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(Not so) Affirmative Action: Evidence From Malawi

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(Not so) Affirmative Action: Evidence From Malawi

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(Not so) Affirmative Action: Evidence From Malawi

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Abstract

¹I investigate the impact of the higher education quota that the Malawian government instituted in 1987. The quota allocated a number of university seats to each district which was proportional to the district's population size. I find that the quota did not have statistically significant impacts on secondary school completion or university entry, but that it did have large and negative impacts on the relative university completion rates of historically over-represented districts and districts in the Northern region. I also find evidence to suggest that the quota may have negatively impacted the long-run decisions of northern individuals to migrate to other regions. The direction and magnitude of these effects contradicts the existing literature on affirmative action in education, and may evidence the claim that the quota was intended to harm the north in favor of the south and center. I argue that affirmative action may have unexpected consequences, and that existing educational policy and limited enforcement capacity due to information constraints have serious implications on the effectiveness of affirmative action in improving societal welfare.



PARIS SCHOOL OF ECONOMICS
ECOLE D'ÉCONOMIE DE PARIS

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1 Introduction

To varying degrees, one of the objectives of education policy in most developed and developing countries is to generate a more equitable distribution of educational resources and outcomes. Persistent inequalities arising from historical wrongs and discrimination in particular provide acute concern regarding fairness and equity, and often require policies which directly target the reduction of these imbalances. It is in these settings that education policy often adopts measures of affirmative action. Affirmative action, AA henceforth, in education policy refers to policies which favor minorities or disadvantaged groups in order to address their unequal education participation and attainment. In terms of higher education, these policies often take shape in the way of providing preferential admission status to the disadvantaged groups for entry into higher education institutions which they would otherwise be unable to attend. AA policies have been implemented in numerous nations (the US, India and Brazil being the most prominent examples) and are often justified as being compensation for historical wrongs (e.g. slavery, segregation and racial discrimination).

That being said, the effects of AA on both minority and nonminority student outcomes are still hotly debated. The outcomes often explored are pre-university effort, minority representation within prestigious universities and minority university graduation outcomes. Regarding pre-university effort, sophisticated structural models and quasi-experimental evidence seem to suggest that AA should motivate minority students to exert relatively more effort just before university due to reduced competition for and greater probability of attaining university seats. With regards to university entry, AA reforms have been shown to increase representation of minority racial groups and castes in Brazil, the US and India within universities. However, there is still little to no consensus on the effect of AA on arguably the most important outcome of all; university graduation. At the center of this controversy lies the mismatch hypothesis, which states that AA can actually harm minority students by allowing them to pursue a quality of university education which their previous education left them ill-prepared for. The evidence for the mismatch hypothesis is still rather inconclusive.

Nevertheless, the existing literature is still yet to address certain aspects of AA which are of interest to both researchers and policymakers alike. Firstly, the bulk of the empirical literature is based on university education in the US. While there has been a recent increase in the number of AA studies carried out in developing countries (Brazil and India being notable examples), the ironic under-representation of developing countries, particularly those from Sub-Saharan Africa, leaves room to question the generalisability of these theories and results to other contexts. Secondly, the effects of AA on "nonminority" students, namely students who are over-represented before AA is established, are relatively unexplored. This is predominantly due to educational nonminorities also being population nonminorities in most cases, such that identifying treatment effects in such a large population is often untenable. Finally, the role of existing educational policy and the extenuating political circumstances is, to my knowledge, not considered by any prominent paper in this field. Given that education policy does not occur in a vacuum, I feel that the existence of such confounding factors creates the opportunity for AA to have impacts which vastly differ from the predictions of standard theory.

In 1987, the Malawian government enforced a quota on higher education entry. The quota changed the process of university entry from one based on merit to one based on reserved seating, whereby university seats were allocated to each district on the basis of the district's share in the country's population. This necessitated that competition for university seats occur at the district level rather than the national level. Given that a large share of the seats were previously occupied by the smallest districts from the smallest region, the North, the quota essentially shifted university seats from the North to the central and southern regions. The aforementioned context provides a unique opportunity for me to contribute to the existing literature in the

following ways.

Firstly, it allows me to investigate the impact of an AA reform in the context of a developing country which had no salient history of inherent discrimination. This is particularly useful as not all settings in which AA may be a desirable policy have social injustice as a pretext. Secondly, it allows me to isolate the impact of AA on a nonminority group, as in this context, the educational nonminority is the population minority. Furthermore, there were aspects of the political setting at the time which served to frustrate and amplify certain aspects of quota. In particular, the government mandated repatriation of Northern teachers back to the north in 1989 likely improved the relative pre-university preparation of northern students, simultaneously undercutting the encouragement effects of the quota while exacerbating the extent of mismatch for non-northern students. Such interactions between AA and existing educational policies may allow for easier identification of the mismatch effect and, more generally, highlight the role of the existing social and political context in determining the effectiveness of AA.

I use data from the 1987 and 2008 censii to separately explore the impact of the quota. In particular, I divide the 2008 sample into age cohorts, and compare those who were likely to have been in education when the quota was enforced to those who were either too young or too old to be exposed to it. I compare the effects of belonging to a relatively over-represented districts and the northern region regional, conditional to being in an exposed cohort and not, on secondary school completion, university entry and university completion. Given that the reform AA was applied at the district level, district over-representation serves a measure of assessing the traditional impacts of AA. Regional comparisons, however, are intended to capture potential impacts which exist over and above the conventional impacts, and may arise due to region-specific differences that are driven by the political context.

My empirical findings either fail or severely contradict the existing literature. In particular, I find no impacts of the quota on secondary school completion or university entry. However, I find the quota had large and negative impacts on over-represented districts and the northern region. I find that the university completion gap grew in favor of under-represented districts by 2.9 percentage points for each unit increase in over-representation, and that the regional gap in graduation rates over and above this grew by 20 percentage points in favor of the south. This directly contradicts the findings of higher pre-university effort and worsened university graduation prospects among minority students due to encouragement and the mismatch effect, respectively.

However, there are numerous shortcomings in my analysis due to data limitation. I do not observe pre-university effort at the intensive margin and I do not have contemporaneous data on education decisions, which may be masking some of the behavioural effects of the quota. Furthermore, I do not observe university applicants, and thus under-estimate the true population of university entrants. Nevertheless, I believe my results give me sufficient room to argue that the limited impact of the quota on secondary school completion and university entry are potentially due to the repatriation and the inability of the university to enforce the quota due to limited capacity. Furthermore, given that the regional gap is much larger than the gap due to over-representation, I believe that this suggests the existence of regional-specific impacts of the quota which go beyond the effects purported by standard theory. While the data does not give license to make any claims about what is driving these region-specific differences, the evidence does lend credence to historical sources which assert that the quota was devised to harm the north in favour of the non-northern regions in order to further consolidate the dictatorship of Malawi's then dictator President Hastings Kamuzu Banda.

On the whole, this paper shows that the impact of AA may not necessarily conform with the existing literature in every context. In particular, if the existing set of educational policies is contradictory to the desired impact of AA and if the government does not have the capacity

to enforce AA due to information constraints, then the impacts of AA on pre-university effort and university entry may be muted. Furthermore, AA may have large and negative impacts on nonminority students if the context in which it is applied already possesses aspects of discrimination against nonminorities in favor of minorities. That is, discrimination which goes beyond positive discrimination intended to reverse an imbalance generated by a universally accepted societal wrong. However, greater work must be done to understand what the mechanisms of these aforementioned "negative impacts" are. I propose a few ways in which future research can build on this paper in order to better understand some of these underlying mechanisms.

2 Literature Review

In order to develop an understanding of the relationship between pre-university effort and AA built on micro-foundations, [Bodoh-Creed & Hickman \(2017\)](#) devised a seminal structural model in which students, conditional on their ability, developed varying levels of human capital in order to signal their ability to imperfectly informed universities. While this model was highly restrictive and had no exogenous variation to identify the key parameters, it did provide a framework for understanding how AA incentivised minority students to develop more human capital before university. By restricting the pool of competitors to other relatively less able minority students, AA exogenously increased the probability of university entry conditional on a student's ability, which in turn motivated them to develop more human capital. [Cotton *et al.* \(2018\)](#) builds on this by providing experimental evidence of AA inducing beneficiary students to exert relatively more effort to prepare for an in-experiment exam. A novelty of this paper is that it measured student time-use by observing the number of hours students used a computer software to prepare for the exam. However, due to the experimental design, generalisability is somewhat limited. [Akhtari & Bau \(2016\)](#) provided quasi-experimental evidence of AA inducing higher pre-university effort by showing that the reintroduction of AA in Texas improved the SAT scores of minorities relative to non-minorities.

It has also been a general finding that AA has increased the representation of minority students at university level, as well as students from low socio-economic status (SES) backgrounds. [Hinrichs \(2014\)](#) found that AA bans in the US did not reduce the representation of minority students in university at large, but it did reduce representation within selective universities and colleges. This suggests that AA created the opportunity for minority students to benefit from attending high quality institutions, and that the annulment of AA removed this benefit. [Bertrand *et al.* \(2010\)](#) found that caste-based AA increased the representation of students from low ranking castes in university engineering degrees. Furthermore, the average SES of the student body also reduced as the displacing low-caste students also tended to come from relatively poorer families than the displaced high-caste students. These results were also mirrored by [Francis & Tannuri-Pianto \(2012\)](#) in Brazil. Thus, on the whole AA tends to increase the representation of both minorities and the economically underprivileged in university when minorities are also over-represented among the poor.

However, [Sander \(2004\)](#) argued that AA can actually negatively impact minorities as offering them places in degrees and institutions which they are ill-prepared for essentially set-up to fail. [Arcidiacono *et al.* \(2016\)](#) applied and estimated a model of student net-returns to provide evidence for this. They outline two competing forces which determine student returns from attending a particular university course. College quality, consisting of institution-specific characteristics which improve the returns of all students, and mismatch, consisting of student-specific characteristics which define how "well suited" a student is to a particular institution. They postulate that the relatively high incompleteness rates among minority students in selective programs is due to the losses of mismatch exceeding the gains of quality, such that the utility of minority students would actually be higher if AA were abolished and minority students attended less selective programs.

They find that the returns of minorities in STEM degrees within selective universities are lower than their returns in less selective universities, such that reallocating minorities to less selective programs would make them better off. While other studies find no evidence of mismatch (Bagde *et al.*, 2016; Hinrichs, 2014; Antonovics & Backes, 2013), the empirical evidence of this is not conclusive as it is unknown whether null results are due to college quality and mismatch effects offsetting one another, or universities responding to AA bans by targeting more resources at minority students.

Nevertheless, the literature on AA in higher education has two salient shortcomings. Firstly, the majority of the empirical studies are carried out in the US, leaving developing nations generally under-represented in the literature. While this has been somewhat mitigated by recent studies based in India (Bagde *et al.*, 2016; Bertrand *et al.*, 2010) and Brazil (Francis & Tannuri-Pianto, 2012), the scarcity of data from developing nations in this literature is notable. Consequentially, the generalisability of the present findings to other contexts may be rightly called into question. The importance of this issue is underscored by the fact that AA policies are applied in many developing nations, and generate a hotbed of controversy therein (e.g. South Africa). Secondly, very little attention is paid to post-education outcomes, such as those related to the labour market. Bertrand *et al.* (2010) is the only article of note which has attempted to link AA to labour market outcomes, and made the telling contribution that the labour market gains of AA for minority students are smaller than the losses of nonminority students. The lack of discussion on these outcomes is primarily due to data limitations; in practise, it very difficult to find individual data on education outcomes which can be linked to labour market data. That being said, the omission of post-education outcomes from the analysis creates a significant gap, as the obvious and crucial links between AA, education decisions and labour market outcomes are left relatively unexplored.

This paper, to my knowledge, is the first to empirically investigate the impact of the Malawian higher education quota. The limited number of studies which have investigated the quota are largely confined to qualitative and historical sources, many of which interpret it as another example of Banda's anti-north pro-center sentiments. Carver (1990) views the quota before a backdrop of various education policies which seemed to be designed to undermine the north while benefiting the central region, Banda's region of origin, and the southern region, which housed a non-negligible fraction of Banda's political base. Vail (1989) goes a step further and argues that Banda's entire presidency was one based on clientelism and cultural homogenisation, such that the culture of his own tribe became synonymous with the culture of the entire country. With regards to how Banda's ethnocentric policies were accompanied by the systematic oppression of the northern region in particular, Mkandawire (2010) argues that the structural violence against the North in many of Banda's policies had cultural violence at its core. In particular, he used the cultural differences which existed between the regions allowed him to legitimise the mistreatment of the northern region, and his normalisation of this mindset spread to the general population. While it is very difficult to quantify cultural violence, the finding that leaders of institutionally weak countries tend to siphon economic rents to citizens from the same ethnic group is common in the political economy literature (Kramon & Posner, 2016; Franck & Rainer, 2012).

3 The Malawian Context

3.1 Background on Educational Inequalities

Malawi is a landlocked country located in the South-East of Sub-Saharan Africa. It was a former British colony before achieving independence in 1964. Leadership was then assumed by President Hastings Kamuzu Banda, who ruled as an autocrat until 1994. He left the presidency after he was defeated by Bakili Muluzi in what was Malawi's first democratic election. Malawi consists

of 3 regions; the Northern, Southern and Central. One of the first issues which the post-colonial Malawian government had to address was that of salient and persistent regional asymmetries in the educational attainment and employment outcomes. In spite of only possessing 12-13% of the country's population, the Northern region boasted a literacy rate which doubled the national average in 1945 (Heyneman, 1972) and, in the civil service in 1969, out of the 113 highest-level Malawian civil servants, the Northern Region held over 50 per cent of the places (Vail, 1989). This imbalance was also reflected in the enrollment rates of Malawi's sole higher education institution, the University of Malawi, more than two decades after its inauguration in 1964. By 1987, multiple sources claimed that the share of Northerners among entrants was as high as 50% (Posner, 1995; Carver, 1990). These disparities can be shown in Table (1), which evidences the North surpasses the other regions in terms of regional population shares of highest qualification and average years of schooling in 1987.

A potential source of these inequalities has been ascribed to the persistence of educational policies undertaken in the colonial era. During this era, education was predominantly supplied by church missions which established bases in various parts of the colony, and took it upon themselves to educate the surrounding population as part of a wider effort to Christianize them (Heyneman, 1972). While virtually all missions were of British origin, they possessed a degree of autonomy with regards to how they would fulfill this mandate, and the divergent philosophies of these missions, sources claim, had a tremendous impact on the trajectories of educational attainment. In particular, the mission which mainly operated in the Northern region was particularly progressive, and adapted curricula which emphasized highly skilled and academic tasks intended to prepare students for participation in leadership roles within the mission and society at large (Heyneman, 1972). On the contrary, the dominant missions in the Central and Southern Region were not equally ambitious. The typical Malawian student within their remit was rarely equipped with more than basic literacy and the ability to perform vocational tasks, with the Dutch Reformed Church Mission in the central region not even teaching English (Lamba, 1984).

Of course, the reality on the ground was far more nuanced than the Northern region dominating the upper echelon of academia and the civil service with a Livingstonia-educated bourgeoisie, and being the sole region to provide key figures in the decolonisation push or post-colonial elite. The southern region also possessed a notable educated middle class which served in the civil service (Carver, 1990), and would serve as the backdrop for the infamous 1915 anti-colonial uprising led by John Chilembwe (also of southern origin). Furthermore, other factors likely influenced the trajectory of regional education and occupation outcomes, conditional on which missions which established there². Nevertheless, the narrative which the government at the time had, and most sources on the subject have, espoused e.g. (Vail, 1989; Mkandawire, 2010; Galafa, 2019) is that of colonial legacy being necessarily deterministic.

3.2 The Structure of the Quota

In order to deal with the imbalances in higher education enrollment and employment outcomes, the government of Malawi issued a directive mandating the The University Council of Malawi to select its students from the applicant pool on the basis of affirmative action rather than merit with effect from the academic year beginning in 1987 (Mhango, 1993). This took form in the shape of the infamous Quota System, whereby: (i) each district was guaranteed 10 places; and (ii) the remaining places were shared amongst all the districts in proportion to their population sizes. The quota lasted until 1993, when it was illegalised by the Malawian high court soon after a referendum to end the one party state. Crucially, the illegalisation was on the grounds that the

²For instance, Vail (1989) that the ethnic diversity in the northern region served as an incentive for educational pursuit, while cultural homogeneity and social norms in the centre generally frustrated it.

quota was "discriminatory and of no solid foundation" (Mhango, 1993). The anticipated winners and losers of this are both implicit and explicit. Explicitly, this reform reallocated seats from students originating from districts which were systematically over-represented in the University student-body relative to their population share, to those from districts which were relatively under-represented. Implicitly, the reform reallocated seats from students originating from the country's Northern districts, to those from the Central and Southern districts.

3.3 The Structure of Higher Education

At the time, Malawi only had one university: the University of Malawi. Given the rarity of higher education in and of itself, seeking higher education abroad was an economic impossibility. Therefore, virtually all of Malawi's graduates attended the University of Malawi. Higher education in Malawi typically lasted for 4 years, and university entrants would be determined on the sole basis of their performance on the exams taken at the end of the final year of secondary school. From the perspective of the university, seats were allocated based on secondary school exam performance and the requirements of the quota. The quota was applied centrally, such that the aggregate student body was mandated to be in line with quota requirements (i.e. representative of district-level population shares) while student shares within certain faculties needn't comply with this. For instance, in a scenario of perfect compliance, we would expect the share of students from Northern districts in the total university population to be 12%, while the share of Northern students in the Accounting course could be much higher than this.

