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Observing the Effects of Diversity on Performance in Ugandan Primary Schools

Sydney Baffour
Claremont McKenna College

Claremont Mckenna College

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Professor Jeffery Flory

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Sydney Baffour

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Abstract

The goal of all firms is to improve efficiency and performance, and previous literature suggests that diversity among teammates is a mechanism to improve productivity. This research uniquely extends previous understandings of horizontal and vertical diversity by examining school performance metrics as an important indicator of economic outcomes. Using data from the Centre for the Study of African Economies(CSAE) at the University of Oxford, I analyze vertical and horizontal diversity and its effects on teacher groups within Ugandan primary schools. Overall, my results suggest a minimally significant, but positive effect of gender and ethnic diversity on student performance outcomes. My findings contradict existing research, which may be in part due to the difference in work environments that my study utilizes for analysis.

Acknowledgements

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I would also like to thank Professor Antecol and Professor Gillen, whose courses provided me with skills that aided in the completion of this thesis, and I know will also help me with my academic endeavors later in life.

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Table of Contents

I. INTRODUCTION:

The goal of all firms is to improve efficiency and performance. Two of the most important mechanisms which shape these practices are worker dynamics and organizational relationships. Regardless of the size or location of a business, these relationships are critical in understanding what drives productivity and can yield better outcomes for any organization. Now, more than ever, firms have drawn their attention to diversity in the workplace and its effects on these relationships.

Existing literature on the topic explains that ethnic diversity can be interpreted in two dimensions. First, horizontal diversity describes the relationship between workers. Second, vertical diversity describes the hierarchical relationship between workers and managers. Some research suggests that the effects of the two dimensions of diversity are heavily dependent on the nature of the firm's output (Lazear 1999), while others interpret diversity as a positive input in production (Alesina and Wacziarg(2000). However, most existing research has focused on understanding ethnic diversity under "business" centric definitions of performance and productivity. I extend previous literature by examining vertical and horizontal diversity in a school setting, and apply these diversity metrics to teacher groups, and create measurements of performance based on student attendance and exam outcomes.

Using data from the Centre for the Study of African Economies(CSAE) at the University of Oxford, I find that more ethnically diverse teacher groups in the horizontal dimension have positive effects on student outcomes. My findings differ from existing literature, specifically that of Hjort(2014) and Marx et. al (2018) In the vertical dimension, I find that ethnic homogeneity has negative effects on student outcomes. Overall, my results suggest a minimally significant, but positive effect of gender and ethnic diversity on student performance outcomes. The

contradictory findings of my research to that of existing research may be in part due to the difference in work structure that my study uses for analysis, as it focuses on team structure within a school environment.

The remainder of this paper proceeds as follows: Section II covers the literature review, providing historical context on ethnic diversity in Africa , information on the Ugandan Primary Education system, and existing literature. Section III discusses the data. Section IV presents the empirical strategy and results of my study. And lastly, Section V concludes and interjects the limitations of my study as well as areas for future research.

1.1 Ethnic Fractionalization in Africa

On a global scale, Ethnic Fractionalization is identified as one of the driving factors of low rates of growth and economic limitation in Sub-Saharan Africa[1]. There are several reasons for this, such as visual differences, language barriers, and historical conflicts between tribes which stifles the successful interaction between groups, particularly in settings in which close interaction is required, such as firm or factory work.

Ethnic Fractionalization in Africa stems at least as far back as European colonialism. In 1885, European powers imposed territorial boundaries throughout the continent. These new lines were drawn with little to no consideration for the actual demographic makeup of the regions, and therefore resulted in drastic, unequal distributions of ethno-cultural groups within the colonized countries.[2] Post-colonial rule left former colonies transformed into some of the most ethnically fragmented regions in the world. Blanton et.al(2005) shows that this time of colonial disruption

[1] Levine, Ross, and William Easterly. "Africa's Growth Tragedy: A Retrospective, 1960 - 89." *Policy Research Working Papers*, 1999, doi:10.1596/1813-9450-1503.
[2] Robert Blanton, T. David Mason, and Brian Athow, "Colonial Style and Post-Colonial Ethnic Conflict in Africa," *Journal of Peace Research* 38, no. 4 (2001): pp. 473-491, https://doi.org/10.1177/0022343301038004005, 473.

also led to postcolonial cultural divisions of labor or "internal colonialism."[3] This system refers to the pattern of structural discrimination which inhibited members of certain ethnic groups to attain specific types of occupations and other social roles on the basis of observable cultural traits. This system persisted throughout all Sub-Saharan Africa, and has created societies in which ethnicity and class coincide. "As a consequence, ethnic identity is reinforced and ethnic solidarity is intensified because one's ethnic identity cannot be divorced from one's economic status and political interest(Blanton et. al 2005)." In the present, this has resulted in adverse effects in African society and economic infrastructure.

