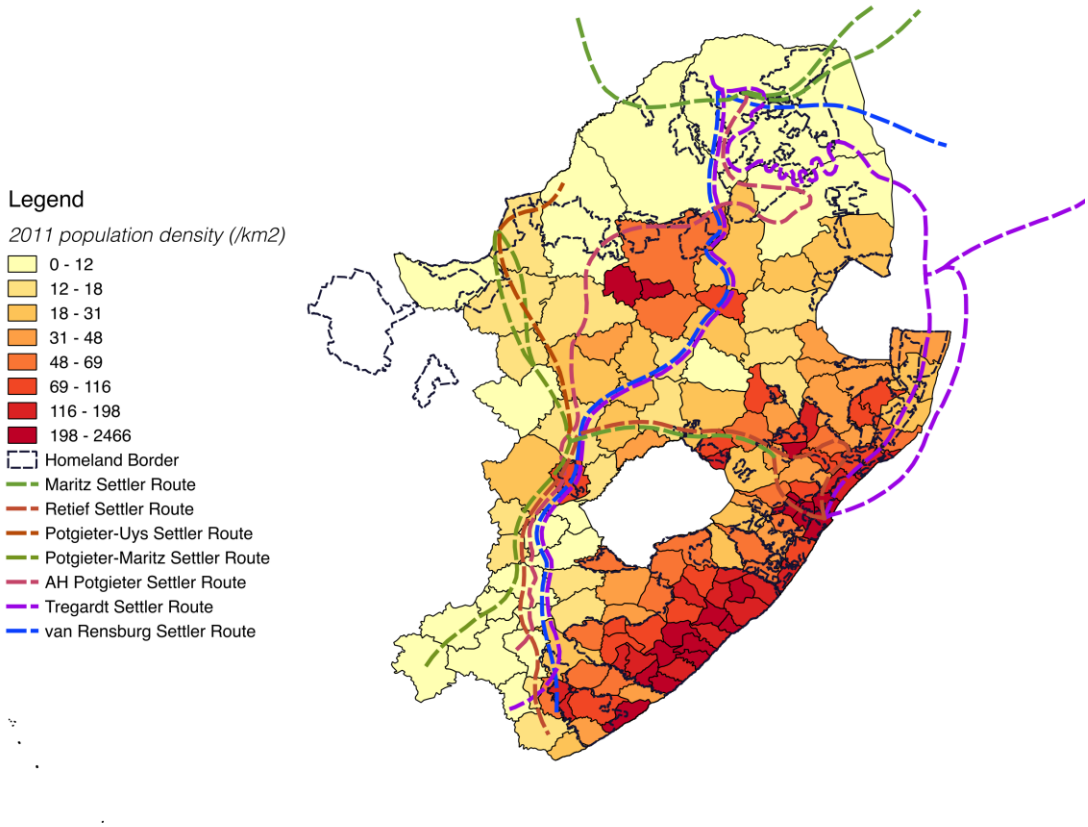

Figure 2 Population Density per square kilometre. Source: 2011 Census, mapped on 1911 district boundaries.

Were these initial patterns rationally chosen, and did they persist only because of the imposition of the apartheid homelands? Figure 3 shows that the regions which were densely inhabited by the black population in 1911 were also highly suitable for ensuring potential food security (as gauged by caloric suitability of the land). Interestingly, most of the Voortrekker settler routes did not navigate to regions with the same potential, except for the isolated parties that ventured into the Zulu kingdom after concluding a treaty with Dingane in 1838. Indigenous populations therefore claimed the best land with the most suitable agricultural potential, while settlers followed afterwards and occupied the next best territories, avoiding existing settlements. These patterns are also reflected in long-run rainfall patterns that are depicted in Figure A1 in the appendix.