3.4 The Political Context

In order to better attribute the potential sources of the behavioural responses driving the empirical results to come, it is important to understand the political climate in which this quota was applied. In contrast to other prominent contexts in which AA has been adopted, the pre-text for AA in Malawi was not one of compensating a sub-group for decades of discrimination which resulted in their educational outcomes lagging behind the remainder of the population. Furthermore, the political climate in which AA was applied at the time was not typified by neutrality and fairness, but blatant ethno-regional favouritism and divide. From the outset of his 30 year rule, President Banda secured and consolidated his place as Malawi's autocrat by heightening ethno-regional fractures. He then used those fractures to attract support from his own ethnic group (the Chewa in the central region) and other interest groups, while simultaneously undermining his rivals, detractors and ordinary citizens, particularly those in the North.

When Banda was challenged by leading cabinet ministers from the Northern and Southern regions, the political fallout which ensued was regional in nature even though the initial disagreement was ideological. The ministers were summarily expelled, Chiefs from the Northern and Southern regions were dismissed, and numerous regional councils in the Northern and Southern regions were dissolved. The Central region (Banda's region of origin) was unscathed and none of the dismissed cabinet ministers were Chewa (Banda's tribe). Banda then used patronage to cement political support for his regime by issuing land reforms in 1965 which gave him the power to grant leases for estates throughout the country. This enabled him to use land to secure loyalty among the middle-class. Furthermore, he dispensed vast economic and strategic privileges upon the central region. Notably, the government moved the national capital from the southern to the central region, quadrupled the central region's share in development expenditure from 11% to 40% between 1967 and 1972, and concentrated the majority of agricultural loans and economic gain to farmers in the central region (Vail, 1989).

Central favoritism went hand in hand with strategic discrimination against the Southern and Northern regions, with a particular emphasis being placed on education in order to undo the northern domination of the educated elite and the civil service. A highly symbolic instance of

this was the illegalisation of the northern Tumbuka language from the press and radio, and the adoption of Chewa as the official language in 1968. This had the two pronged agenda of synonymising Malawian culture with Chewa culture and frustrating northern education prospects, as it necessitated that Chewa be taken as a subject in school which, if failed, would force the failing student to resit all exams. The Malawi Examinations Board replaced the Cambridge Overseas Examination, and made grade requirements for entry into secondary school higher for northern and southern students relative to central students. Finally, between 1973-1976 the administration within the University of Malawi and the civil service were purged of non-Chewa, southern and northern individuals in favor of Chewa candidates, in order to secure a steady stream of loyal Chewa bureaucrats. These are just a handful of numerous examples which evidence Banda's intentions to not only advantage the central region, but also disadvantage the southern and northern regions (Vail, 1989; Carver, 1990).

3.5 The Repatriation of Northern Teachers

A policy reform which arose independently to the quota, but one which likely had serious interactions with it, was the repatriation of northern teachers in 1989. Following a series of speeches in which Banda accused northerners of carrying out policies to stunt development in the south and center, and allegations that northern teachers were sabotaging the academic performance of non-northern students, Banda issued an instruction that all teachers should return to teach in their regions of birth. While this was not instituted into law, compliance to this demand was sufficiently widespread for it to be felt and have telling ramifications. Carver (1990), which was written at the time, indicated that it was "implemented to a large degree, with many northern teachers having to return to lower paid jobs - or unemployment - in their own region". While there is no quantitative analysis of the impact of this reform, Mkandawire (2010) provides the anecdote of Mitundu Secondary School in Lilongwe, a school in the central region which was reduced to just two teachers after the repatriation.

4 Anticipated Effects

4.1 University Entry

Given the findings in the literature, the nature of the quota and the setting in Malawi, it is possible to anticipate some of the potential discernible impacts of the quota, particularly regarding pre-university effort, university entry and university completion. The first and most obvious impact pertains to university entry. If the quota was perfectly enforced, we would anticipate that the share of university students originating from districts which were historically over-represented relative to their population shares before the quota would decline after the quota, such that their university shares correspond to their population shares. We would also anticipate the analogous result for historically under-represented districts, but in the opposite direction. Implicitly, the same analysis would roughly hold at the regional level. Given the over-representation of the northern districts relative to central and southern districts, we would expect the relative university share of the northern districts to also decline. This would, of course, only apply if the districts can produce enough eligible students to fill their allocated number of seats, such that the constraint binds. Conditional on this, the aforementioned effects would arise mechanically if the quota were stringently enforced.

4.2 Pre-University Effort

In order to better understand the implications of the quota on pre-university effort, let us consider a simplified thought experiment motivated by the theoretical model adapted by Cotton *et al.* (2018).

4.2.1 A Simple Example

Let us assume that student ability θ_i follows a continuous distribution and is bounded, such that there exists a spectrum of individual abilities in the entire student population. Let us further assume that there are two districts of equal population size: the northern district, N , and the southern district, S . Let the total number of students in the North and South be equal to N^N and N^S , respectively, and $N^N = N^S$. Let the ability distribution of students in the South, $F(\theta_i)^S$, be likelihood ratio dominated by the ability distribution in the North, $F(\theta_i)^N$. The most important implication of this is that the value of θ_i at each quantile of the ability distribution is higher for the North, such that the cumulative distribution function (CDF) of ability for the South is to the left of that of the North for every value of θ_i .

For simplicity, let us assume that university provides a positive and identical payoff, P , for all students (e.g. due to securing a financially rewarding job after graduation) and that universities select students on the sole basis of the observed human capital, h_i , which students produce (e.g. test scores). Furthermore, let us assume that there are fewer university seats, N^C , than there are students in each district, such that $N^C < N^N = N^S$ only some students qualify for university. Let us further assume that the production of human capital is costly in terms of utility, its production technology depends positively and entirely on ability, and that this technology is identical for all students. It follows that the utility of student i corresponds to: $U_i = A \times P - h_i(\theta_i)$, where $A = 1$ if the student qualifies for university and $A = 0$ otherwise. Let's assume that students are rational and maximise utility and that there is some level of human capital $\overline{h_i(\theta_i)}$ for each agent for which $U_i = P - \overline{h_i(\theta_i)} < 0$ such that there is no incentive to go to university. It follows that the human capital exerted by each student exists in the interval $h_i \in [0, \overline{h_i(\theta_i)}]$. It also follows that $\overline{h_i(\theta_i)}$ for low ability students is relatively low, while that of high ability students is relatively high. Finally, let us assume that students know the entire distribution of ability, such that they know their own ability and that of every other student in the population.

4.2.2 Without a Quota

Let us now consider a scenario in which university considers students on the basis of free entry, such that a student competes with the entire population of students. It follows that, conditional on each realisation of θ_i being unique, there is some optimal level of human capital $\overline{h_i(\theta_i)}_{min}$ which results in all university seats being perfectly filled with no shortage or excess. It also follows that $\overline{h_i(\theta_i)}_{min}$ corresponds to the maximal human capital of the marginal student who just failed to qualify. This occurs because there is perfect knowledge of student ability, and the next subsequent student to this marginally failing student would have no incentive to produce a level of human capital more than this, as this is the minimum amount needed to qualify and the production of human capital is costly. By the same logic, all other qualifying students generate human capital equal to $\overline{h_i(\theta_i)}_{min}$, and all non-qualifying students produce no human capital, as there is no incentive to behave differently as far as utility is concerned.

As far as the distribution of students in university is concerned, by virtue of the dominance of $F(\theta_i)^N$ over $F(\theta_i)^S$, it follows that the share of students from the South will be less than its population share, 50%, while that of the North will exceed its population share. This is because there will be a higher share of students in the North for whom $h_i(\theta_i) > \overline{h_i(\theta_i)}_{min}$. Hence, a no quota situation results in the North being over-represented in university and the south being under-represented.

4.2.3 With a Quota

Now let us consider what may happen when a quota is introduced. The university still selects students on the sole basis of human capital production, but now allocates an equal number

of seats for students from the North and South. Thereafter, the university selects the best performers from each district to fill the allocated seats. In order to see how student behaviour changes according to student ability, we simply carry out the previous analysis but at the district level.

Let the prohibitive levels of human capital for the marginally failing students in the South and North be equal to $\overline{h_i(\theta_i)}_{min}^S$ and $\overline{h_i(\theta_i)}_{min}^N$, respectively. Given the dominance of the dominance of $F(\theta_i)^N$ over $F(\theta_i)^S$, it follows that $\overline{h_i(\theta_i)}_{min}^S < \overline{h_i(\theta_i)}_{min} < \overline{h_i(\theta_i)}_{min}^N$. This means that students in the South who had no incentive to produce human capital before the quota due to their value of θ_i being too low now produce human capital after the quota. This is the discouragement effect at work; the quota reduces the relative competition which Southern students face such that the level of human capital required to qualify is no longer prohibitive for low ability students. However, not all Southern students increase their human capital production. There are some students who still produce no human capital as $\overline{h_i(\theta_i)}_{min}^S$ is still prohibitive. Furthermore, there are some students, those who qualified for university without the quota, who actually reduce their human capital production as the human capital required for university entry is less demanding than before.

The converse is true for the northern district. The relative competition increases, and this forces students for whom $\overline{h_i(\theta_i)}_{min} < \overline{h_i(\theta_i)} < \overline{h_i(\theta_i)}_{min}^N$ to reduce their human capital production to 0, while the remaining subset of qualifying students increase their human capital levels above the pre-quota level. Consequently, the district shares of students in university equals their population shares, while the pre-university effort levels increase for some and decrease for others in both districts.

On aggregate, human capital (or effort) can either increase or decrease depending on the pre and post-quota effort levels, and the share of seats allocated to each district post-quota. In particular, pre and post-quota human capital are equal if

$$\overline{h_i(\theta_i)}_{min} = q^N \times \overline{h_i(\theta_i)}_{min}^N + (1 - q^N) \times \overline{h_i(\theta_i)}_{min}^S$$

Where q^N is the share of seats allocated to the North under a quota.

The aforementioned model is very simple and makes numerous assumptions. For instance, it assumes that schooling (or "human capital" in the model) has no inherent productive purpose beyond serving as a signal for universities. This would be in line with the Spence Model (Michael, 1973) of human capital, in which the only purpose which education serves to students is as a signal for universities to be able to discern their unobserved types. It, however, completely neglects the Beckerian perspective on the perceived role of education as a means of developing human capital (Becker, 1973). However, it still roughly captures the competitive elements of the pre-university effort decisions which students face before and after the quota.

By virtue of the quota restricting a given student's competition pool to individuals from their own district of origin, the ability distribution of the student's competitors effectively shifts, conditional on the student's ability. For students from relatively under-represented districts, the quality of competition likely reduced, as the historical under-representation of their districts suggests that the level of ability of students within these districts was relatively low compared to the overall population. Lowering the ability of the student's competition would increase the probability of the student entering university, conditional on the student's own ability. This, in turn, may have increased pre-university effort for some students who, in absence of the quota, may have not qualified for university without the quota but now can because of the quota. The empirical literature suggests that this may be true in terms of the intensive margin (i.e. test scores), while there has been no notable research done on extensive margin effects (i.e. secondary

school completion). The converse of this would be true for over-represented (northern) districts: due to greater competition, the discouragement effect would reduce pre-university effort and attainment at the bottom of the ability distribution, while increasing it at the top.

Regarding aggregate effects, the literature suggests that the discouragement effects for the losers of AA (and indeed some winners in under-represented districts) in this respect are minimal, at least relative to the encouragement effects for the winners, such that a net-gain is possible. Even if there is a reduction in aggregate effort, there may still be gains in terms of allocative/pareto efficiency if students from under-represented districts value education more than students from over-represented districts (however, I feel this to be highly debatable in this context).

4.3 University Completion

With regards the impact of the quota on university completion, the debate in the literature gravitates around the mismatch hypothesis. Mismatch refers to a situation in which AA essentially sets up minority students to fail by allocating them seats in prestigious programs and institutions even though these students lack the required preparation to succeed. This can be illustrated by hearkening back to the exercise developed in previous discussion.

Suppose we are considering the students enrolled in the university when there is no quota applied. Every student enrolled has a level ability such that the cost of developing human capital in the entry phase was not prohibitive, in particular $\overline{h_i(\theta_i)} > \overline{h_i(\theta_i)_{min}}$ for each student. Let us call the distribution of ability observed among Southern entrants Θ_F^S , where F represents free entry. When the quota is applied, the entry requirements for Southern entrants become less stringent, such that the distribution of abilities now also consists of students that were not sufficiently able to enter before the quota. In particular, those for whom $\overline{h_i(\theta_i)_{min}^S} < \overline{h_i(\theta_i)} < \overline{h_i(\theta_i)_{min}}$. It follows that the lower bound for the ability distribution of Southern entrants under AA, Θ_{AA}^S , is lower than that observed before Θ_F^S , such that Southern university students are now, on average, less able.

Suppose there were some minimum level ability required to graduate from university, $\overline{\theta}_{min}$ which remains the same before and after the quota. Let us assume that the lower bound of abilities for the Southern students before the quota was below this value and that the upper bound was above this value, such that there was some failure already present but not all students failed. It would necessarily be the case the failure rate among Southern students would increase. If we make the analogous assumption for the Northern students, then the Northern failure rates would necessarily decrease.

With application to the Malawian context, it would be reasonable to expect that the quota increased the university failure rate in the under-represented (southern/central) districts, while potentially reducing the failure rate among over-represented (northern) districts.

4.4 Importance of the Malawian Context

While the aforementioned predictions stem from credible theoretical and empirical literature, it would also be reasonable to assume that some particularities of the Malawian context at the time would amplify certain aspects of these predictions more than others, leading to final results which may be more extreme than or somewhat contradictory to those which prevail in the existing literature.

4.4.1 The Repatriation: Mismatch and Discouragement

Corroborating the repatriation with the assertions of the mismatch hypothesis, it is possible that the repatriation may have exacerbated the mismatch effect. If northern teachers were moved

from non-northern regions to return to the north, then it suggests that the teacher-student ratio in the north, and thus the quality of schooling therein, was relatively improved compared to other regions. This suggests that student preparedness for university relatively decreased in the central and southern regions, such that the pre-existing mismatch generated by the quota may have been, ironically, reinforced. According to the theory, it would be reasonable to expect the university completion rates among southern and central entrants to be negatively impacted for cohorts who's secondary schooling years coincided with the repatriation.

With regards to secondary school completion, the repatriation may somewhat counterbalance the discouragement effect by better equipping northern students for secondary school examinations relative to students from other regions. However, there may also be discouragement effects associated with the repatriation, such as teachers being demotivated by having to move back to the north against their will or observing their colleagues having to do so, or northern students being demoralised by the regionalism underlying the repatriation. Hence, the reinforcement in this case could go either way.

4.4.2 Student Perceptions and Discrimination

The political atmosphere in the period of the quota was one fueled by ethno-regional divisions and tensions, with the quota itself possessing implicit regionalistic undertones. This may have had two potential impacts on educational outcomes. Firstly, it may have led to disproportionately higher student discouragement in non-central regions, primarily the north, if student's from these regions saw the quota as a veiled attempt to favour students from the centre at their expense. Secondly, it may have led to the teaching and administrative staff, and possibly students, within the university showing partiality toward students from the central region at the expense of students from the north and south.

While there is no existing survey data of student perceptions at the time, there were salient instances of student discontent toward the quota. In 1988, an issue of the Chirunga Newsletter, a Magazine produced by students attending the Chancellor College, levelled many criticisms against the University establishment, including the quota itself (Carver, 1990). When the students responsible for publishing the issue were expelled, it sparked a student-led demonstration within the University. This event is particularly striking as such outspoken criticism of the government was unprecedented and, indeed, dangerous³. Hence, these events may be indicative of serious student discontent toward the quota. While Carver (1990) stated that even beneficiaries of the quota were also displeased by the fact it would diminish the merit and value of their achievements, it seems reasonable to hypothesise that discontentment was asymmetrically skewed toward those who lost out from the quota, especially students from the north.

With regards to discrimination, there is, again, little to no documented evidence of this. Then again, given the nature of this subject, that should hardly serve as a surprise. Albeit so, there are aspects of the institutional context at the time that would facilitate discrimination. For instance, Kamuzu's continual purges of the university staff and administration may have led higher incentives among university lecturers to show favoritism to students from the central region, either due to patronage-purchased loyalty or out of fear of being removed from their position. Indeed, the repatriation served as a vivid example of how Banda would treat a teaching establishment which he distrusted. These factors may have served as motivators for lecturers to provide "desirable results" by giving central students relatively higher grades and graduation probabilities.

Nevertheless, I express these conjectures with the utmost caution, especially as I do not have

³3 of the 4 expelled students eventually left the country in fear of being arrested. Several dissenters and critics of the government were imprisoned without trial for several months and even years within the infamous Mikuyu prison.

clear-cut data on student perceptions and time-use. However, I am merely highlighting aspects of this context which may lead to results that are contradictory to those seen in other contexts. Indeed, these factors would suggest that the quota would induce relatively higher rates of failure among northern students at university level, while the mismatch hypothesis, buttressed by the repatriation of northern teachers, would strongly suggest the opposite.