Uganda is also a country that shares the same challenges of ethnic fractionalization as it's East African neighbors[4]. Prior to colonization, the country was divided into four ruling Kingdoms which constituted the dominant ethnic groups. British colonial rule led to the forced relocation of several ethnic subgroups all over Uganda in an attempt to erase ethnic identities. The redrawing of boundaries within Uganda was followed by the British "divide and rule" strategy, which exploited pre-existing class structures within the country to implement their system of indirect rule. For example, the Acholi people of Uganda, at the time, were one of the smaller minority groups, and were therefore selected to receive British education. They later became the dominant ethnic group within the colonial civil service and police/military forces.[5] This cultivated factional rivalries among the different ethnic groups, which allowed for Britain to maintain a strong-hold within Uganda throughout the late 1800s and early 1900s. Subgroups from all four established Kingdoms still exist today, and currently there are over 40 subgroups

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[3] Ibid.475

[4] Ross Levine and William Easterly, "Africa's Growth Tragedy: A Retrospective, 1960 - 89," *Policy Research Working Papers*, 1999, https://doi.org/10.1596/1813-9450-1503, 35.

[5] Robert Blanton, T. David Mason, and Brian Athow, "Colonial Style and Post-Colonial Ethnic Conflict in Africa," *Journal of Peace Research* 38, no. 4 (2001): pp. 473-491, https://doi.org/10.1177/0022343301038004005, 480.

and 20 spoken languages in the country. On a micro level, this extreme diversity coupled with the internal colonization problem, has resulted in pockets of industry and public life with mixed populations of different ethnic groups.

1.2 The Ugandan Education System

In the first direct presidential election since Independence, Yoweri Museveni became the 9th President of Uganda in 1996. Shortly after, the administration implemented Uganda's free Universal Primary Education(UPE) program.[6] The program prompted the removal of primary school fees and increased government spending on primary education. Although this led to significant increases in primary school enrollment, school resources still remained a challenge. This in turn developed into the current structural problems within the country's primary schools, such as high rates of teacher absenteeism, inadequate teaching facilities, and weak school-level management structures.

These problems have resulted in poor outcomes on a national level. In 2006, 83% of primary-school-age children were attending primary school. However, out of that population only 53% actually completed primary education, and the numbers have remained consistent over time. [7] According to Unicef, 96% of primary-school-age children in Uganda were attending primary school in 2015; out of that population, 67% of children actually completed primary education.[8] The proportion raises serious concerns, and there exist several programs locally throughout Uganda aimed at alleviating some of the issues and structural inefficiencies through monetary and non-monetary aid.

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[6] David Stasavage, "The Role of Democracy in Uganda's Move to Universal Primary Education," *The Journal of Modern African Studies* 43, no. 1 (2005): pp. 53-73, https://doi.org/10.1017/s0022278x04000618, 53.
[7] "EPDC - Education Policy Data Center | Making Sense of Data ...," Education and Policy Data Center (fhi360), accessed May 11, 2020, https://www.epdc.org/.
[8] "Education." *UNICEF Uganda*, https://www.unicef.org/uganda/what-we-do/education.

School oversight groups like Parent Teacher Associations(PTA) and School Management Committees(SMC) actively work to enforce checks and balances over the institutional process within local community schools, such as creating teacher incentive structures based on student performance, reviewing teacher/pupil attendance rates, and actively meeting with school representatives. Although well-intentioned, complications still arise when one examines the actual effectiveness of these committees. For example, many SMCs struggle to make significant changes within the schools, as faculty members refuse to accept the input of the committees. Additionally, the desires of the SMCs do not always align with that of the PTAs, resulting in little progress made within the schools altogether. Lastly, SMCs have historically struggled with clear outlining of their roles, and consequently there exist some SMCs in which members do not actually understand their positions.[9] Conversely, the sentiment around PTAs has historically been positive. Their implementation was a result of the Education Act of 1963. PTAs were most notable for their aid in the increase of teaching salaries for Ugandan Primary teachers and their significant impact on fundraising for student school supplies.[10] However, as time progressed PTAs became a burden on parents as they increased school fees. Furthermore, a study conducted by van den Berg & van Noort (2011) found that most parents described communication with the PTAs to be challenging, as there were no direct mechanisms to contact their local organizations if they had complaints or questions[11].