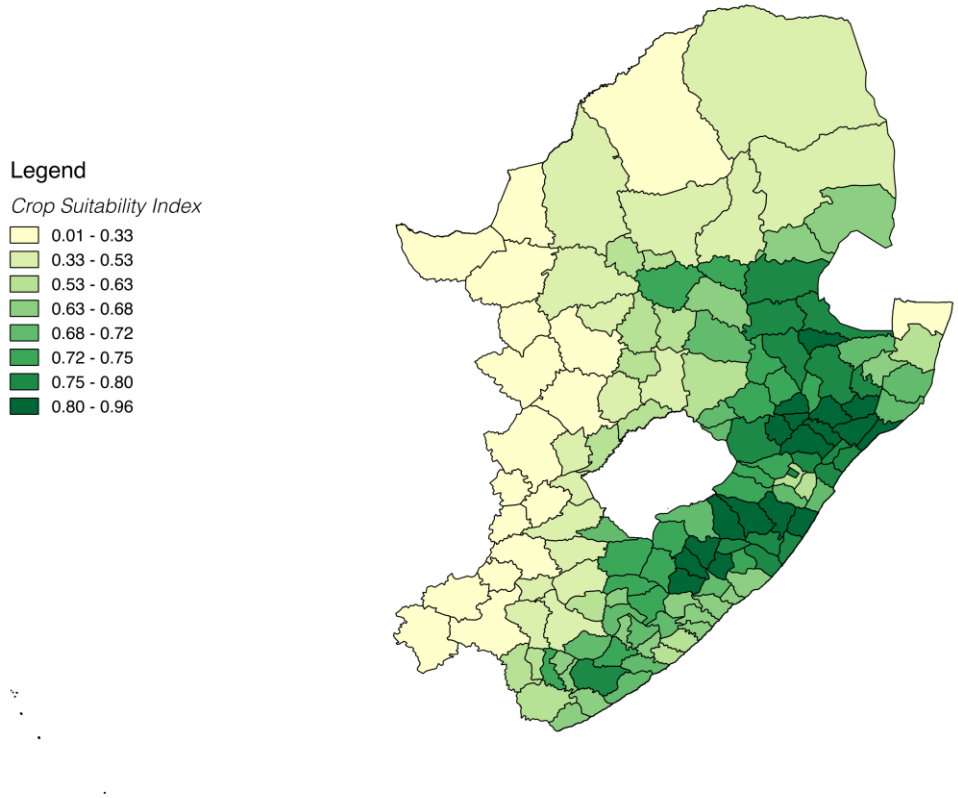

Figure 3 Caloric suitability index. Source: Galor & Özak (2014), mapped on 1911 district boundaries.

Table 1 Correlation matrix

	log(1/distance from settler route)	log(1911 black population density)	log(2011 black population density)	log(2011 black unemployment rate)	log(terrain ruggedness)	Long-run rain levels	Caloric suitability index
log(1/distance from settler route)	1						
log(1911 black population density)	0.1484	1					
log(2011 black population density)	0.2372	0.8297	1				
log(2011 black unemployment rate)	0.030	0.5184	0.3715	1			
log(terrain ruggedness)	-0.0052	0.5033	0.3848	0.4969	1		
Long-run rain levels	0.407	0.6557	0.6579	0.4028	0.4773	1	
Caloric suitability index	0.2476	0.6435	0.5569	0.4325	0.6947	0.7424	1

Pre-industrial food security was, however, not the only determinant of black settlement patterns. Conflict did not only motivate the choice of white settler routes, but also the proximate migration patterns of black populations. Figure 4 shows that populations settled – partially – in places that were the most rugged in the region. These regions are also known to be adjacent to the locus of the Mfecane in the 19th century, and provided security from the ensuing instability.

Table 1 confirms the interrelationship between these factors. While our proxy for early 19th century black population density (the inverse distance from white settler routes) is positively correlated with rainfall and caloric suitability patterns, a weak negative correlation with terrain ruggedness arises. Populations tended to settle in agriculturally suitable regions without being characterised by the obstacles of "bad geography" at the time that the Mfecane was winding down. Links to regions with high food potential persisted into later years, except that by 1911 black populations were located in more rugged regions, seeking security in the post-Mfecane period. On balance, however, population distributions remain strongly correlated over a period of more than 150 years.