4.4.3 Limited Capacity for Enforcement

In most other contexts in which AA was applied, there was reasonable room to believe that there was sufficiently credible compliance to the AA reforms. This was either due to relative ease of verification of the different groups, or the possession of sufficient information to be able to verify a student's belonging to a certain group. For instance, Brazil and the US perform AA on the basis of race, which is verified either visually or through tracing one's lineage through public records. Similarly, the Indian government issues caste validity certificates to verify one's caste. However, Malawi did not have a centralised means of gathering information about individuals in the country, therefore one's district of birth had to be self-declared. The quota likely created the incentive for students from over-represented districts to falsify their district of origin, with the lack of credible verification making it possible.

There is some evidence in the literature of students manipulating the self-declared membership to a minority group for their advantage. [Francis & Tannuri-Pianto \(2012\)](#) investigated the impact of racial quotas in Brazilian higher education, whereby seats were reserved for students who self-identified in their university application as being Afro-Brazilian. All students who self-identified in their application were later interviewed by a university panel in order to verify their claim. However, comparison of the racial identity claims made by students on their application to claims the same students made in a survey after they had matriculated suggested that the quotas raised the likelihood that dark skinned students, who thus had the ability to declare Afro-Brazilian ethnicity, self-identified as Afro-Brazilian in their application but not in the post-matriculation survey. This suggests that students only claimed Afro-Brazilian ethnicity in order to benefit from the quota, without truly identifying as being Afro-Brazilian. It further suggests that we should be cautious of potential misrepresentation when considering the Malawian context.

4.4.4 Annulment of the Quota

Finally, the annulment of the quota in 1993 also provides a hypothetical reversal of the aforementioned effects. In particular, students from historically over-represented (under-represented) districts may once again, in theory, have a high (low) probability of university entry. While this would only give us a rather short/medium-term impact of AA, it would still be very interesting to see how this reversal would influence all the aforementioned outcomes, if at all. This is made more significant by the fact that Kamuzu was elected out of power in 1994, simultaneously changing the political climate. A highly suppressive dictatorial regime with limited public freedoms, at least in certain domains, was replaced with a democracy. Hence, there may have been other unforeseen impacts on education behaviour which may appear in the data.

5 Data

The data to be used for estimation come from the 10% samples of the micro-data from the Malawi population censii in 1987 and 2008. While the 1998 census was also available, this data had no information on district of origin, and, therefore, could not be used. The censii data contain information on individual characteristics and education such as age, district⁴ of

⁴It must be noted that the definition of district changed marginally for some areas between 1987 and 2008. In particular, Lilongwe, Blantyre and Zomba were divided into two separate districts each, while Neno separated

birth, district of residence, highest qualification and year of education in the Malawian schooling system and number of years of schooling. It also contains information on current occupation and asset ownership. Given that the samples are randomly drawn from a population census, they are representative at the population level. The summary statistics for the individual and district-level characteristics are shown in tables (4) and (5) respectively.

5.1 Outcomes of Interest

Ideally, I would like to estimate the impact of the quota on pre-university effort, district/regional representation in university and university completion. I will now discuss the measures which I use to proxy for these outcomes, why I chose them and their limitations.

5.1.1 Pre-University Effort

With regards to the effect of the quota on pre-university effort, the associated outcome often used in the empirical literature is student performance in a standardised exams which universities use to select students, such as the SAT and high school GPA in the United States (e.g. (Bodoh-Creed & Hickman, 2017)) or secondary school examinations in India (e.g. (Bagde *et al.*, 2016)). Due this being a somewhat imprecise measure of effort, as exam performance also depends on stochastic factors (e.g. sleep the night before), this measure has been improved upon by finding some measure of time-use. For instance, Cotton *et al.* (2018) uses the number of times children logged into and the amount of time they spent using a revision software. However, I do not have this information at hand, as the Malawi National Exam Board, the institution which holds records of secondary school exam performance dating back to the early 1960s, does not make this information publicly available.

Therefore, I opted to use the only information available to devise an imperfect measure of secondary school effort. In particular, since I have information on the highest year of schooling, I look at the probability that an individual completes secondary school, conditional on entering secondary school. I use the conditional probability so that I can isolate the impact of the quota on the immediate transition from secondary school to university, and not other outcomes which occur prior to this (e.g. the probability of entering secondary school). While it is indeed possible that the quota influenced decisions prior to a particular stage of interest (e.g. looking at conditional university completion "disguises" the impact which the quota had on secondary school completion and university entry), it is an outcome which most obviously relates to how these impacts are investigated in the literature. For instance, secondary school effort focuses on tests which were taken in the final year of secondary school, hence limiting the sample to those who took it and excluding potential secondary school entry effects, for example. Thus, conditional probabilities are outcomes which are very fitting with the outstanding theoretical and empirical literature on the effects of AA. Nevertheless, this is still an imperfect measure nonetheless, as I may still be capturing the effect of the quota on behaviour other than effort just before university entry as shown by standardised tests (e.g. attrition during the years before the final year).

There are three variables which can be used verify secondary school completion: (i) highest education attainment achieved on the international scale (*edattain*); (ii) highest education attainment achieved on the International scale but with more detail (*edattaind*); and (iii) highest year of schooling ever achieved on the Malawi scale (*educmw*). *edattaind* is the equivalent dis-aggregation of *edattain* into attainment subcategories, while *educmw* is a further dis-aggregation of *edattaind* into individual years and is specific to the Malawian education system. This makes

from the Mwanza to become its own district. Since the districts which existed in 1987 were likely to have been districts upon which the quota was imposed, I redefined the districts in 2008 census such that they were identical to those in the 1987 census.

the detection of the completion of various stages of education, namely secondary and tertiary, very easy. Hence, this is the strategy I use to define the outcome of interest which proxies for pre-university effort. When investigating this outcome in the regression analysis, the sample will be limited to all those who have reported completing at least one year of secondary school (i.e. secondary school entrants).

5.1.2 University Entry

I look at the probability of entering university (conditional on completing secondary school) and the share of university seats occupied by each region to see if the quota influenced university entry. This step is used to verify if there is a "first stage"; that is, to assess if the quota worked as expected and actually reallocated university seats from over-represented districts to under-represented districts. Narrowing the population to those who have completed secondary school would be consistent with the methods used in the literature. For instance, the effect of AA on minority representation at university has typically been investigated by considering the population shares of minority and nonminority groups among first-time undergraduate enrollees as an outcome of interest (Hinrichs, 2012), hence limiting the sample to those who have completed high school. The corresponding sample to be used for the regression analysis of this outcome are all those who have completed secondary school.

However, detecting entry into these stages is less perfect with the data I have available. Stage entry is not measured directly, but can be inferred by corroborating *edattaind* and *edattain* with *educmw*. In particular, if *edattaind* and *edattain* indicate that an individual has accomplished a certain stage of education (e.g. primary school) and has also achieved at least one year of the next stage (e.g. "Secondary School, Year 1") then it suggests that the individual has begun the next stage of education. The problem with this measure, however, is that we do not consider the individuals who entered the next stage and failed to complete a year. Hence, I cannot distinguish individuals who enrolled into university, but did not finish their first year, from those who graduated from high school without pursuing any further education. Hence, the number of enrollees is underestimated.

Furthermore, conditional entry may be an inaccurate measure of university entry probability as not all individuals graduating from high school want to attend university. A better measure would be to look at the share of applicants which are accepted from each region/district (Antonovics & Backes, 2013), but applicant information is unavailable⁵. Finally, since only one university is observed and the reform occurred simultaneously for the whole population, I can only assess the effect of the quota on district university shares graphically, as opposed to quantitatively assessing its impact by comparing student outcomes across universities which were treated at different times⁶.

5.1.3 University Completion

As for university completion, I look at the probability of completing university conditional on "entering" university (that is, having completed at least 1 year of university). While this outcome relates most closely to the outcomes looked at in the literature, I do not observe first year drop-outs, and this may bias my results. Any results which I find must be viewed with these limitations in mind. The corresponding sample to be used for the investigation of this outcome are all individuals who have completed at least one year of university.

⁵This strategy would also allow me to estimate how the composition of students changes with a diff-in-diff.

⁶The primary short-coming of the variation in my data is that I cannot estimate a diff-in-diff specification of region/district shares across cohorts at the individual level while only looking at university entrants

5.2 Measuring Historical Over-representation

I chose to define over-representation as the percentage point difference between a district's historical representation at university and its share in the population in 1987. Historical university representation refers to the average share of university seats held by a particular district in all cohorts prior to the reform. I use an average over all cohorts because I was to capture the systematic entry probabilities affiliated with a district. This, in my opinion, better captures how districts are likely to be impacted by the quota than measures like the one or two cohort lag. This is because it preserves the number of cohorts and captures long-run entry probabilities, which are likely to be more precise than short-term entry probabilities. The population share corresponds to the population share of the entire district in 1987, as I believe that this is likely to be the benchmark which the government set for the quota to reach.

The distribution of historical over-representation by district is shown Table (5). As expected, all districts in the north are over-represented and only one district in the central region is over-represented with the rest being under-represented. The southern region has a mixture of the two, and actually possesses the most over-represented district in the period, Balaka.

5.3 Defining Cohorts

Given that the data on education is not contemporaneous, identifying the effect of the quota relies on retrospective analysis. While I have information on whether an individual eventually completed a certain level of education, I do not have information on how old they were when they did. Thus, in order to identify the effect of the reform I aggregate individuals into cohorts based on age, and observe how outcomes vary for cohorts which I believe are most likely to have been impacted by the quota. I roughly pinpoint which cohorts were the most likely to be impacted by looking at how the distributions of the outcomes of interest vary with age. Ages which show drastic discontinuities which in line with the predictions are considered potential candidates. These ages are also cross-referenced with the distribution of ages observed among students who were attending various levels of education in 1987 in order to assess whether those ages roughly correspond with education behaviour at the time. I look at a wide range of measures and ages in order to avoid misattribution of the affected cohorts, which may lead to misapprehension of the true effect of the reform.

More details of what age ranges the cohorts were divided into and how they were selected are given in the section discussing graphical analysis.

6 Empirical Strategy

Before outlining the empirical strategy, it is important to highlight what different effects are at work, what I would ideally like to estimate and what the data allows me to estimate. It is after these issues are addressed that I can then propose an empirical strategy to estimate the desired and identifiable causal impact.

6.1 What I Would Like to Estimate

Given that the quota impacts both under-represented and over-represented districts simultaneously, there are two potential treatment effects which I would ideally want to identify. Namely, the effect of the quota on outcomes for individuals who originate from over-represented districts and on individuals who originate from under-represented districts. In an ideal and fictional scenario, both treatment effects could be identified if we simultaneously observed the outcomes of over-represented and under-represented districts with and without the quota in the time

period the quota was implemented. But given that we can only observe outcomes with the quota in the post-quota period, there is an identification problem due to missing information.

In most cases in the empirical literature, this identification problem is overcome by using a difference-in-difference (DID) estimator. In particular, for situations in which exposure to the AA reform varies over time for both minority and nonminority students, the researcher can compare the difference in outcomes between minority/nonminority students in different areas when none of the areas are treated to the corresponding difference after one of the areas is treated but the other is not. Assuming parallel trends, this DID estimator identifies the average treatment effect of AA on the minority/nonminority students⁷.

6.2 What I can Actually Estimate

Given that all under-represented and over-represented districts are exposed to the quota at the same time, and that there are districts whose university shares perfectly equal their population proportions, I cannot separately recover the effects of the quota on both types of districts using DID. Nevertheless, what I can identify using DID is the effect on the quota on the difference in outcomes between over-represented and under-represented districts. That is, I can still identify how the quota, for instance, impacts the difference between the high school completion probabilities of students in over-represented districts and students in under-represented districts. However, what I cannot identify is how the separate impacts of the quota on over-represented and under-represented districts contribute to this difference. For example, I can identify whether the quota makes students from under-represented districts 10% less likely to complete secondary school than students from over-represented districts, but I cannot verify whether this is because the quota makes students from under-represented districts less likely to complete secondary school outright. It could be that the quota makes from under-represented districts more likely to finish secondary school, but that it makes the students over-represented districts even more so.

Nevertheless, identifying the impact of the quota on the difference in outcomes between various districts and regions can still be useful for evaluating the validity of the claims and findings within the theoretical and empirical literature in the Malawian context. In particular, standard theory would suggest that the quota would make the difference in secondary school completion between over-represented and under-represented districts to decline. That is, we would expect pre-university effort exerted by students in under-represented districts to grow relatively to that of students in over-represented districts post-quota. Furthermore, we would expect the relative difference in university completion outcomes to grow in favor of over-represented districts post-quota due to the mismatch effect.

In fact, we would expect the quota to have a larger impact on the relative difference between the district outcomes than on the individual district outcomes themselves because the individual effects are going in opposite directions. For instance, theory predicts secondary school outcomes in over-represented districts to deteriorate while outcomes in under-represented districts improve post-quota, such that the combination of these two effects (i.e. the difference) would be larger than the individual effects. Hence, if the predictions of standard theory hold true, we would expect them to materialise in even more exaggerated fashion than what would be typically expected. However, if no differences are observed, or the differences go in the opposite direction to what the literature predicts, then it would suggest an even more extreme divergence from

⁷Parallel trends refers to the assumption that the difference in outcomes between the minority/nonminority students in the different areas in the period the reform took place, had the reform not taken place, would have been identical to the difference before the reform. Hence, the outcomes of the minority/nonminority students in the untreated areas are used as a proxy for the outcomes of the students in the treated areas if the students in the treated areas were not treated. Given that the timing of the treatment varies across areas for both the minority and nonminority students, the effects of AA on both groups can be separately identified using a DID estimator. [Hinrichs \(2012\)](#) does this by exploiting the variation in the timing of AA bans across states in the US.

standard theory. Finally, assessing the effect of AA on the achievement gap between minority and nonminority students, rather than its effect on individual minority and nonminority outcomes, has precedent in the literature (Francis & Tannuri-Pianto, 2012; Akhtari & Bau, 2016; Akhtari *et al.*, 2019).

The underlying assumption for identification is, again, parallel trends. In particular, the difference in outcomes between under-represented and over-represented districts observed before the quota would have remained the same in the periods after the quota had the quota not taken place. Hence, if the difference between the two groups in the period of the reform is statistically different to the difference just before the reform, then it suggests that the quota has had an impact on the difference between the groups equal to the size of the excess difference.

6.3 Analytical Illustration

Let us define the difference the mean outcomes between the over-represented and under-represented districts in period t as d_t :

$$d_t = \mathbb{E}[y_{itd}|O_d = 1] - \mathbb{E}[y_{itd}|O_d = 0]$$

Where $O = 1$ if a district is over-represented and $O = 0$ if a district is under-represented⁸. Let $T = 1$ represent the period in which the quota is observed and 0 otherwise, and $d_t(T)$ the observed difference in outcomes conditional on whether the quota has come into effect. The average treatment effect we would like to estimate is equal to:

$$ATE = \mathbb{E}[d_t(1)|T = 1] - \mathbb{E}[d_t(0)|T = 1] \quad (1)$$

However, this is not identified because we never observe $\mathbb{E}[d_t(0)|T = 1]$; the difference in outcomes when there is no quota in the periods after the quota comes into effect. However, we can replace $\mathbb{E}[d_t(0)|T = 1]$ with the difference in outcomes before the quota comes into effect, $\mathbb{E}[d_t(0)|T = 0]$, as the parallel trends assumption dictates that $\mathbb{E}[d_t(0)|T = 1] = \mathbb{E}[d_t(0)|T = 0]$. Since, $\mathbb{E}[d_t(0)|T = 0]$ is observed, the ATE is identified as:

$$ATE = \mathbb{E}[d_t(1)|T = 1] - \mathbb{E}[d_t(0)|T = 0] \quad (2)$$

The following regression equation is a generalisation of a model which can be used to empirically estimate the treatment effect under the assumption of parallel trends more generally:

$$y_{idt} = \alpha + \beta_1 O_d + \beta_2 Post_t + \beta_3 O_d \times Post_t + \varepsilon_{idt} \quad (3)$$

Where y_{idt} is the outcome for individual i from district d in time period t , O_d is a continuous measure for how over-represented the district is in university relative to its population share, $Post_t$ is a dummy variable which equals 1 for all periods after the quota comes into effect and 0 otherwise, and ε_{idt} is the error term. The coefficient on the interaction between O_d and $Post_t$, β_3 captures the DID. In particular, since O_d is continuous, the interaction captures the change in the slope of O_d after the quota relative to the slope before the quota⁹. We could also include

⁸While this precludes perfectly balanced districts, I use this binary measure for the ease of illustration. I later specify a regression which over-representation is a continuous variable and can this incorporate perfectly balanced districts.

⁹Even though the conceptual framework I have developed considers over-representation to be binary variable, the DID reasoning can be easily extended to the continuous setting, and has been used in prominent studies (Nunn & Qian, 2014).

regional dummies and interact them with $Post_t$ to find the region-specific DID over and above the district-level over-representation DID.

6.4 Empirical Specification

I begin by separately specifying two models designed to capture different mechanisms of the quota effect, and then combine them to see which mechanism dominates. The first specification is shown in equation (4) estimates the DID for district-level over-representation, O_d , with \mathbf{X}_{idc} referring to a vector individual characteristics. As there are very few individual level characteristics which can be used, \mathbf{X}_{idc} only contains a dummy variable for gender and district-level historic measures of years of education, asset ownership¹⁰ and migration¹¹. In each of these cases, historical is defined as looking at the district level averages of these characteristics for those who had both completed their education in 1987 and who would not be considered in the 2008 sample. In particular, I looked at those aged above the highest year of my oldest cohort. This was in order to ensure that these variables were as exogenous as possible for the sample in consideration.