These challenges still exist today, and it is evident that the success of the organizations heavily rely on parent participation and investment, which is low due to the high rates of poverty

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[9] Benedict Osei-Owusu and Francis Kwame Sam, "Assessing the Role of School Management Committees (SMCs) In Improving Quality Teaching and Learning in Ashanti Mampong Municipal Basic Schools," *Journal of Emerging Trends in Educational Research and Policy Studies* 3, no. 4 (2012): pp. 611-615, 612.
[10] John C. Ssekamwa, *History and Development of Education in Uganda* (Kampala: Fountain Publishers, 2000).
[11] Roos van den Berg and Lissy van Noort, "Parental Involvement in Primary Education in Uganda ," *Master Education, Socialization and Youth Policy* , 2011, 9.

in some Ugandan communities. Most parents work long days, which can impede parent involvement. Furthermore, high rates of illiteracy among parents further inhibit participation, as some parents do not understand the subject material that their child is learning, or do not feel comfortable talking to faculty about school matters. Lastly, extreme rurality in certain areas results in some parents living too far away from the school to be actively engaged.[12]

For Ugandan students, their time in primary education culminates with the Primary Leaving Exam(PLE). The PLE is a national examination which provides a certificate demonstrating completion of primary school. For all students in grade 7, a passing exam score acts as a prerequisite for entry into secondary education. The Uganda National Examinations Board began administering the exam across the country in 1966, and since then, the exam has solidified itself as an important benchmark in a young student's education. However, with the current challenges, students face severe disadvantages, particularly due to the lack of sufficient teachers, and high rates of teacher absenteeism.

The World Bank Service Delivery Indicator Report (2013) provides statistics regarding teacher absenteeism based on data collected from 400 primary schools across Uganda. The survey used a standardized methodology to measure absenteeism, characterized by unannounced visits to the school within a two week period. The survey found that, on average, 1 in 4 (24 percent) teachers were not in school. Furthermore, about the same share of schools (26 percent) had absenteeism rates higher than 40 percent. The report also shows that 1 in 3 teachers were not in the classroom teaching, and therefore absent from class. For every 100 teachers, only 39 teachers were in class teaching, 29 were in school but not in the classroom, and 24 could not be

[12] Ibid. 11

found (See Figure 1).[13] The report also calculated that out of the official teaching day of 7 hours 20 minutes, the average Primary 4 student would only experience about 3 hours 17 minutes of teaching and learning time with her teacher. These statistics raise extreme concern for students' preparedness, particularly for PLE performance.

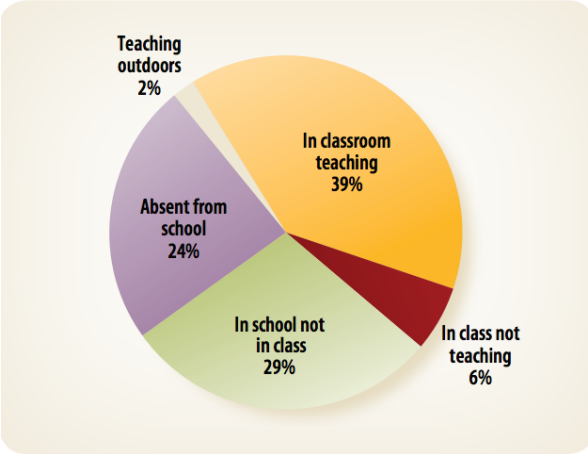

***Figure 1*: Absence from school and absence from class: Percent distribution of teachers by absenteeism status from the World Bank SDI Report(2003)**

II. LITERATURE REVIEW:

For educators and administrators, a school is of course a workplace, and as such it can be analyzed as an organization or a type of firm that produces educational outcomes for students. Research suggests that the structure of a team, as well as the demographic makeup of a firm can have costs and benefits to overall performance. Alesina and La Ferrara (2005) explain that ethnic diversity within a large population can affect economic outcomes in three ways. The first outcome stems from Social Identity Theory. As a characteristic of intergroup behavior, individuals may derive positive utility from the wellbeing of members from their own group, and negative utility to that of members of other groups. Secondly, diversity within a team can

[13] Waly Wane and Gayle H. Martin, "Education and Health Services in Uganda ," *Service Delivery Indicators-Education & Health* , November 2013, 6.

influence the strategies individuals use to attain their optimal utility, which may or may not align with overall optimal economic outcomes for the team as a whole. Even if individuals are indifferent to homogeneity, it may be optimal for them to transact with preference to members of one's own type if there are market imperfections (such as asymmetric information).[14] Ethnic affiliation may help to provide a reputation mechanism to mitigate these problems.