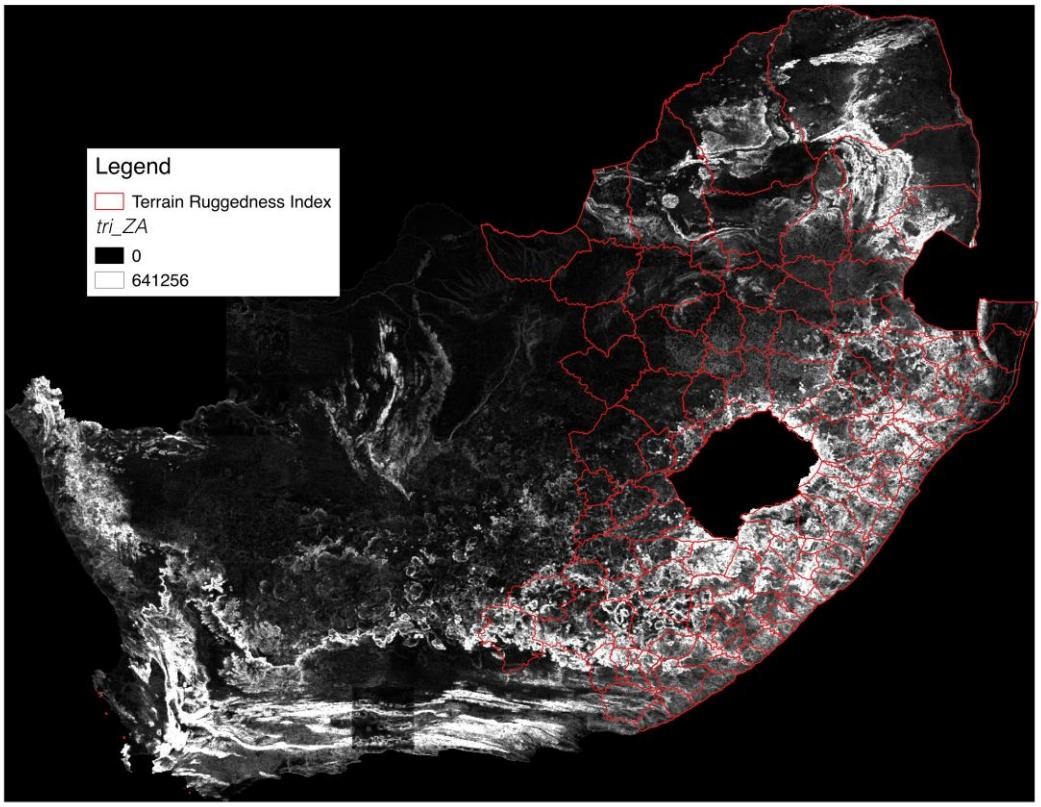

Figure 4 Terrain ruggedness index. Source: Nunn & Puga (2012) mapped on 1911 district boundaries

Table 2 presents OLS regressions to illustrate these propositions. Our proxy for 19th century black population patterns is positively correlated with rainfall (for the sake of food security) and negatively with terrain ruggedness (after the Mfecane but before the large-scale movements of people during the period of white colonisation of the interior) in column 1; the high collinearity between rainfall and caloric suitability renders the coefficient on the latter insignificant, though it is positive. About 20% of the variation in early settlement patterns are described by the combination of geographic fundamentals. Column 2 shows that early settlement is still reflected partially by this pattern, with the initial population distribution marginally correlated with 1911 population density. However, columns 3 and 4 show that some minor shifts did occur: while rainfall still determines locational choice positively, caloric suitability now plays an independent role. By 1911 populations have relocated to *more*

rugged regions in search of physical security or as a result of losing their land to white occupation. While this indicator is collinear with caloric suitability, it is nevertheless clear that movements in Bantu-speaking groups did occur between the 19th and 20th centuries, moving to regions with high food security potential *and* topographical security. Yet, the overall distribution remained fairly static (as in column 2) so that food security still dominated locational choice above physical security. Column 5 shows that all of the geographic and environmental factors can explain the weak persistence of populations' location – the coefficient on our proxy for 19th century population distribution becomes statistically meaningless. Hence, groups stayed where they could maintain food security, despite some moving to more rugged regions.