Model (4) is analogous to model (3) except that the term $Post_t$ has been divided into subcategories which refer to cohorts. In particular, there are K cohorts and the term $\sum_{k=c^*-K; k \neq -1}^{k=K-c^*} 1\{c - c^* = k\}$ refers to the sum of the dummy variables indicating all but one of the K cohorts. Each cohort is referenced with the letter c , c^* refers to the first cohort impacted by the reform and k corresponds to the cohort which is k cohorts after the cohort first impacted by the reform. Furthermore, the average outcome in cohort $k = -1$, the cohort just before the reform, and the corresponding effect of over-representation in cohort $k = -1$ are captured by β_{-1} and γ_{-1} respectively.

$$Y_{idc} = \beta_{-1} + \gamma_{-1} O_d + \sum_{k=c^*-K; k \neq -1}^{k=K-c^*} \beta_k 1\{c - c^* = k\} + \sum_{k=c^*-K; k \neq -1}^{k=K-c^*} \gamma_k 1\{c - c^* = k\} \times O_d + \delta \mathbf{X}_{idc} + \varepsilon_{idc} \quad (4)$$

In this case, there is a DID between each cohort and the cohort just before the reform, with γ_k referring to the DID for the cohort k cohorts after the reform. Finding that γ_k is statistically significant is suggestive that the quota had an impact on outcomes in cohort k if the parallel trends assumption holds. While there is no formal way to test the parallel trends assumption, an empirical method which is often used to evaluate its validity is the existence of pre-trends (Pischke, 2005). That is, if the DID's for the cohorts prior to the quota are not statistically different from 0, then it shows that the outcomes evolved identically for both groups. While this is neither necessary or sufficient to evidence parallel trends, it is a useful benchmark. The empirical test for this is testing the joint significance of the interaction terms for cohorts before the quota, and finding that they are not different from 0.

In particular, we must test the hypothesis:

$$H_0 : \gamma_k = 0 \quad \forall k \in \{-2, \dots, c^* - K\} \quad (5)$$

Equation (5) tests if all the DID terms for cohorts before the reform are equal to 0, and the null is rejected if at least one DID is significantly different from 0.

The second specification shown in equation (6) is analogous to equation (4) but replaces O_d with a dummy representing the "Universal Southern" region. That is, an artificial region consisting of

¹⁰Asset ownership is an index of assets owned by individuals in 1987, with higher weight given to more "valuable assets". While these weights are arbitrary, they are intended to roughly capture wealth.

¹¹The share of people who end up living in a region different to their region of birth, with the central and southern region being considered as the same region (to be explained in a later section).

both the Central and Southern regions. I make this aggregation because the results which arise from aggregation remain qualitatively similar to those attained when treating the Central and South as separate regions. Therefore, in order to improve precision, I aggregate the South and Central region for the remainder of the analysis. The interactions between the region dummy and cohorts capture the DID for the South. Again, we test the hypothesis the quota had an impact by looking at the joint and individual significance of the DID's for cohorts after the quota.

$$Y_{irc} = \delta_{-1} + \beta_{-1} South_r + \sum_{k=c^*-K; k \neq -1}^{k=K-c^*} \beta_k 1\{c - c^* = k\} + \sum_{k=c^*-K; k \neq -1}^{k=K-c^*} \delta_{rk} 1\{c - c^* = k\} \times South_r + \lambda \mathbf{X}_{irc} + \varepsilon_{icr} \quad (6)$$

The final specification combines the equations (4) and (6) by including the interactions between the South dummy and the over-representation measure into the same regression. The merit of doing this is that it serves as an implicit test to see which mechanism of the quota had a larger effect on outcomes. The mechanism which (4) is intended to capture is the effect of the quota which would be routinely expected in the literature; as AA is being applied at the district level on the basis of over-representation, we would expect to find the treatment effect here. The mechanism (6) is intended to capture is the region-specific effect of the quota, over and above the over-representation effect typically associated with AA. That is, the additional and unexpected impacts which the quota may have had due to its ethno-regional undertones and those of the politics at the time.

If only the mechanisms proposed by standard theory are relevant, then we would expect the regional interactions to become statistically and economically insignificant when the over-representation interactions are included. This is because the regional differences are just capturing the variation occurring at the district-level, such that once this variation is controlled for with the over-representation measure any regional differences should disappear. On the contrary, if we find that the regional dummies remain large and statistically significant even when the measure is included, then it suggests that there were regional factors which were influenced by the quota, conditional on district-level impacts.

7 Results

7.1 Graphical Analysis

I begin by looking at how the plots of the average conditional secondary school completion, university entry and university completion vary with the date of birth shown in figures (3)-(5) respectively. The merit of doing so is that I will be better able to identify which ages seem to be most impacted, and correctly generate cohorts based on perceived treatment intensity. I carry out this analysis at the regional level because it is relatively easy to illustrate graphically. Furthermore, I graphically illustrate the effect of over-representation by looking at how the slope of the relationship between the outcomes and over-representation changes across cohorts.

7.1.1 Age-level Analysis

Figure (3) appears to show a distinct downward spike for those aged between 17 and 21. For those aged 16 and younger, the distribution tapers off and becomes persistently positive in value. While the magnitudes are small on the whole and are imprecisely estimated for the ages in the tails, those aged between 17 and 21 appear to be a contender for the first impacted cohort. This can be corroborated with the histogram of ages of those who were most likely to be in their final

year of secondary school in 1987. In particular, figure (1) shows a histogram of the ages of those who had completed their third year of secondary school and reported to still be in education in the 1987 census. Given that the distribution appears to be centered at 20, this is very much suggestive that those who were roughly 20 and younger in 1987 were likely to be the first group impacted by the quota. At the very least, it makes my proposed range of ages feasible (3).

Looking at figures (4) and (5), there appears to a somewhat large increase associated with the cohort of those aged 22 and immediately younger. However, the increase associated with university entry is likely exaggerated by the preceding data point which coincided with an uncharacteristic drop. There is also a massive increase associated with those aged 22 and younger for university completed, roughly three times the size of the increase in university entry. The feasibility of this age being in the first impacted cohort is supported by the histogram of ages among university attendees in 1987 shown in figure (2), which appears to be centered on those aged 22 and immediately younger.

7.1.2 Generating cohorts

In light of these observations, I created my cohorts as follows. Given that the secondary school and university impacts appear to occur at different ages, I generate different definitions of cohort for each set of outcomes. Regarding university outcomes I created 8 cohorts which consisted of 4 years each in all but the youngest cohort, which had 3 years, and generated these cohorts by aggregating years either side of those aged 22 in 1987. In particular, I assigned those aged 22 and in the 3 younger subsequent years into c^* , the most impacted cohort, and assigned the 4 subsequent years into the next cohort, and so on, until I reached the age of 8. While being arbitrary to a degree, my rationale for choosing 8 as a stopping age is because the corresponding age in 2008 is 29. Given that I want to limit my sample to those who have completed their education, and this age seemed reasonably high for this assumption to hold. I replicated this process for the ages 23 and older, assigning the cohort immediately preceding c^* as the omitted category, and did so until the age of 59. This age was partially arbitrary, but also chosen in order to ensure that individuals were below retirement age, as I consider occupation later on in the analysis, and to mitigate for non-random attrition due to mortality. The creation of secondary school cohorts is highly similar, except I assign those between 18 and 21 to c^* , and aggregate the subsequent years into two separate cohorts, and the preceding years into five separate cohorts.

7.1.3 Cohort-level Analysis

The final cohorts and the corresponding ages are summarized in tables (2) and (3). I re-plotted figures (1)-(5) in terms of the cohort definitions in figures (6)-(8), and the general findings are in line with the analysis at the year level. Secondary school completion shows a slight drop, university entry shows a slight increase and university completion shows a relatively large increase at cohort 0. While the university entry and completion plots look very similar, note that the peak gap for university entry is 2.5 percentage points, while the peak gap for university completion is almost ten times larger at 25 percentage points. Note that in every case, the impacts last for at most two cohorts before somewhat returning to pre-quota levels. Finally, given that the cohort plots appear to be relatively flat in the pre-quota period, excluding the earliest cohort for figures (6) and (7), this suggests that pre-trends holds and that the parallel trends assumption is valid.

7.1.4 Over-representation Analysis

In order to visualise the DID between cohorts -1 and 0 captured by the change in slope of the over-representation measure, I plotted the each outcome in cohort -1 and 0 against the over-representation measure and estimated a line of best fit associated with each cohort. These

plots are shown in figures (9)-(11). The plots for secondary school completion and university entry in figures (9) and (10) are highly similar. Both show positive relationships between over-representation and completion/entry which are essentially identical across cohorts. This suggests that the DID's associated with these outcomes are close to 0. However, the plot for university completion shown in figure (11) tells a corroborative story to the regional plot seen earlier. Over-representation is positively associated with university completion in cohort -1 but this association becomes negative in cohort 0, implying that the DID is negative. Given that the northern region was over-represented relative to the south, these figures support one another.

7.2 Regression Analysis

The results from my main specifications looking at secondary school completion, university entry and university completion are shown in Tables (7)-(9). Each has the following format. The first two columns look at the specification with the region interaction terms only. The following two columns are identical except with respect to the over-representation interaction terms. The final two columns consist of both region and over-representation interaction terms. All columns have the full set of control variables.

I duplicate the specification of each column by using cluster and heteroskedasticity robust standard errors in one column, and using standard errors which account for neither clustering nor heteroskedasticity in the other. I use clustered standard errors because the assignment to "treatment" (i.e. over-representation) occurs at the district level, and [Abadie *et al.* \(2017\)](#) shows that in such contexts standard errors should account for the correlation which exists between individuals in the same cluster (i.e. district) through clustering. However, [Cameron *et al.* \(2008\)](#) also showed that clustered standard errors tend to be downward biased when the number of clusters is small (i.e. ranging from 5 clusters to 30). Upon comparing the standard errors I estimate with and without clustering, I find that the former are generally smaller than the latter, and this impacts statistical significance in some instances. Given that clustering should generally inflate standard errors, I highly suspect that the clustered standard errors are downward biased. Therefore, I include specifications which control for clustering and which do not in order to be wary of any spurious findings of statistical significance. Nevertheless, the findings are generally unchanged¹².

In line with graphical analysis, the coefficient estimates of the regional and the over-representation DID's are small and statistically insignificant for both secondary school completion and university entry across all specifications. This holds for both over-representation and the regional differences. However, the impacts of both terms are large and statistically significant in every specification with regards to university completion. Looking at Column (5) of table (9), the gap between the graduation rates of southern and northern university entrants (i.e. southern graduation rate $-$ northern graduation rate) grew by an additional 20 percentage points between cohort -1 and cohort 0, rising from -3.8% to just over 24% . Given that the average gap in the cohorts preceding this was approximately the entire period was approximately -1% , the impact increased the gap by almost 25 times the size of the pre-quota average. This gap remained positive in favor of the south in cohort 1, but fully recovered by cohorts 2 and 3. Given that the quota lasted for 6 years, it is no surprise that its effect had entirely disappeared within two cohorts.

The over-representation interaction tells roughly the same story, showing large, negative and statistically significant impacts for cohorts 0 and 3, with cohort 3 having somewhat smaller

¹²[Cameron *et al.* \(2008\)](#) also proposed bootstrapping asymptotically pivotal statistics to improve the statistical performance of clustered standard errors when the number of clusters is small, and [Imbens & Kolesar \(2016\)](#) adding to this by proposing degrees of freedom adjustments which are also robust to skewness in the treatment variable. I have not used any of these proposed solutions due to their computational intensity, but they could be implemented in theory.

magnitudes. The interpretation is as follows: a 1 percentage point increase in over-representation is predicted to decrease the attainment gap between an over-represented district and an under-represented district by an additional 2.9 percentage points in cohort 0, relative to cohort -1. Given that average over-representation is about 1.67 percentage points, the additional gap between over-represented and under-represented districts was predicted to fall by an average of 4.83 percentage points. This is not as large as the regional effect. The DID's for all cohorts prior to the quota were found to be jointly insignificant from 0 for every specification, indicating that parallel trends may hold and that these estimates can be treated as causal.

7.2.1 Interpretation

The distributions of conditional secondary school completion, university entry and university completion by cohort are shown in figures (6)-(8), much like the age-level distributions, over-representation plots and the regression analysis, seem to be contradictory to the ex-ante predictions advised by the empirical and theoretical literature. In particular, the south-north gap in conditional secondary school completion appears to have marginally increased. Furthermore, the conditional entry gap appears to be relatively unaffected. While there is an increase at cohort 0, this is equal to approximately 2 percentage points, which is quite small given the anticipated redistribution the reform intended to have on paper. Additionally, the gap in conditional university completion appears to have fallen significantly by about 20 percentage points. This persists for about two cohorts before rebounding to pre-quota levels. This is corroborated by the plots of district-level over-representation for cohorts -1 and 0, which show no impacts for secondary school completion and university entry, while showing that the quota caused over-represented districts to perform relatively worse than under-represented districts. All these findings are shown to be statistically significant in the regression analysis.

There is no easy way to corroborate these results with the existing theoretical and empirical literature. If the quota were enforced, we would expect it to be reflected in the over-representation measure and the regional dummy having statistically significant negative and positive impacts on university entry, respectively. Furthermore, we would expect students from over-represented/northern districts to be relatively less motivated, and thus have lower secondary school graduation rates. Finally, if the mismatch hypothesis were correct, then we would expect students from over-represented/northern districts to be more prepared for university, and have a higher probability of graduation. However, in all these cases, the impacts are either negligible or radically contradictory. This suggests that there may be other prevailing mechanisms besides those highlighted in the existing literature which were at work in the Malawian context at the time.

8 Additional Analysis

8.1 Lifetime Outcomes

In this section, I explore the potential ways in which the quota may have had long-term impacts on the outcomes of university entrants who were exposed to its effects. In particular, I look at the effect on the probability of enrolling into other non-university tertiary education, the probability of living in a region different to one's region of birth, the probability of living in an urban area and the number of assets owned according to the asset index which I devised. Given the hypothesised impacts of the quota, we would expect that secondary school graduates from northern/over-represented districts were more likely to take up other education due to the limitations which the quota placed on university entry and the impacts of the quota on university completion. Furthermore, given that all university campuses were in the south, we would expect that northern students were less likely to permanently leave the north during

the period of the quota, especially if they failed to complete university. Finally, if we think that failure had tangible impacts on labour force outcomes, then it is reasonable to expect that northern/over-represented university entrants owned fewer assets due to the negative impacts of the quota.

Nevertheless, the extent to which these outcomes can be used to credibly assess the true impact of the quota is limited. Given that these outcomes were observed almost 20 years after the fact, it is highly unlikely that the impacts of the quota persisted that long, especially with regards to migration and asset ownership. It is more likely that the quota's most salient impacts were restricted to the early stages of post-education, and that they gradually dissipated over time as other factors play more prominent roles in student outcomes (e.g. work experience, social connections, luck, etc.). Looking at contemporaneous outcomes which occurred soon after education completion may be very informative, but the outcomes I am investigating are likely to show either no impacts or significant impacts which may not be directly attributable to the quota due to all the other events which occurred between education completion and the 2008 census. Furthermore, the asset index is generated using a rather arbitrary weighting of various possessions, and may be reflective of preferences rather than economic capacity. The wages earned early on in one's career would be a more precise measure of the quota's impacts on economic outcomes. However, due to data limitations, I confine my analysis to the aforementioned outcomes.

The regression results are shown in tables (10) and (11). Very much in line with expectations, almost all impacts are small and statistically insignificant, except for the probability of migration. The gap in migration grew by 14 percentage points in favor of the south in cohort 0 relative to cohort 1, suggesting that northern entrants in this cohort were less likely to move away from the north. This is very much in line with the aforementioned findings on university incompleteness. Given that most northerners had almost no familial connections in the central and southern region, the only way most could sustain themselves was to find jobs. If university in-completion forced failing northern students to return home due to no viable economic options, then this may explain the impact. Furthermore, the fact that this impact is isolated to the most impacted cohort before returning to statistical insignificance thereafter suggests that this change in behaviour can be associated with the reform rather than some shift in migration patterns.

8.2 Comparison of elites

Hypothetically speaking, there may be two factors simultaneously impacting northern students; over-representation and a potential region-specific factor associated with the regionalism which existed at the time. Even though I control for over-representation in the regressions, this may not be fully accounting for the interactions which may exist between over-representation and region of birth, such that the region interactions may still be capturing some aspects which are also related to over-representation. In order to extract the effect of regionalism from over-representation, I compare northern districts to southern districts (that is, districts in both the southern and central regions) which are also over-represented. The idea here is that both sets of districts were impacted by over-representation such that any remaining differences between them and northern districts are likely due to region-specific differences. I essentially use over-represented southern districts as counterfactuals for the northern districts, if these northern districts were southern, in order to identify the north-specific effect.

However, this strategy may break down for two potential reasons. First, if the extent of over-representation among northern districts is significantly different, then these southern districts may be poor proxies. Secondly, since I am looking at the universal southern region, I am combining the central and southern regions. If the region-specific effect of the quota in these regions is different, then any northern effect I want to identify will also include regional differences

between the south and center. For instance, if southern students viewed the quota as anti-south just as much as northerners may have viewed it as anti-north, then both may have suffered from similar levels of excess demotivation. Hence, the estimated northern specific effect may be biased. If, for example, I am looking at university completion and both the northern and southern districts were similarly impacted, I would under-estimate the northern-specific effect¹³.