Table 2 Population Persistence: 19th to early 20th century

	1	2	3	4	5
	log(1/Dist to settler route)	log(1911 Pop Dens (/sqkm))	log(1911 Pop Dens (/sqkm))	log(1911 Pop Dens (/sqkm))	log(1911 Pop Dens (/sqkm))
log(1/Dist to settler route)		0.243*			-0.163
		(0.139)			(0.114)
log(1911 Pop Dens (/sqkm))					
Homeland					
Caloric Suitability	0.370			1.325**	1.386**
	(0.463)			(0.611)	(0.61)
log(TRI)	-0.337***		0.444***	0.25	0.195
	(0.117)		(0.128)	(0.154)	(0.158)
LR Rainfall (mm)	0.002***		0.004***	0.003***	0.004***
	(0.001)		(0.001)	(0.001)	(0.001)
Constant	-2.195	3.045***	-6.463***	-4.184**	-4.541**
	(1.338)	(0.649)	(1.441)	(1.768)	(1.779)
R-squared	0.221	0.022	0.477	0.495	0.502
N	138	138	138	138	138
F	12.66	3.062	61.516	43.702	33.549

* p<0.1, ** p<0.05, *** p<0.01

OLS regressions. Own calculations form various integrated data sources.

Table 3 presents similar estimates, but disentangles historical influences on 2011 population distributions. Column 1 shows the remarkable persistence of early 19th century population distributions into the early 21st century. However, columns 2 and 3 indicate that geographic fundamentals play a large role in this persistence: populations are still located in regions of high long-run rainfall. Further, the explanatory power raises substantially with the inclusion of geographic factors, while the persistence parameter makes no statistical contribution. Some changes in these patterns do, however, arise. Caloric suitability remains positively correlated with modern settlement patterns (though without significant effects), while terrain ruggedness now has a positive and insignificant association with 2011 population density. Together these observations suggest that rainfall remains key to settlement, while the need for physical protection from natural barriers has declined with the dissipation of tribal and colonial conflicts. Column 4 highlights another important change: homeland status is strongly positively correlated with the current spatial population distribution, despite the historical controls. Hence, some of the patterns seen in the 21st century must be attributed to intervening experiences.

Columns 5 to 7 test whether geographic fundamentals can similarly explain persistence between 1911 and 2011. The persistence elasticity remains robustly close to one and is statistically significant in all specifications. It is moderated somewhat by the inclusion of geographic controls, however. At least partially then, historical settlement patterns have deep roots in the long-run capacity of the land to sustain regional food production. These fundamentals are also highly correlated with the borders of the apartheid homelands, which were established in densely populated regions. In column 7 homelands have no independent role to play in explaining 21st century population density, despite their large role in keeping populations of different race groups separate. Rather, the homelands system's influence on modern settlement patterns can be traced back to times *before* their imposition. Geography

direcly explains some of the long-run population persistence, while institutions has no additional explanatory power. Other unobserved factors must therefore explain the persistence. This could include cultural norms, the migrant labour system that separated families into units that stayed in the homelands and urban workers, and the land tenure system.

Table 3 Population Persistence: 19th to 21st century

Log(2011 population density)	1	2	3	4	5	6	7	8
log(1/Dist to settler route)	0.452***		-0.040	0.008				0.101
	(0.159)		(0.139)	(0.133)				(0.101)
log(1911 Pop Dens (/sqkm))					0.963***	0.854***	0.856***	0.864***
					(0.056)	(0.075)	(0.086)	(0.086)
Homeland				1.074***			-0.015	-0.007
				(0.267)			(0.229)	(0.229)
Caloric Suitability		0.787	0.802	1.312*		-0.344	-0.355	-0.399
		(0.744)	(0.748)	(0.72)		(0.542)	(0.569)	(0.57)
log(TRI)		0.077	0.063	-0.153		-0.137	-0.134	-0.104
		(0.188)	(0.194)	(0.192)		(0.136)	(0.142)	(0.145)
LR Rainfall (mm)		0.005***	0.005***	0.004***		0.002***	0.002***	0.002***
		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Constant	5.974***	-0.949	-1.037	2.246	2.040***	2.622*	2.588	2.867*
	(0.74)	(2.152)	(2.181)	(2.222)	(0.124)	(1.572)	(1.656)	(1.680)
R-squared	0.056	0.444	0.444	0.505	0.688	0.717	0.717	0.72
N	138	138	138	138	138	138	138	138
F	8.111	35.662	26.584	26.94	300.398	84.418	67.03	56.024

* p<0.1, ** p<0.05, *** p<0.01

OLS regressions. Own calculations form various integrated data sources.

Table 4 Reversals of fortunes: 19th to 21st century

log(2011 unemployment rate)	1	2	3	4	5	6	7	8
log(1/Dist to settler route)	0.008		-0.019	-0.007				-0.005
	(0.023)		(0.022)	(0.019)				(0.019)
log(1911 Pop Dens (/sqkm))					0.084***	0.058***	0.011	0.010
					(0.012)	(0.016)	(0.016)	(0.016)
Homeland				0.274***			0.261***	0.261***
				(0.038)			(0.043)	(0.043)
Caloric Suitability		-0.002	0.005	0.135		-0.079	0.112	0.114
		(0.118)	(0.119)	(0.103)		(0.115)	(0.107)	(0.108)
log(TRI)		0.116***	0.109***	0.054**		0.101***	0.056**	0.055**
		(0.03)	(0.031)	(0.027)		(0.029)	(0.027)	(0.027)
LR Rainfall (mm)		0.000*	0.000**	0.000		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Constant	-0.657***	-2.316***	-2.357***	-1.521***	-0.856***	-2.074***	-1.499***	-1.514***
	(0.107)	(0.342)	(0.346)	(0.317)	(0.027)	(0.335)	(0.312)	(0.318)
R-squared	0.001	0.282	0.286	0.487	0.269	0.346	0.488	0.489
N	138	138	138	138	138	138	138	138
F	0.122	17.577	13.338	25.071	49.969	17.595	25.197	20.865

* p<0.1, ** p<0.05, *** p<0.01

OLS regressions. Own calculations form various integrated data sources.

Reversals of fortunes

Given the persistence of populations, one might expect a historical persistence of local welfare, in much the same way that other authors purport. We however dispute this linkage by showing that black welfare (proxied by 2011 unemployment rates) reversed in the 20th century, corresponding to the imposition of apartheid legislation. We assume that densely populated areas before the imposition of the 1913 Land Act were wealthy regions, and show that these are areas of high unemployment today. The conflation of historical population densities with initial wealth is an assumption made by both Acemoglu et al. (2002) and Mahoney and Caicedo (2015). Our evidence does support this assumption in the pre-Union era: densely populated areas were also regions that were highly suitable to sustain food security and provide physical protection for populations. This assumption is likely to be valid in earlier periods when households relied on the land, but less so when they are more integrated into an industrialised labour market in later periods. Some of these early densely-populated regions have been postulated to emerge as communities with vibrant subsistence agricultural sectors by the end of the nineteenth century (Bundy, 1979). However, population density may be a poor proxy for wealth in modern economies, so that past attempts to uncover reversals of fortune may be tenuous at most.

Figure 5 shows the spatial distribution of the 2011 broad unemployment rate[8] by 1911 district demarcations. The geographic spread of modern day unemployment corresponds remarkably closely with population density in the early 19th *and* 20th centuries, indicating that former wealthy regions have become enclaves of poverty. Importantly, these regions overlap strongly

[8] Discouraged workers, who would accept a job if offered to them, but have ceased active job search in the month prior to the census, are considered to be "broadly" unemployed. This definition of unemployment, in contrast to the stricter version prescribed by the International Labour Organisation, has been shown to be more appropriate in the South African context, where unemployment is particularly high (Kingdon & Knight, 2006).

with the former apartheid homelands, so that an institutional explanation may be responsible for this reversal.

Table 4 investigates this possibility econometrically. Columns 1 to 4 show that the link between very early population distributions and moden unemployment is tenuous at most. Other factors – such as terrain ruggedness – are correlated with 2011 local unemployment rates, while early population patterns are not. Terrain ruggedness is, however, largely driven by the fact that former apartheid homelands were located in some of the roughest topographical regions of the country. Column 4 also shows the strong correspondence between apartheid homeland regions and unemployment today.

Any association between dense populations and unemployment seen in Figures 1 and 2 must, therefore, be the result of intervening changes in the 20th century and is not the result of long-run geographic phenomenon. Columns 5 to 8 show exactly this. The link between 2011 unemployment and 1911 population density is positive and strongly significant in column 5, clearly indicating a reversal of fortunes between the 20th and 21st centuries. The relationship is only slightly moderated by the inclusion of geographic indicators in column 6, confirming that long-run fundamentals do not serve as a dominant channel through which the reversal could operate. However, controlling for homeland status in columns 7 and 8 renders the correlation statistically insignificant and economically negligible. Unlike the case above, where population persistence could not be accounted for by the formation of apartheid homelands, institutions can explain why local fortunes reversed. This result is strengthened by the fact that no links exist over the very long-run, when the foundations of apartheid policy were not yet laid in the 19th century.