To address the first concern, I look at the average levels of over-representation among the north and the "southern elite" (i.e. the over-represented districts) in table (6). The averages appear to be very similar, suggesting that they may be comparable. Furthermore, I look at plots comparing the gap in outcomes between over-represented southern districts and northern districts in figures (13)-(14). In the same figures, I also generate a placebo plot comparing under-represented central districts and under-represented southern districts. If there are any excess differences between the central and southern regions, then it should be made visible by the placebo plot. If outcomes are roughly similar, especially in the affected cohorts, then it is likely that there are no differences between the center and the south, and that aggregating them should enable me to identify a north-specific effect. All the plots seem similar in that the placebo group tends to show the smallest differences and the elite comparison being an exaggerated version of the simple regional differences. This is particularly true for university completion. The placebo group shows virtually no impacts in cohort 0, while comparing the north to the southern elites shows near identical differences to those seen previously across the whole region. This suggests that the bulk of the regional differences can almost be entirely attributed to regionalism, rather than over-representation.

The regression analysis is shown in tables (12) and (13), which show values of similar magnitude to those seen before. While the university completion effect is not statistically significant, this imprecision is likely due to the smaller sample size rather than evaporation of any meaningful differences. Furthermore, migration effects remain statistically significant, and the rebound effect in cohort 2 is now larger and statistically significant, which is in line with the previous findings. Meanwhile, the effects of over-representation have, rather understandably, become very small and statistically insignificant. Taken together, these findings are highly supportive of region-specific differences having meaningful impacts on both education and long-term migration outcomes.

9 Discussion

9.1 Limitations

Before discussing the potential implications of these findings on the existing AA literature and the application of AA to educational policy, it is crucial to acknowledge some of the numerous weaknesses and limitations of this study and the context in which they were found. With regards to internal validity, perhaps the greatest weakness of my study is that I rely on retrospective data and have very little contemporaneous data which existed at the time of the reform. This makes the process of attribution very difficult, as the true impact of the quota is likely to have been diluted by behavioural adjustments which individuals made to cope with it. In addition to this, some behavioural adjustments which may be of interest may go undetected (e.g. I cannot identify delayed entry into university). Furthermore, this data limitation forced me to analyse outcomes which may only partially capture the true impact I sought to investigate. For instance, I do not observe university applicants, first year drop-outs, pre-university effort at the intensive margin, the reasons for leaving various stages of education, and individual-level characteristics

¹³In theory, I could create a "southern elite" and a "central elite" (i.e. the over-represented districts) and separately identify north-specific differences for both. However, the central region only has one over-represented region, so this method is not viable.

during and immediately after education. Taken together, these data limitations may mask several impacts which the quota had, leaving me with only a small glimpse of the full effect.

Finally, with regards to external validity, Malawi during the late 80s was somewhat unique in comparison to most modern day contexts. The existence of an autocratic hegemony which systematically and overtly favors a particular group at the expense of another is, at face-value at least, becoming an increasingly rare phenomenon both within Sub-Saharan Africa and developing countries as whole. While the universal establishment of fully-functioning democracies is still yet to be achieved, such extreme cases are becoming less common. This has been partially aided by growing international interdependence via trade and finance creating a means for external bodies to enforce on domestic policy reforms (e.g. international aid). However, this uniqueness should not be overstated. This context may still be somewhat applicable to semi-democracies which combat corruption and weak political institutions, particularly as studies in political economy evidence that even rulers of modern and democratic regimes have some agency with regards to public finance disbursement ([André *et al.*, 2018](#); [Franck & Rainer, 2012](#); [Kramon & Posner, 2016](#)).

9.2 Theoretical and Policy Implications

That being said, there are a few tentative conclusions which I draw from the empirical analysis. Firstly, the narrative endorsed by the historical literature specifically discussing the quota in Malawi may be somewhat supported by the findings. Virtually all prominent sources which discussed the quota were highly cynical of its intentions, and believed its underlying motive was to diminish northern domination of the educated elite in favor of the central region in order to consolidate Banda's rule. According to this lens, the goal of the quota was to harm the north, and perhaps part of the south, as much as it was to benefit the center. Such a notion was very much in line with Banda's overall modus operandi of heightening ethno-regional tensions and using patronage to curry favor among his southern and central loyalists. Furthermore, one can corroborate of these motives with the aforementioned enforcement issues at entry to develop a reasonable explanation for the aforementioned results.

Suppose the quota was always intended to damage the university entry prospects of northern students relative to those from the universal south, but could not do so to the desired extent at entry-level due to some constraints (e.g. northern students falsifying their district of birth). However, if these constraints become alleviated post-entry (e.g. recognition of district/region of birth became easier), then the intended discrimination becomes feasible. The only difference now is that it will take shape in the form of university completion rather than university entry. The case of discrimination against students who truthfully claim to be from the northern region is somewhat uninteresting, as detection and enforcement are relatively easy to implement. However, the case of northern students who falsify region of birth is more interesting.

While the correct discernment of the district of birth is somewhat unlikely for falsifying students, identifying their region of birth post-entry is conceivable due to observable characteristics which make northerners highly different to individuals from the south and center. A particular characteristic is language. In spite of Chichewa and English being the official languages of Malawi at the time, the Tumbuka language remained the lingua franca of the northern region and was unique to it. Consequently, most northerners spoke English and Chichewa with accents that the typical Malawian listener could easily trace back to the northern region. Hence, any attempt made by a northern student to masquerade as central or southern student would be almost immediately betrayed when they spoke. Therefore, if lecturers within the university could discern northern students by their accents, then it would give them the opportunity to single them out and take measures to prevent their graduation (e.g. by unfairly giving them failing grades).

Such a conspiracy can be argued as valid under the circumstances at the time. Given that there were several instances that would suggest Banda's free reign to remove and appoint lecturers as he pleased, there were conceivable incentives for lecturers to behave in line with his anti-north sentiments. For instance, they may have feared being fired (or worse) if the quota failed to assail the north's per-capita domination of university graduates, or they may have felt loyalty toward Banda due to owing their position in the university to his acts of patronage. Furthermore, such a strategy would not require all staff members to be complicit in order for it to be effective. Indeed, it would only require a sufficient number of lecturers to coordinate such that the overall grade of a particular student does not meet the requirement to pass. Hence, the aforementioned conjecture may serve as plausible explanation for the results I find, as the motives and means proposed therein are reasonable in light of the Malawian context. Nevertheless, more data is required for such a claim to be substantiated at the main story, because, as it stands, the results are consistent with numerous other explanations.

Secondly, the predictions of the existing theoretical literature may not perfectly apply in every context. It may very well have been the case that Malawi possessed unique aspects which worked against the hypothesised impacts of AA. In particular, the repatriation of northern teachers may have served to negate the impact of higher pre-university effort among students from under-represented and southern districts. However, these existing policies also worked in "favor" of certain hypotheses held by standard theory. If the mismatch hypothesis were correct, the repatriation of northern teachers in 1989 would have served to exacerbate it and made mismatch effects more salient. Nevertheless, the impacts which I found were large and contradictory, especially with regards to university completion. This is suggestive of other factors that are yet to be explored as responsible for driving the results.

Thirdly, periphery educational policies and enforcement capacity may matter if AA is to be effective. Regarding the former, the repatriation of northern teachers may have undermined the impact of pre-university effort on secondary school graduation. The latter is largely in reference to the finding the quota had little to no impact on university entry. While my measure of entry was imperfect, I believe the lack of an impact may also be driven by imperfect enforcement of the quota due to the difficulty of correctly identifying students' district of birth. Indeed, had the quota been based on some immutable characteristic which did not rely on a well developed central information system to verify, such as gender, perhaps there would have been a larger impact on university entry. However, due to self-declaration, I believe there is every chance that some northern students exploited the informational weakness of the university and masqueraded as non-northern students. The evidence from Brazil ([Francis & Tannuri-Pianto, 2012](#)) indicates that students have high incentives to misreport aspects of their identity in order to take advantage of administrative loopholes, and these incentives were also likely to have been present in Malawi. Thus, it may be sensible for education policy to develop a holistic agenda which maximises the potential impacts of AA, and to take the capacity of enforcement into account when selecting a characteristic upon which AA will be based.

Finally, the negative and unforeseen impacts of AA on nonminority students (i.e. students who "lose" due to AA) may exist and be large. Supposing that the relative failure of northern and over-represented districts at university level was not itself an objective of the quota, though most historical sources claim it was ([Carver, 1990](#); [Posner, 1995](#); [Mkandawire, 2010](#)), the quota appeared to have achieved very little in terms of improving district representation among university entrants and encouraging students from under-represented districts to increase pre-university effort. On the contrary, the results appear to be more consistent with the North being made relatively worse off on a metric which, according to the theoretical literature, was meant to be unaffected at the very least or improve in favor of the North at the very most. The assertion that this impact was driven by non-northern students being encouraged to exert relatively more effort than northern students after university entry does not seem very tractable. Once

entry has been achieved, it seems most reasonable to assume that most of the southern-specific encouragement effects of the quota had passed, and that ability and other incentives would now be the defining factors for success within university. Hence, while this cannot be directly estimated from the data, there is some reason to believe that the growth in the gap may have been largely due to the deterioration of northern performance. If AA is to generate net welfare gains and to be accepted by the general public, it is important to limit the potential losses of those who are disadvantaged by it.

9.3 Potential Extensions

Be that as it may, the question of which underlying mechanism is driving the results is one which my current study cannot answer. There are numerous potential explanations which are consistent with my findings, whether it be northern demotivation due to underlying regionalism or northern discrimination at the hands of fellow students or teaching staff just to name a few. A potential extension which can be made to my analysis would be to look at how university course and degree selection varied due to the quota. In particular, if northern students were induced to select courses which were more difficult or less preferred due to the greater demand (or fear of greater demand) for university education generated by the quota, then this may be a reason for the large increase in the graduation gap. Furthermore, contemporaneous data may shed more light on masked behaviours. For instance, if the quota forced northern students to resit secondary school exams until they performed well enough to qualify for highly competitive northern university seats, or if they delayed entry until the quota ended, then the growing graduation gap may have been due to the growing cost of education with age (e.g. education fatigue, opportunity cost from unused labour, etc.). There are many potential avenues which could be taken if the right data is found.

Additionally, I did not have the data to fully exploit Malawi's unique setting to investigate the mismatch hypothesis. If one can correctly identify districts or traditional authorities (sub-districts) which were differentially exposed to the repatriation, then one could compare southern districts with relatively low exposure to southern with relatively high exposure in terms of university graduation rates. For instance, southern districts with large shares of northern teachers before the repatriation were likely to have been seriously impacted by it, while those with relatively few may have not suffered as much. This may have translated into pre-university preparation, and university graduation probabilities further down the line. Over and above the south-specific effect of the quota, we would expect students from southern districts which were highly exposed to the repatriation to perform less well at university than southern students with relatively little exposure. These effects could be identified, under the right assumptions, with a DID estimation strategy.

Perhaps the greatest future contribution which can be made to better understanding this context would simply be to gather information from the people who lived through it. While I have sought a few opinions and anecdotes from individuals who were students at the time, this is a far cry from robust analysis coming from a randomly assigned and comprehensive survey. While there will always be serious limitations to the extent to which this can be done well, a small survey of the attitudes of former students and their experiences of the quota may shed more light on the true effects of the quota than a comprehensive empirical study devoid of subjective experiences. This overall body of literature is fundamentally about people making decisions, therefore to better understand why people made those decisions it only makes sense that the first place to begin is to ask them directly.

Finally, the debated historical origin of the inequalities in Malawi suggest a relatively unexplored aspect of the long-run impacts of colonial education policy. The importance of colonial legacy in the determination of contemporary education outcomes through the mechanism of church missions

is one which has been long discussed with application to the African context (Wantchekon *et al.*, 2015; Jedwab *et al.*, 2018). Furthermore, the heterogeneous impacts of missions under the jurisdiction of different colonizers (Cogneau & Moradi, 2014) and of missions operated by different schisms within the Christian faith, namely Catholicism and Protestantism (Nunn *et al.*, 2014), have also been discussed. However, what is yet to be investigated are the heterogeneous impacts of missions operated by different denominations/organisations within the same schism (i.e. heterogeneity across Protestant Missions), and how they may have contributed to inequalities in contemporary education outcomes within colonies. Exploring the differential impacts of the Livingstonia Mission and D.R.C.M on the education inequalities which predated the quota may be an interesting topic of future research.

10 Conclusion

In conclusion, I endeavoured to explore the potential impacts of the quota which the Malawian government enforced upon university entry by looking at its effects on pre-university effort, university entry and university graduation. On the whole, my results largely contradict the predictions of the standard theory in AA literature. In particular, I find no impacts on secondary school completion and university entry, but large impacts on the relative graduation rate in favor of under-represented and southern districts. Given that these districts were likely to be less prepared for university, the mismatch hypothesis states that their relative performance should have deteriorated rather than improved. However, this does not necessarily negate the validity of existing theory, but merely serves to underscore the importance of the existing political and legislative setting in which AA is applied. I also believe this provides some evidence that more work must be done to better understand the negative and unexpected consequences of AA and their sources. Taken together, this paper should not be read as a vilification of AA. However, it does provide evidence that education policy which intends to use AA must carefully consider the existing education policy, the capacity to enforce AA and the pre-existing socio-political landscape if AA is to improve the welfare of its intended beneficiaries and society as a whole.

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11 Table Appendix

11.1 Table 1

Table 1: Educational Inequalities in 1987

Region	< Primary	Primary	Secondary	University	School (Years)	Pop. Share
Central	91.8	7.19	0.925	0.006	2.16	12
Northern	80.2	17.1	2.48	0.03	4.04	50.5
Southern	91.1	7.80	1.03	0.008	2.18	37.5

The relevant population of each summary statistic is the entire sample of the 1987 census. "<Primary" refers to the probability of failing to complete primary education. "Primary" is the probability of completing primary school at most. "Secondary" is the probability of completing secondary school at most. "University" is the probability of completing university at most.

11.2 Table 2

Table 2: Cohorts and Age Ranges (SS Completion)

Cohort	Age in 1987	Age in 2008
-4	34-38	55-59
-3	30-33	51-54
-2	26-29	47-50
-1	22-25	43-46
0	18-21	39-42
1	13-17	34-38
2	8-12	29-33

"Cohort" refers to the cohort number relative to the first impacted cohort, where cohort 0 is the first impacted cohort. Age in 2008 refers to the reported age of the respondent in the 2008 census. Age in 1987 is the estimated age of the respondent in 1987, conditional on their reported age in 2008 (i.e. age in 2008−21). Each row refers to an age range which was used to define a cohort for the regressions looking at secondary school completion.

11.3 Table 3

Table 3: Cohorts and Age Ranges (University Outcomes)

Cohort	Age in 1987	Age in 2008
-4	35-38	56-59
-3	31-34	52-55
-2	27-30	48-51
-1	23-26	44-47
0	19-22	40-43
1	15-18	36-39
2	11-14	32-35
3	8-10	29-31

"Cohort" refers to the cohort number relative to the first impacted cohort, where cohort 0 is the first impacted cohort. Age in 2008 refers to the reported age of the respondent in the 2008 census. Age in 1987 is the estimated age of the respondent in 1987, conditional on their reported age in 2008 (i.e. age in 2008−21). Each row refers to an age range which was used to define a cohort for the regressions looking at university entry and university completion.

11.4 Table 4

Table 4: Summary Statistics (2008 Census)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	341,387	40.579	9.772	28	32	49	59
Female	341,387	0.497	0.500	0	0	1	1
Schooling (Yrs.)	340,351	4.763	4.272	0	0	8	18
Assets	339,445	2.982	1.785	0	2	3.500	14
Secondary School Entry	341,387	0.177	0.382	0	0	0	1
Secondary School Comp.	341,387	0.099	0.299	0	0	0	1
University Entry	341,387	0.009	0.096	0	0	0	1
University Comp.	341,387	0.006	0.077	0	0	0	1
Other Education	341,387	0.009	0.095	0	0	0	1
Migration	341,387	0.025	0.155	0	0	0	1

The relevant population of each summary statistic is the entire sample of the 2008 census. "Schooling" refers to the average years of schooling in the district. "Assets" refers to the average score on the asset index. "Secondary school entry" refers to the probability of entering secondary school. "Secondary School Comp." refers to the probability of completing secondary school. "University Entry" refers to the probability of entering university. "University Comp." refers to the probability of completing university. "Other education" refers to the probability of completing at least one year of other education. "Migration" refers to the probability of an individual living in a region which is different to their region of birth, whereby all individuals from southern or northern regions are assumed to be part of the universal "Southern" region.

11.5 Table 5

Table 5: District Averages

Region	District	Over Rep.	Pop. Share	Schooling	Assets	Migration
Northern	Chitipa	1.12	1.4	2.87	3	3.74
Northern	Karonga	0.982	1.8	3.07	3.43	9.71
Northern	Mzimba	2.05	5.8	2.6	2.98	13.8
Northern	Nkhata Bay/Likoma	1.91	1.81	2.68	3.35	22
Northern	Rumphi	1.96	1.22	4.04	3.56	9.79
Central	Dedza	-0.334	5.82	1.44	2.73	0.319
Central	Dowa	-0.598	4.45	1.61	2.7	0.363
Central	Kasunga	-0.751	2.76	2.29	3	3.87
Central	Lilongwe	-0.769	12	1.54	2.73	0.526
Central	Mchinji	-0.951	2.4	1.89	3.03	0.494
Central	Nkhotakota	-0.158	1.6	1.76	3.25	3.1
Central	Ntcheu	-0.298	4.6	2.27	3.05	0.388
Central	Nthisi	0.358	1.71	2.11	2.77	0.406
Central	Salima	-0.139	2.13	1.24	2.63	0.234
Southern	Balaka	9.57	1.13	0.894	2.97	0
Southern	Blantyre	0.508	6.11	2.43	3.39	0.776
Southern	Chikwawa	-2.46	3.41	1.46	2.8	0.166
Southern	Chiradzulu	-1.1	3.74	1.96	3.14	0.331
Southern	Machinga	-3.2	4.41	1.02	2.82	0.759
Southern	Mangochi	-3.12	5.72	0.718	2.86	0.715
Southern	Mulanje	-5.57	7.43	1.9	3.2	0.602
Southern	Mwanza	3.33	1.44	1.81	2.87	0.29
Southern	Nsanje	0.193	2.61	1.27	2.85	0.264
Southern	Phalombe	0.34	1.95	1.08	2.91	0
Southern	Thyolo	-5.03	6.17	1.92	3.19	0.402
Southern	Zomba	2.99	6.42	1.91	3.11	0.715

Region refers to the region which each district belongs. "Over-Rep" represents the over-representation measure associated with a particular district. "Pop. Share", "Schooling", "Assets" and "Migration" refer to district level averages taken from those aged above 38 in the 1987 census. "Pop" refers to the population share of the district. "Schooling" refers to the average years of schooling in the district. "Assets" refers to the average score on the asset index. "Migration" refers to the probability of an individual living in a region which is different to their region of birth, whereby all individuals from southern or northern regions are assumed to be part of the universal "Southern" region.

11.6 Table 6

Table 6: North vs Southern Elite

Region	District	Over-Rep.	(4)	(5)	(6)
North	Chitipa	1.81	3.19	3.18	3.25
North	Karonga	1.6	3.19	3.18	3.25
North	Mzimba	4.67	3.19	3.18	3.25
North	Nkhata Bay and Likoma	2.83	3.19	3.18	3.25
North	Rumphi	2.89	3.19	3.18	3.25
South	Balaka	8.78	3.35	3.7	4.55
South	Blantyre	0.0227	3.35	3.7	4.55
South	Mwanza	3.03	3.35	3.7	4.55
South	Nthisi	0.217	3.35	3.7	4.55
South	Phalombe	0.193	3.35	3.7	4.55
South	Zomba	2.37	3.35	3.7	4.55

Region refers to the region which each district belongs, whereby "South" consists of districts in either the central region or the southern region. "Over-Rep" represents the over-representation measure associated with a particular district. Columns (4)-(6) look at the region average over-representation measure for the 3 different samples covered in the regression analysis. In particular, (4) considers all secondary school entrants, (5) considers all secondary school graduates and (6) considers all university entrants. The averages change with each sub-sample because each district is differentially represented in each sub-sample.

Table 7: Secondary School Completion

	<i>Dependent variable:</i>					
	Prob. of Secondary School Completion					
	(1)	(2)	(3)	(4)	(5)	(6)
South × Cohort 0	-0.040 (0.025)	-0.040 (0.025)			-0.038 (0.025)	-0.038 (0.027)
South × Cohort 1	0.019 (0.022)	0.019 (0.022)			0.024 (0.022)	0.024 (0.024)
South × Cohort 2	0.019 (0.021)	0.019 (0.021)			0.027 (0.021)	0.027 (0.022)
Over × Cohort 0			0.003 (0.003)	0.003 (0.003)	0.001 (0.004)	0.001 (0.003)
Over × Cohort 1			0.002 (0.003)	0.002 (0.003)	0.003 (0.002)	0.003 (0.003)
Over × Cohort 2			0.002 (0.003)	0.002 (0.003)	0.003 (0.002)	0.003 (0.003)
Clustering	No	Yes	No	Yes	No	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50,090	50,090	50,090	50,090	50,090	50,090
R ²	0.009	0.009	0.012	0.012	0.012	0.012

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited to secondary school entrants. The dependent variable is the probability of completing secondary school. Each column corresponds to a different specification of the same regression. (1) and (2) are specifications with with the over-representation measure only, (3) and (4) are specifications with the regional interactions only, and (5) and (6) are specifications with both interactions. (1), (3) and (5) are not estimated with cluster robust standard errors, while (2), (4) and (6) are. "South" indicates a dummy variable which equals 1 when an individual is from the south and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 8: University Entry

	<i>Dependent variable:</i>					
	Prob. of University Entry					
	(1)	(2)	(3)	(4)	(5)	(6)
South × Cohort 0	0.025 (0.024)	0.025 (0.026)			0.025 (0.026)	0.025 (0.023)
South × Cohort 1	0.009 (0.018)	0.009 (0.024)			0.009 (0.024)	0.009 (0.019)
South × Cohort 2	-0.011 (0.021)	-0.011 (0.023)			-0.011 (0.023)	-0.011 (0.022)
South × Cohort 3	-0.003 (0.020)	-0.003 (0.022)			-0.003 (0.022)	-0.003 (0.021)
Over × Cohort 0			-0.001 (0.003)	-0.001 (0.002)	0.0001 (0.003)	0.0001 (0.002)
Over × Cohort 1			0.002	0.002 (0.002)	0.002 (0.003)	0.002 (0.002)
Over × Cohort 2			0.0002 (0.003)	0.0002 (0.002)	-0.0001 (0.003)	-0.0001 (0.002)
Over × Cohort 3			-0.0005 (0.003)	-0.0005 (0.002)	-0.001 (0.003)	-0.001 (0.002)
Clustering	No	Yes	No	Yes	No	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,557	28,557	28,557	28,557	28,557	28,557
R ²	0.021	0.021	0.021	0.021	0.021	0.021

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited to secondary school graduates. The dependent variable is the probability of entering university. Each column corresponds to a different specification of the same regression. (1) and (2) are specifications with with the over-representation measure only, (3) and (4) are specifications with the regional interactions only, and (5) and (6) are specifications with both interactions. (1), (3) and (5) are not estimated with cluster robust standard errors, while (2), (4) and (6) are. "South" indicates a dummy variable which equals 1 when an individual is from the south and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 9: University Completion

	<i>Dependent variable:</i>					
	Prob. of University Graduation					
	(1)	(2)	(3)	(4)	(5)	(6)
South × Cohort 0	0.267*** (0.091)	0.267** (0.106)			0.204** (0.094)	0.204** (0.088)
South × Cohort 1	0.115 (0.088)	0.115** (0.050)			0.092 (0.090)	0.092* (0.049)
South × Cohort 2	-0.084 (0.083)	-0.084 (0.089)			-0.134 (0.086)	-0.134* (0.081)
South × Cohort 3	-0.017 (0.091)	-0.017 (0.076)			-0.032 (0.093)	-0.032 (0.080)
Over × Cohort 0			-0.036*** (0.011)	-0.036*** (0.013)	-0.029** (0.011)	-0.029*** (0.008)
Over × Cohort 1			-0.010 (0.010)	-0.010 (0.008)	-0.009 (0.010)	-0.009 (0.010)
Over × Cohort 2			-0.023** (0.009)	-0.023** (0.009)	-0.025** (0.010)	-0.025*** (0.008)
Over × Cohort 3			-0.005 (0.010)	-0.005 (0.009)	-0.005 (0.010)	-0.005 (0.010)
Clustering	No	Yes	No	Yes	No	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,680	2,680	2,680	2,680	2,680	2,680
R ²	0.023	0.023	0.021	0.021	0.029	0.029

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited to university entrants. The dependent variable is the probability of completing university in each regression. Each column corresponds to a different specification of the same regression. (1) and (2) are specifications with with the over-representation measure only, (3) and (4) are specifications with the regional interactions only, and (5) and (6) are specifications with both interactions. (1), (3) and (5) are not estimated with cluster robust standard errors, while (2), (4) and (6) are. "South" indicates a dummy variable which equals 1 when an individual is from the south and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 10: Lifetime Outcomes: Clustering

	<i>Dependent variable:</i>			
	Other Education	Migration	Urban	Assets
	(1)	(2)	(3)	(4)
South × Cohort 0	−0.026** (0.012)	0.144** (0.067)	0.148 (0.084)	0.232 (0.336)
South × Cohort 1	−0.023 (0.016)	0.051 (0.058)	−0.019 (0.059)	−0.824* (0.439)
South × Cohort 2	−0.011 (0.015)	−0.005 (0.081)	0.120* (0.063)	−0.629 (0.485)
South × Cohort 3	−0.006 (0.017)	−0.028 (0.058)	0.075 (0.077)	−0.283 (0.739)
Over × Cohort 0	0.001 (0.002)	0.001 (0.003)	−0.008 (0.012)	−0.091* (0.049)
Over × Cohort 1	0.002 (0.002)	0.001 (0.004)	0.005 (0.006)	−0.061 (0.086)
Over × Cohort 2	0.003 (0.002)	0.001 (0.004)	0.005 (0.008)	−0.137* (0.073)
Over × Cohort 3	0.004** (0.002)	0.006 (0.004)	0.003 (0.008)	−0.008 (0.081)
Clustering	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes
Observations	28,557	2,680	2,539	2,663
R ²	0.014	0.496	0.037	0.050

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited secondary school graduates for column (1) to university entrants for columns (2)-(4). All regressions have standard errors clustered at the district level. The dependent variables corresponding to each column are as follows. (1) is the probability of entering other education, (2) is the probability of the respondent's district of residence being different to their district of birth, (3) is the probability of dwelling in an urban area and (4) is the score on the asset index. "South" indicates a dummy variable which equals 1 when an individual is from the south and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 11: Lifetime Outcomes: No Clustering

	<i>Dependent variable:</i>			
	Other Education	Migration	Urban	Assets
	(1)	(2)	(3)	(4)
South × Cohort 0	−0.026 (0.021)	0.144*** (0.053)	0.148 (0.091)	0.232 (0.706)
South × Cohort 1	−0.023 (0.020)	0.051 (0.051)	−0.019 (0.087)	−0.824 (0.671)
South × Cohort 2	−0.011 (0.019)	−0.005 (0.048)	0.120 (0.083)	−0.629 (0.641)
South × Cohort 3	−0.006 (0.019)	−0.028 (0.052)	0.075 (0.089)	−0.283 (0.698)
Over × Cohort 0	0.001 (0.003)	0.001 (0.006)	−0.008 (0.011)	−0.091 (0.086)
Over × Cohort 1	0.002 (0.002)	0.001 (0.006)	0.005 (0.010)	−0.061 (0.079)
Over × Cohort 2	0.003 (0.002)	0.001 (0.006)	0.005 (0.010)	−0.137* (0.076)
Over × Cohort 3	0.004* (0.002)	0.006 (0.006)	0.003 (0.010)	−0.008 (0.078)
Clustering	No	No	No	No
Covariates	Yes	Yes	Yes	Yes
Observations	28,557	2,680	2,539	2,663
R ²	0.014	0.496	0.037	0.050

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited secondary school graduates for column (1) to university entrants for columns (2)-(4). None of the regressions are estimated with cluster robust standard errors. The dependent variables corresponding to each column are as follows. (1) is the probability of entering other education, (2) is the probability of the respondent's district of residence being different to their district of birth, (3) is the probability of dwelling in an urban area and (4) is the score on the asset index. "South" indicates a dummy variable which equals 1 when an individual is from the south and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 12: North vs Southern Elite: Clustering

	<i>Dependent variable:</i>				
	SS Compl.	Uni Entry	Uni Compl.	Other Educ.	Migration
	(1)	(2)	(3)	(4)	(5)
South × Cohort 0	−0.031 (0.026)	0.013 (0.024)	0.164 (0.103)	−0.033** (0.016)	0.159** (0.071)
South × Cohort 1	0.030 (0.026)	−0.007 (0.017)	0.114* (0.065)	−0.027 (0.017)	0.040 (0.060)
South × Cohort 2	0.025 (0.025)	−0.023 (0.022)	−0.203*** (0.077)	−0.022 (0.018)	0.010 (0.087)
South × Cohort 3		−0.017 (0.021)	−0.081 (0.110)	−0.024 (0.019)	−0.032 (0.065)
Over × Cohort 0	0.0003 (0.004)	0.002 (0.002)	−0.018** (0.008)	0.002 (0.003)	−0.009 (0.008)
Over × Cohort 1	0.0005 (0.0003)	0.008*** (0.002)	−0.014 (0.012)	0.002 (0.002)	−0.001 (0.008)
Over × Cohort 2	0.003 (0.003)	0.004 (0.003)	−0.009 (0.006)	0.005* (0.003)	−0.010 (0.010)
Over × Cohort 3		0.005 (0.003)	0.002 (0.017)	0.009*** (0.002)	−0.001 (0.009)
Clustering	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	26,342	15,189	1,527	15,189	1,527
R ²	0.023	0.025	0.046	0.020	0.505

*p<0.1; **p<0.05; ***p<0.01

The sample has been limited to secondary school entrants for column (1), to secondary school graduates for columns (2) and (4), and to university entrants for columns (3) and (5). All of the regressions are estimated with cluster robust standard errors. The dependent variables corresponding to each column are as follows. (1) is the probability of completing secondary school, (2) is the probability of entering university, (3) is the probability of graduating from university, (4) is the probability of entering other education and (5) is the probability of the respondent's district of residence being different to their district of birth. "South" indicates a dummy variable which equals 1 when an individual is from the south, conditional on their district of birth being historically over-represented, and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

Table 13: North vs Southern Elite: No Clustering

	<i>Dependent variable:</i>				
	SS Compl.	Uni Entry	Uni Compl.	Other Educ.	Migration
	(1)	(2)	(3)	(4)	(5)
South × Cohort 0	−0.031 (0.029)	0.013 (0.024)	0.164 (0.103)	−0.033 (0.023)	0.159** (0.068)
South × Cohort 1	0.030 (0.025)	−0.007 (0.022)	0.114 (0.100)	−0.027 (0.022)	0.040 (0.067)
South × Cohort 2	0.025 (0.024)	−0.023 (0.021)	−0.203** (0.095)	−0.022 (0.020)	0.010 (0.063)
South × Cohort 3		−0.017 (0.021)	−0.081 (0.104)	−0.024 (0.020)	−0.032 (0.069)
Over × Cohort 0	0.003 (0.006)	0.002 (0.004)	−0.018 (0.018)	0.002 (0.004)	−0.009 (0.012)
Over × Cohort 1	0.001 (0.005)	0.008* (0.004)	−0.014 (0.017)	0.002 (0.004)	−0.001 (0.011)
Over × Cohort 2	0.005 (0.005)	0.004 (0.004)	−0.009 (0.016)	0.005 (0.004)	−0.010 (0.011)
Over × Cohort 3		0.005 (0.004)	0.002 (0.017)	0.009** (0.004)	−0.001 (0.011)
Clustering	No	No	No	No	No
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	26,342	15,189	1,527	15,189	1,527
R ²	0.023	0.025	0.046	0.020	0.505

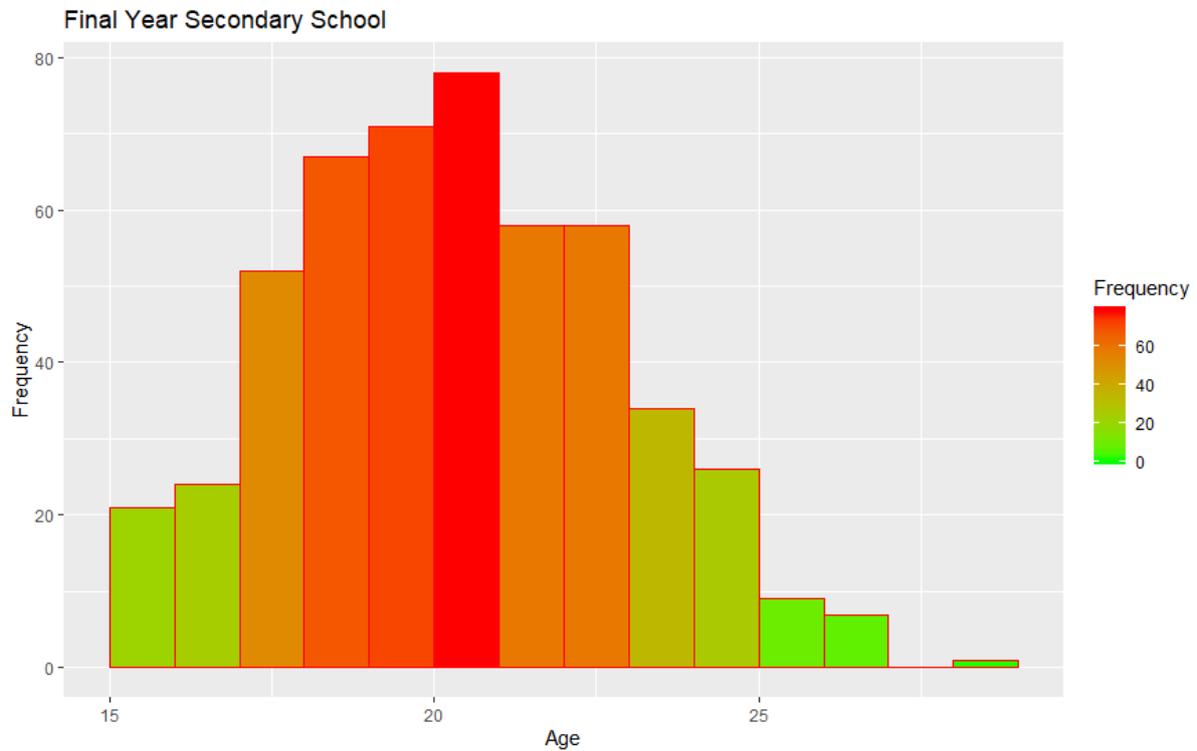
*p<0.1; **p<0.05; ***p<0.01

The sample has been limited to secondary school entrants for column (1), to secondary school graduates for columns (2) and (4), and to university entrants for columns (3) and (5). None of the regressions are estimated with cluster robust standard errors. The dependent variables corresponding to each column are as follows. (1) is the probability of completing secondary school, (2) is the probability of entering university, (3) is the probability of graduating from university, (4) is the probability of entering other education and (5) is the probability of the respondent's district of residence being different to their district of birth. "South" indicates a dummy variable which equals 1 when an individual is from the south, conditional on their district of birth being historically over-represented, and "Over" represents the over-representation measure. Each row corresponds to an interaction with a particular cohort dummy. The covariates consist of the full list outlined in Section 6.