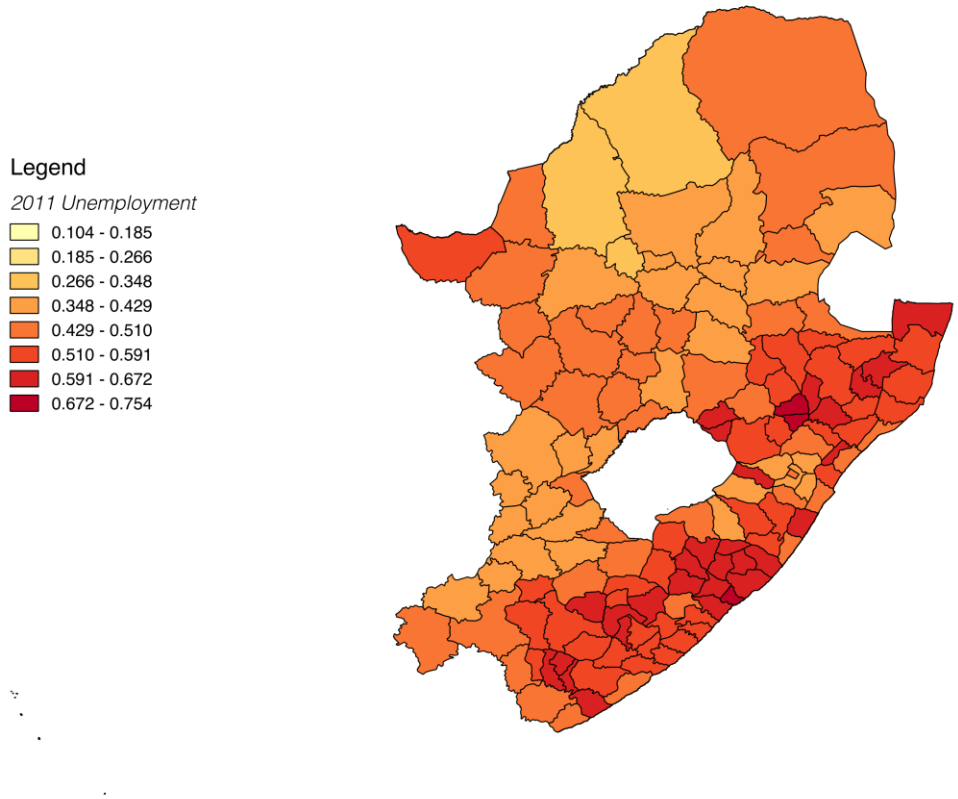

Figure 5 Broad Unemployment Rate. Source: Census 2011, mapped on 1911 district boundaries

Segregation and apartheid institutions, rather than geography, therefore explain most of the reversal of fortune we find, supporting the findings of Acemoglu et al. (2002). The challenge, of course, is to identify which institutions were responsible for this reversal. This is no easy task. Segregation and apartheid policies both affected blacks living in what became 'white South Africa' and those living in the traditional areas which became the homelands. Several repressive and discriminatory policies against blacks were imposed in 'white South Africa': already by 1911, on the eve of the enactment of the 1913 Land Act, the seeds of racial discrimination had already been sown, with a battery of legislation already in place to regulate the labour market, and with the largest effects targeted at black inhabitants in densely populated regions (including the 1911 Mines and Works Act which enforced the colour bar and job reservation, as well as the 1908 hut taxes that intended to force rural inhabitants into

the mainstream labour market). The 1913 Land Act, while limiting land ownership to blacks in white areas, also secured the system of traditional rule in the native areas. The extensions to the Land Act and the more extensive homelands policies established the system of traditional land rights and chiefly power (Delius 2008). While blacks enjoyed greater 'freedom' in the homelands, their economic freedom was limited by the quality of the institutions imposed in these regions.

As the South Africa economy expanded during the mid-twentieth century, growing at roughly 4% per annum between 1935 and 1970, black wages in 'white South Africa', despite the many discriminatory apartheid policies, began to increase (Mariotti 2012). By the 1970s and 80s, with rising political tension and a domestic and international economic crisis, the repressive labour laws were relaxed or abolished, causing rapid increases in black wages but also an increase in unemployment as mechanisation, especially on the farm and in manufacturing, set in. Black migration to the cities increased rapidly, forcing the apartheid government to review and ultimately withdraw the system of separate development. When South Africa held its first democratic elections in 1994, black South Africans could live and own property anywhere within the borders of the former 'white South Africa'.

The same was not true in the former homelands. Here the system of traditional rule was maintained, with land occupancy the prerogative of the chief. These regions were also the most deprived regions of South Africa at the coming of democracy; today, two decades later, they remain the most poor. As Noble et al. shows, the 'deprivation gap between former homelands and the rest of South Africa has not declined in the period 2001 to 2011'. While more than a third of black South Africans still live in the former homelands – a remarkable persistence over more than two centuries – these South Africans today, in contrast to their

ancestors two centuries ago, are the poorest and most destitute. Geography explains why they inhabited those regions two centuries ago; institutions why their fortunes have reversed.

CONCLUSION

Does wealth persist over time despite historical shocks like colonisation? One strand of literature suggests no: Acemoglu et al. argue that colonisation brought bad institutions to most of sub-Saharan Africa that caused a 'reversal of fortune'. Another strand of literature suggests the opposite: despite several centuries of colonialism in Latin America, Valencia and Caicedo argue, 'persistence dominate'.

In this paper we empirically investigate this persistence versus reversal hypothesis in the context of South Africa. Our results suggest that while populations persist, wealth does not. Densely populated regions before colonialism remain densely populated. But institutional differences between the former 'white areas' and homelands reversed the fortunes of the indigenous population, reflected in unemployment outcomes today.

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ADDENDUM

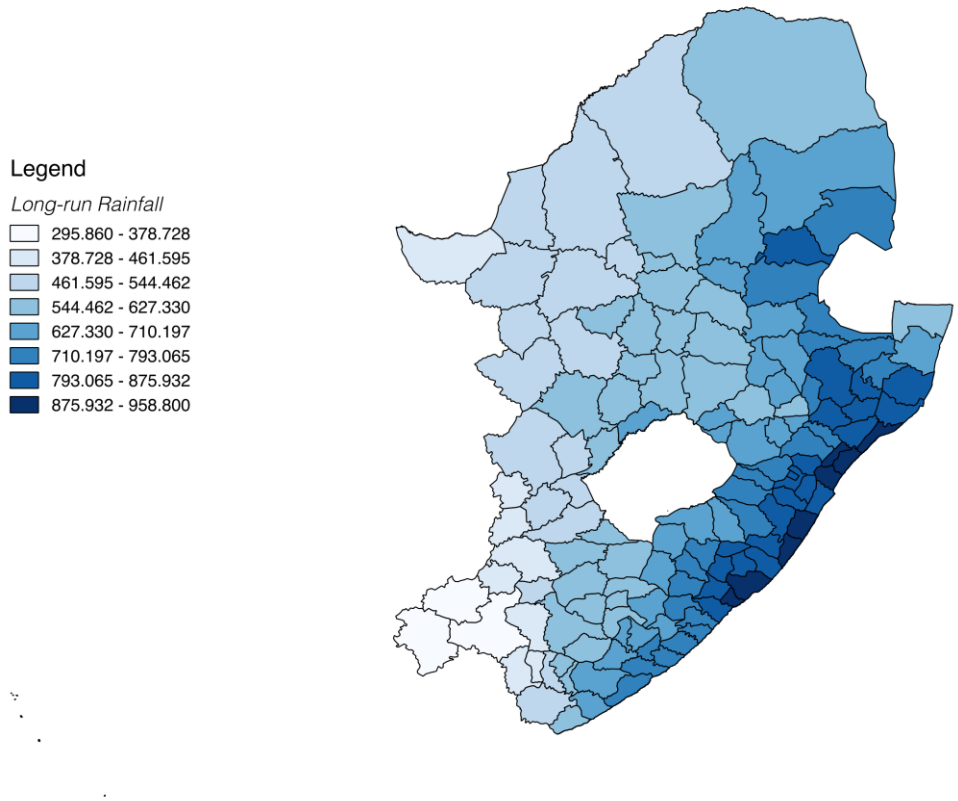

Figure A1 Long-run rainfall patterns. Source: Matsuura & Willmot (2012), mapped on 1911 district boundaries.