12 Graph Appendix

12.1 Fig 1

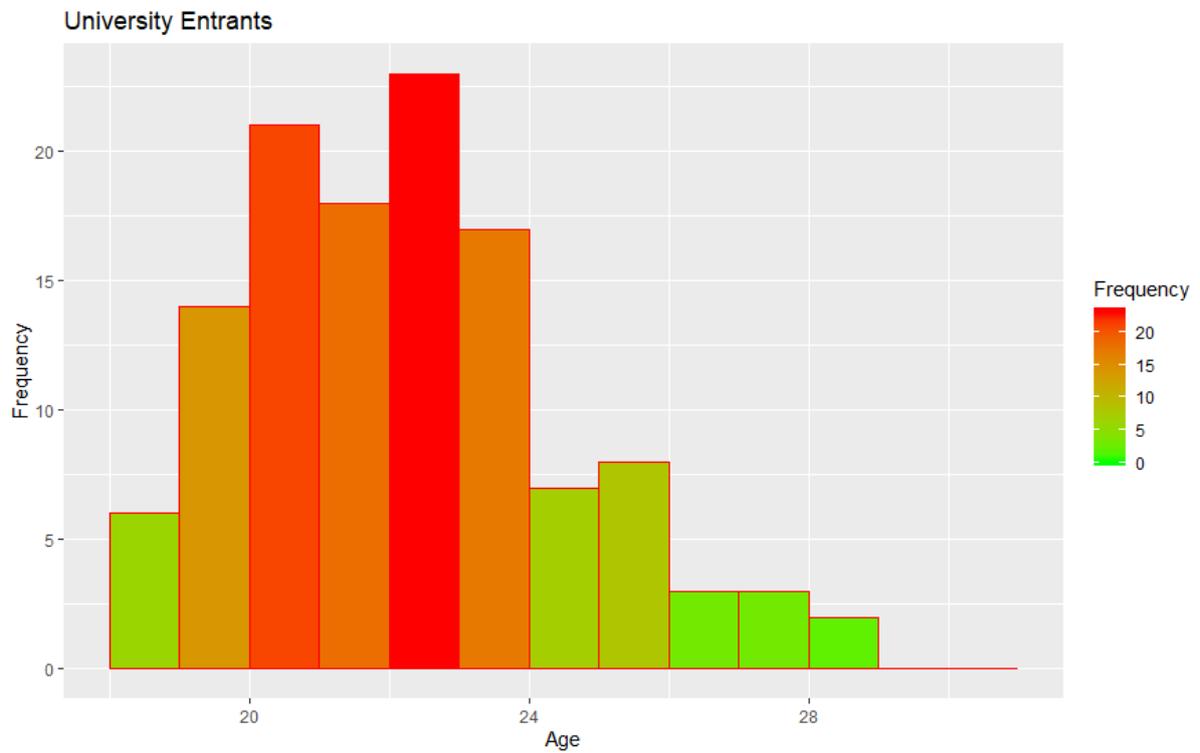
Figure 1: Age Distribution: 4th Year SS Students (1987)



The relevant sample is the 1987 census. The sample has been reduced to individuals who completed the third year of secondary school and also reported that they were still in school at the time of the census. This is a histogram of the ages of the aforementioned sample.

12.2 Fig 2

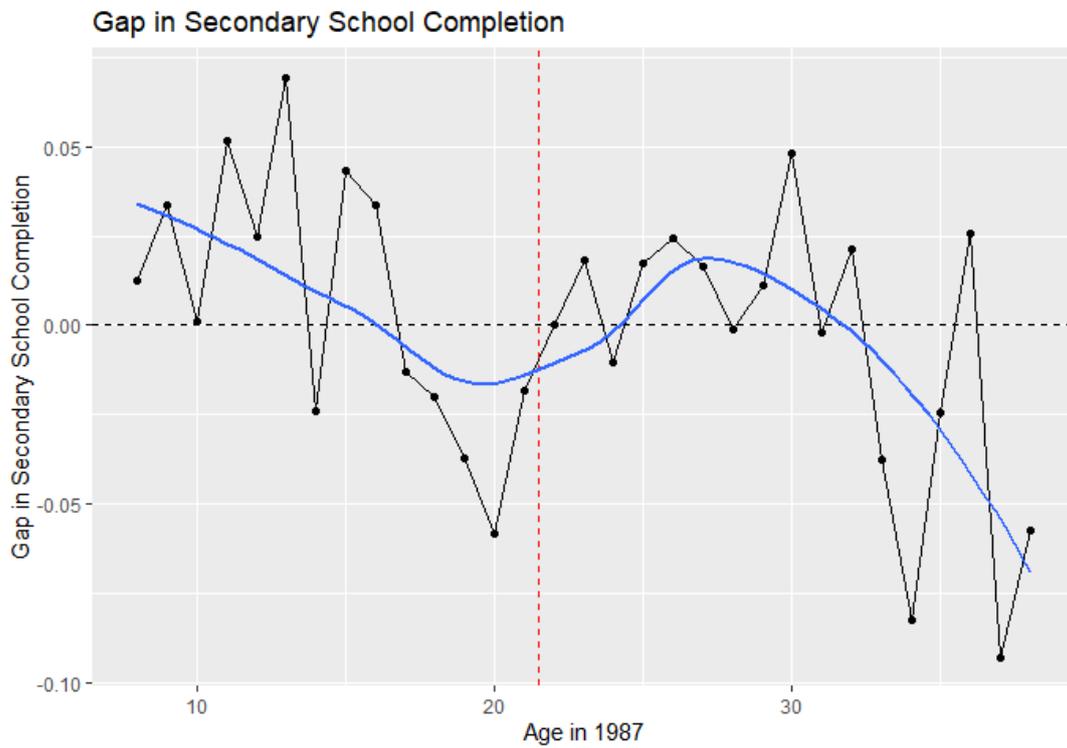
Figure 2: Age Distribution: University Entrants (1987)



The relevant sample is the 1987 census. The sample has been reduced to individuals who completed at least one year of university and also reported that they were still in school at the time of the census. This is a histogram of the ages of the aforementioned sample.

12.3 Fig 3

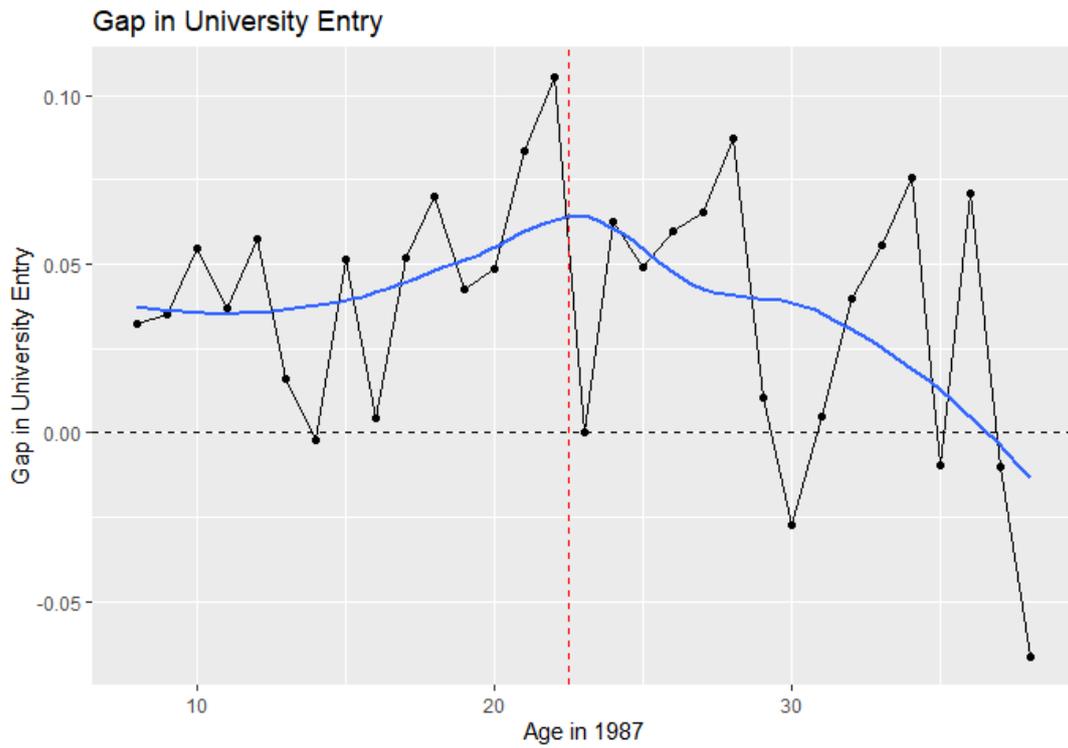
Figure 3: Gap in Secondary School Completion



The sample has been reduced to secondary school entrants. X-axis: age in 1987. Y-axis: Universal Southern – Northern share of students that graduated secondary school. The blue line represents a line of best fit using a loess smoothing function.

12.4 Fig 4

Figure 4: Gap in University Entry by Date

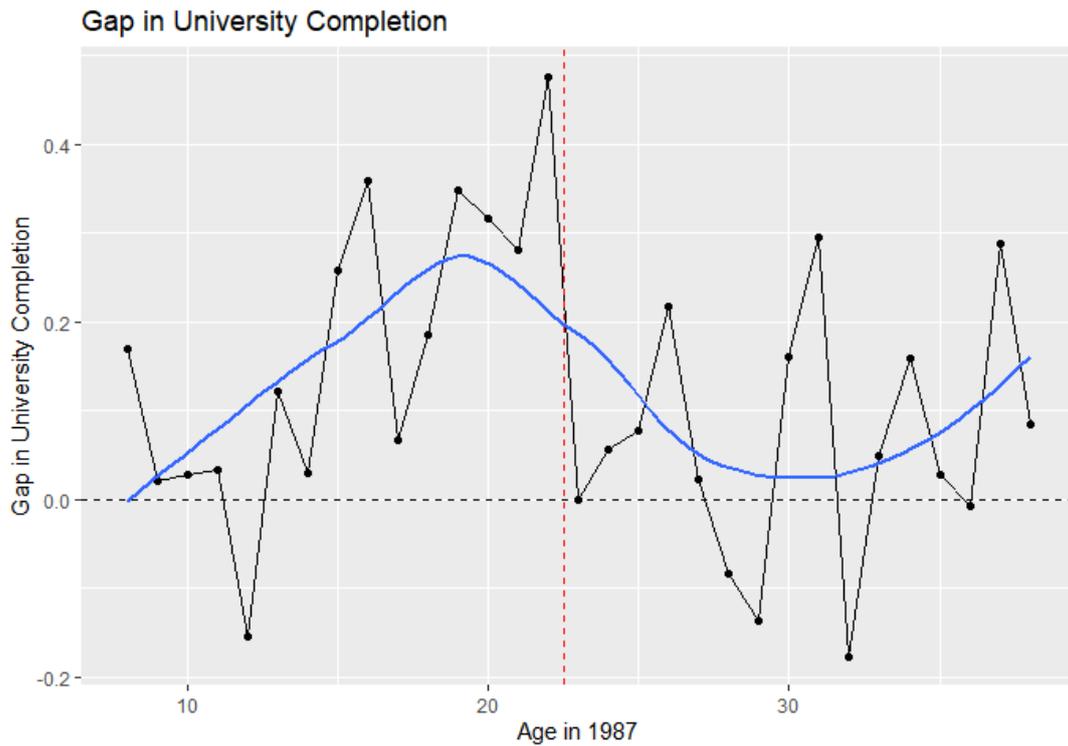


The sample has been reduced to secondary school graduates. X-axis: age in 1987. Y-axis: Universal Southern – Northern share of students that entered university. The blue line represents a line of best fit using a loess smoothing function.

12.5 Fig 5

12.6 Fig 6

Figure 5: Gap in University Completion

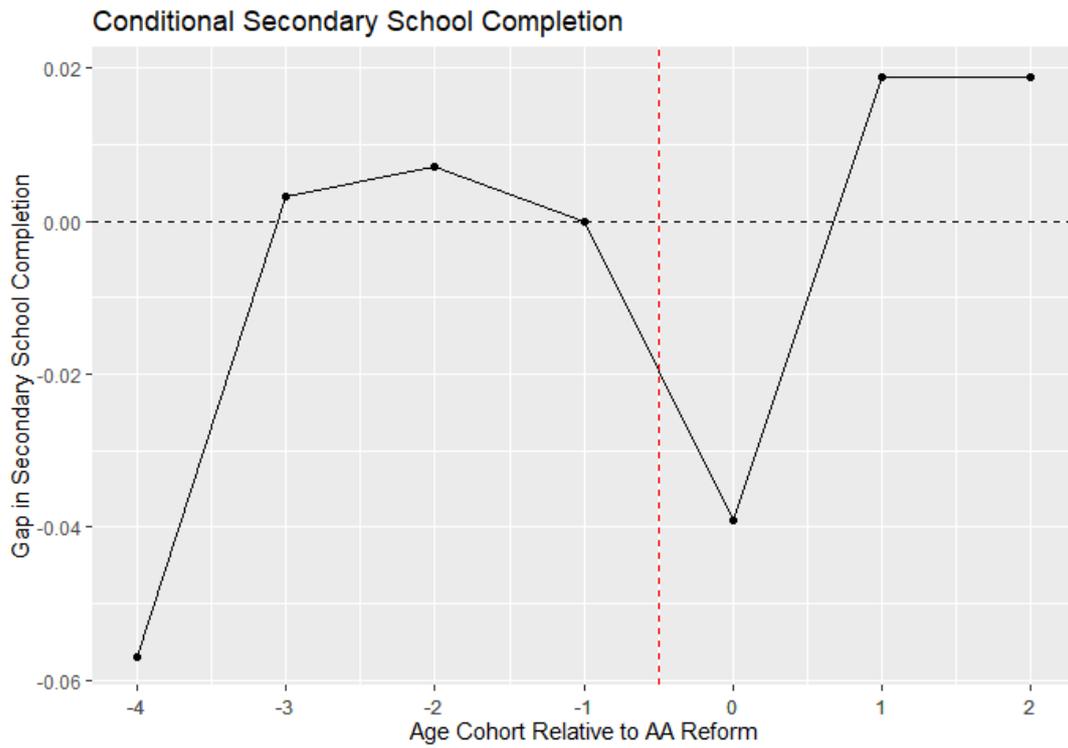


The sample has been reduced to university entrants. X-axis: age in 1987. Y-axis: Universal Southern – Northern share of students that graduated from university. The blue line represents a line of best fit using a loess smoothing function.

12.7 Fig 7

12.8 Fig 8

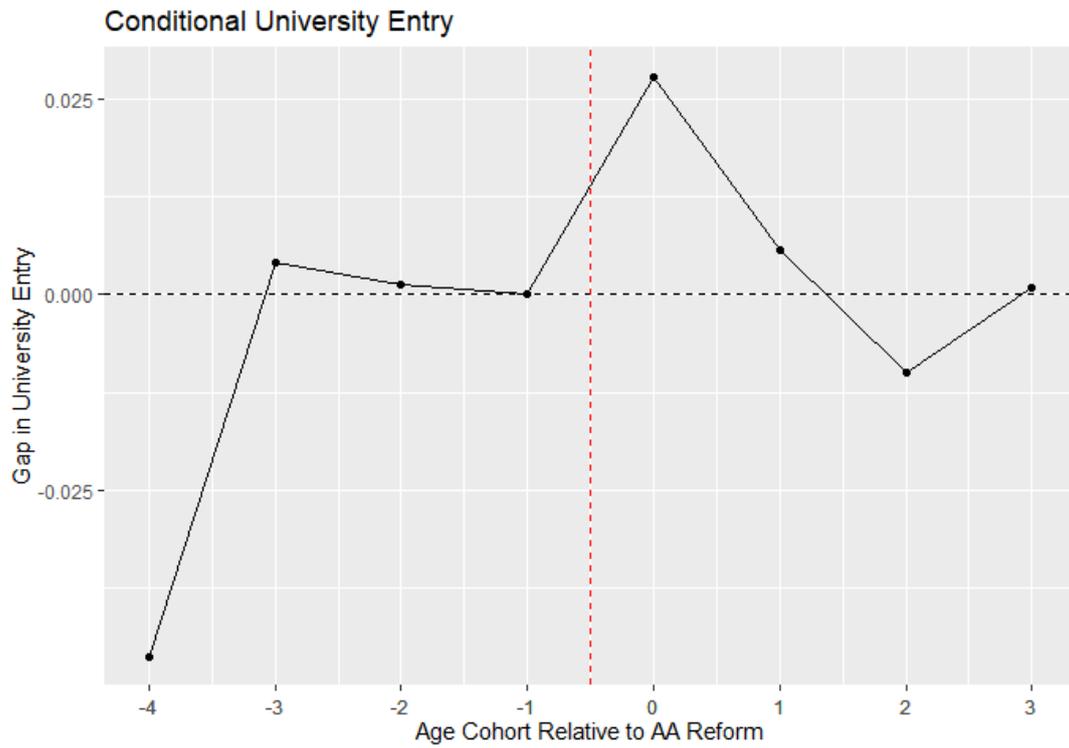
Figure 6: Gap in Secondary School Completion



The sample has been reduced to secondary school entrants. X-axis: age cohort relative to the cohort first impacted by the quota. Y-axis: Universal Southern – Northern share of students that graduated from secondary school.

12.9 Fig 9

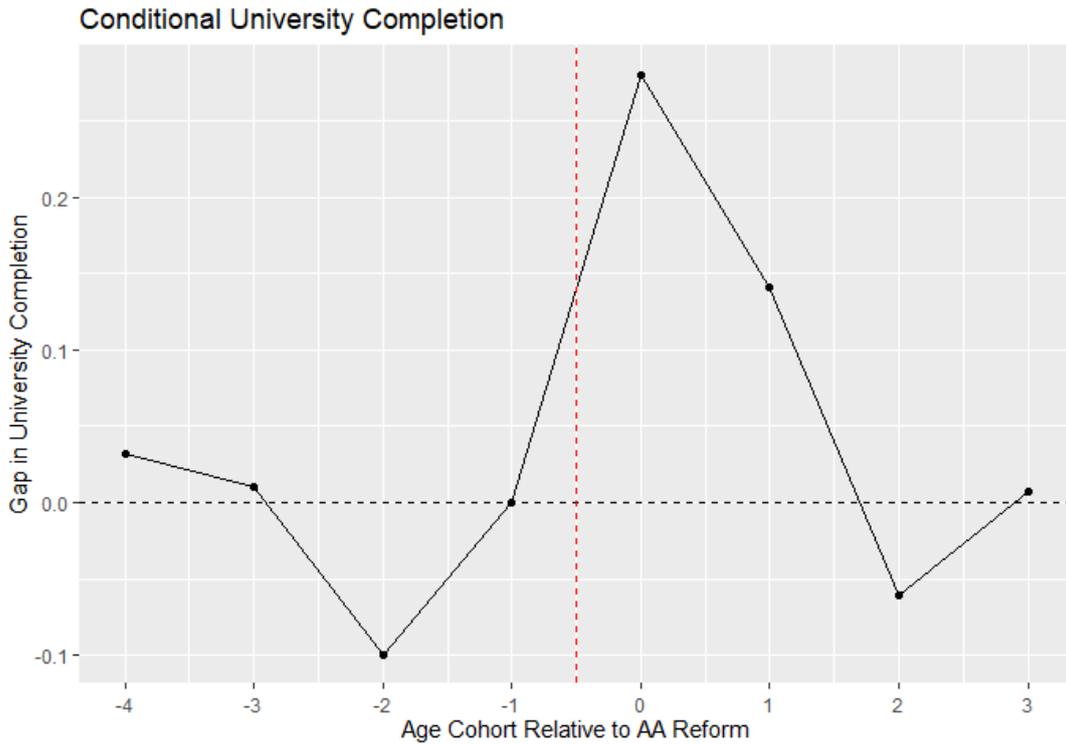
Figure 7: Gap in University Entry



The sample has been reduced to secondary school graduates. X-axis: age cohort relative to the cohort first impacted by the quota. Y-axis: Universal Southern – Northern share of students that entered university.

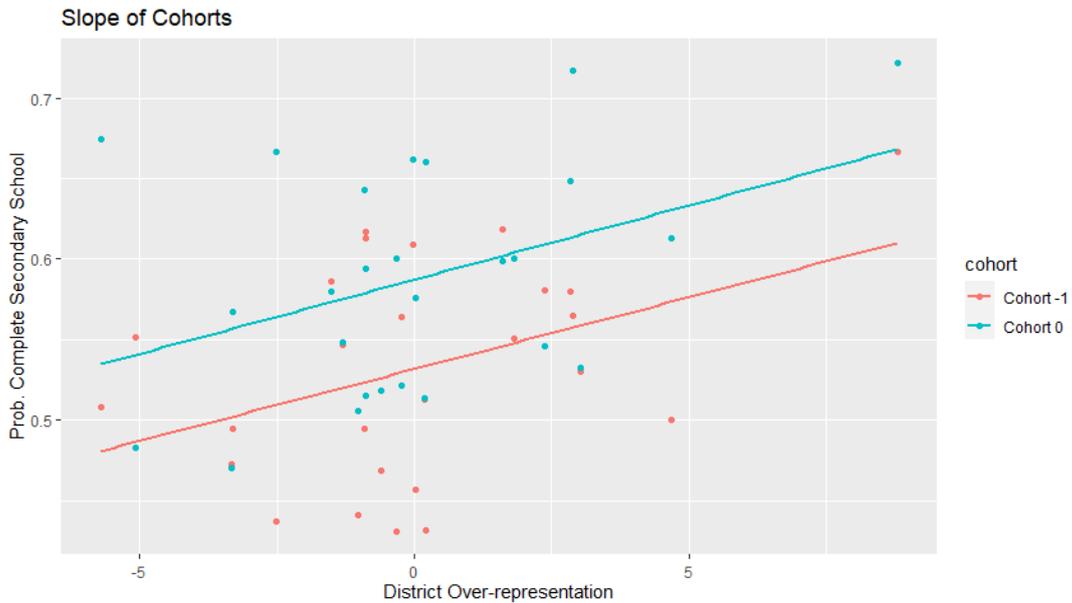
12.10 Fig 10

Figure 8: University Completion by Cohort



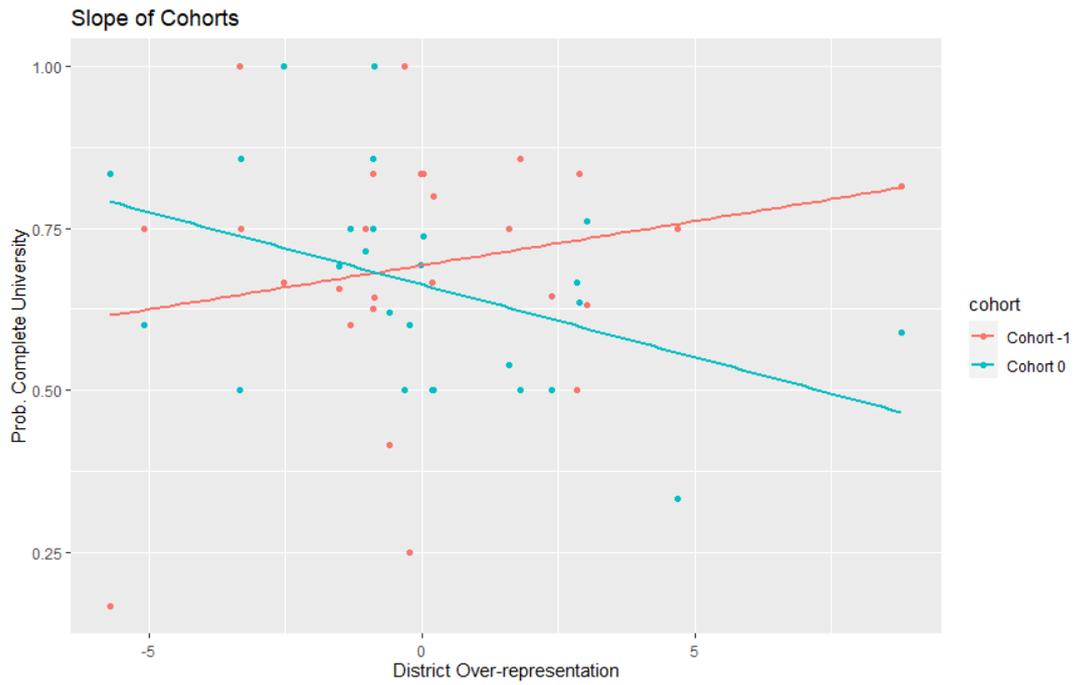
The sample has been reduced to university entrants. X-axis: age cohort relative to the cohort first impacted by the quota. Y-axis: Universal Southern – Northern share of students that graduated from university.

Figure 9: Slope Comparison: Secondary School Completion



The sample has been reduced to secondary school entrants. Each data point represents a district. X-axis: over-representation measure. Y-axis: share of students that graduated from university. Red: individuals in cohort 1. Blue: individuals in cohort 0.

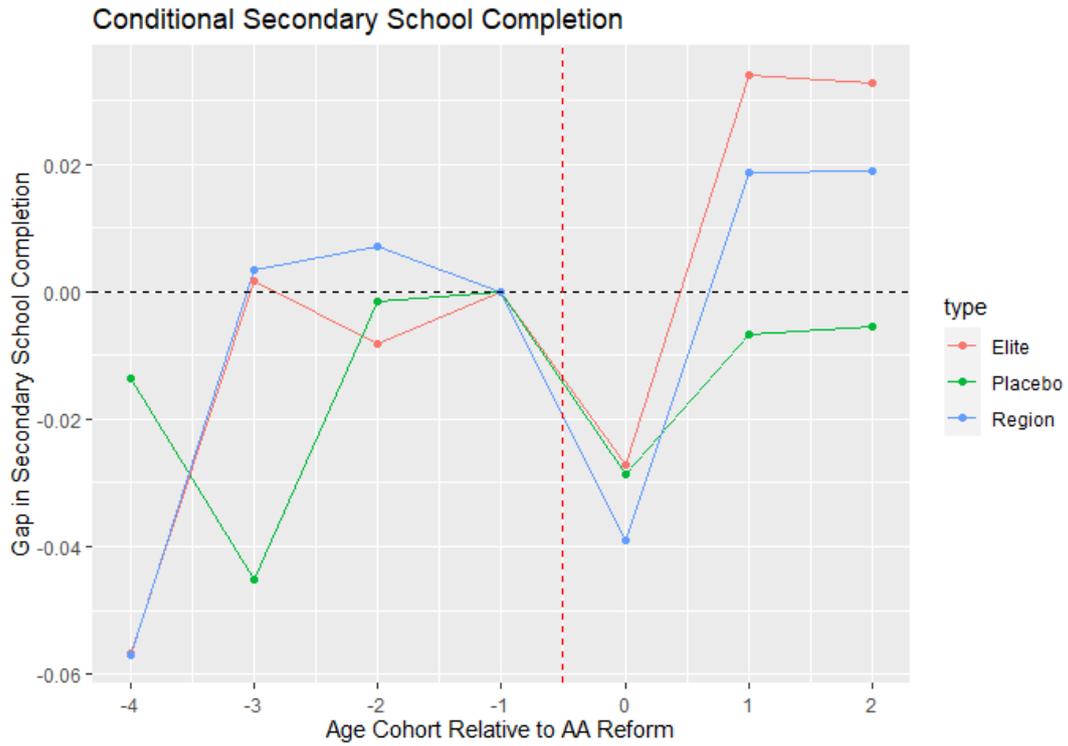
Figure 11: Slope Comparison: University Completion



The sample has been reduced to university entrants. Each data point represents a district. X-axis: over-representation measure. Y-axis: share of students that graduated from university. Red: individuals in cohort 1. Blue: individuals in cohort 0.

12.12 Fig 12

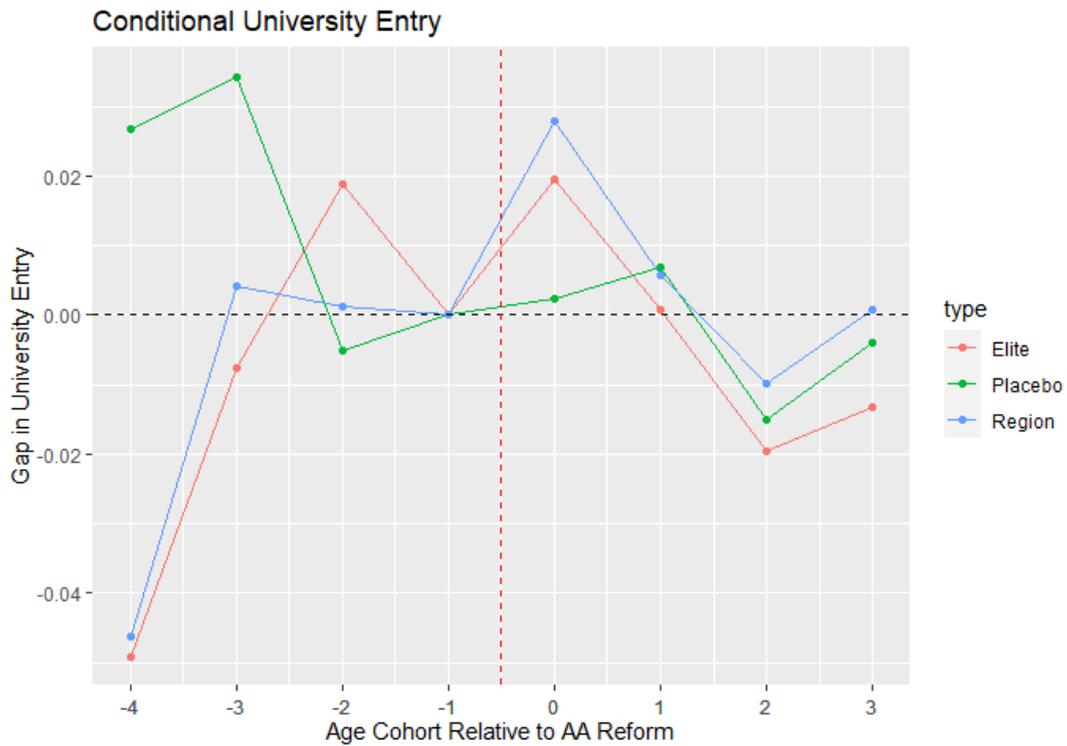
Figure 12: Placebo: Secondary School Completion



The sample has been reduced to secondary school entrants. Red vertical line: midpoint between cohorts 1 and 2. Region: Universal Southern–Northern graduation rate. Placebo: Southern–Central graduation rate (under-represented districts only). Elite: Southern (over-represented districts)- Northern graduation rate

12.13 Fig 13

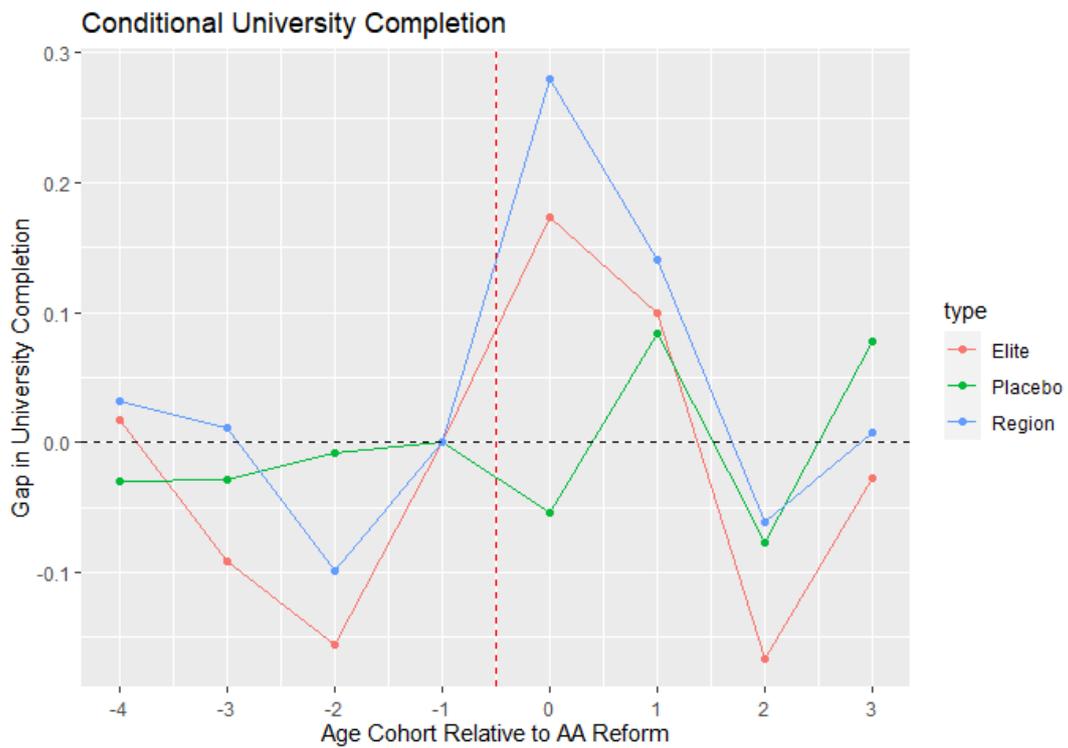
Figure 13: Placebo: University Entry



The sample has been reduced to secondary school graduates. Red vertical line: midpoint between cohorts 1 and 2. Region: Universal Southern–Northern entry rate. Placebo: Southern–Central entry rate (under-represented districts only). Elite: Southern (over-represented districts)-Northern entry rate

12.14 Fig 14

Figure 14: Placebo: University Completion



The sample has been reduced to university entrants. Red vertical line: midpoint between cohorts 1 and 2. Region: Universal Southern–Northern graduation rate. Placebo: Southern–Central graduation rate (under-represented districts only). Elite: Southern (over-represented districts)–Northern graduation rate