The last way in which ethnic diversity can affect economic outcomes is explained by the work of Alesina and Wacziarg(2000), which suggests that diversity can also be interpreted in economic models. Their research uses a Dixit Stiglitz production function, in which individual skills are entered into the function as intermediate inputs. Their model suggests that increases in measured diversity also increase total output. However, the function fails to address the known costs associated with increased diversity, such as stifled communication through language barriers and cultural differences.[15] The work of Lazear(1999) also adds to this theory. He identifies a tradeoff between the benefits of diversity and the potential costs from ethnically heterogeneous work environments, such as challenges with communication and cultural practices. Lazear argues that by accounting for the nature of the production and its technology, one can find an optimal level of heterogeneity that would give the best level of tradeoff.[16] This suggests that team diversity can provide benefits to overall firm production, but it is partly dependent upon the unique work setting characteristics.

2.1 Vertical and Horizontal Measurements of Diversity

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[14] Alberto Alesina and Eliana La Ferrara, "Ethnic Diversity and Economic Performance," *Journal of Economic Literature* 43, no. 3 (2005): pp. 762-800, https://doi.org/10.1257/002205105774431243, 2.
[15] Ibid.3
[16] Edward P. Lazear, "Culture and Language," *Journal of Political Economy* 107, no. S6 (December 1999), https://doi.org/10.1086/250105, 113.

Previous literature on diversity separates the analysis into two variations. Vertical diversity analyzes the hierarchical relationship between supervisor and employee; horizontal diversity analyzes the relationship among employees at the same level, or within a group.[17] Each can have effects on performance and productivity. According to the work of Prat(2002), team performance in the horizontal dimension has a direct link to team theory, and its success is heavily dependent on the categorization of desired product outcomes.[18] The research suggests that firms whose activities require "good fit" between various units will benefit most from homogeneous work-forces in order to maximize coordination. Conversely, if work activities depend on the exploitation of new opportunities, team structure will be more heterogeneous in order to maximize the chance of developing successful innovations. This theory is supported by the work of Lazear (1998), who's theory of the "global team" proposes that teams should be more likely to form between cultures that have easy communication and complementary knowledge or skills.[19]

Hoogendoorn and Praag(2012) examined the business performance of 45 companies consisting of 550 students from a business program in the Netherlands. Demographically, the sample consisted of 55% students with non-Dutch ethnicities. Other than intentionally varying the levels of ethnic composition, the teams were randomly composed. The levels of Dutch ethnicity per team ranged from 20%-90%. Their results concluded that ethnically diverse teams had significantly positive marginal effects on business performance, but only if the level of ethnic diversity is "substantial", meaning that the majority of the team is ethnically diverse. It is

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[17] Benjamin Marx, Vincent Pons, and Tavneet Suri, "Diversity and Team Performance in a Kenyan Organization ...," Harvard Business School (Harvard Business School, February 16, 2016),2.
[18] Andrea Prat, "Should a Team Be Homogeneous?," *European Economic Review* 46, no. 7 (2002): pp. 1187-1207,
[19] Lazear, Edward. *Globalization and the Market for Teammates*(National Bureau of Economic Research, May 1998), 3.

important to recognize that the study focused on ethnic diversity within the business program, and the students used in the study represented over 53 countries in total. Therefore, it is unclear if the results found would apply to a more narrowed definition of diversity, specifically if one were to analyze tribal diversity within one specific ethnicity.

The research conducted by Hjort(2014) and Marx et. al(2018) attempt to answer this question on a micro level. They observe ethnic diversity and its effects on economic performance within Kenya. Their research differs from that of Hoogendoorn and Praag(2012), as they focus on ethnic differences within the same nationality, as opposed to ethnic groups on a larger scale. In the vertical dimension, the research conducted by Hjort(2014) studied the effects of homogeneity on Kenyan flower packing plant workers. The workers were organized in teams of three, in which one "supplier" would use their discretion to distribute flowers downstream to two different "processors" who would then package the flowers for the final output product (See Figure 2). The researchers used quasi-random assignment to create three different ethnicity configurations. The first set of teams were homogeneous, meaning that all workers identified as the same ethnic group. The second set of teams were "vertically mixed" meaning that both processors were of a different ethnic group than the supplier. Lastly, the third set of teams were "horizontally mixed", meaning that only one processor was of a different ethnic group than the supplier.

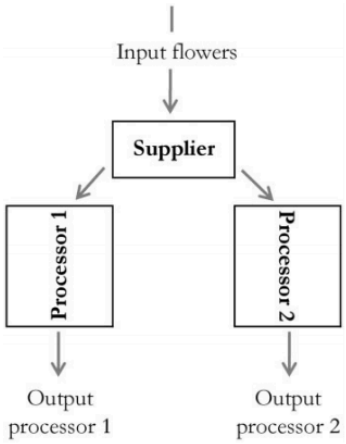

Figure 2: Visualization of flower packing plant team structure

The research found that overall performance of a firm saw an 8% decrease in productivity when the teams were vertically mixed. This suggests that individuals in the management role, or the "supplier" role were more likely to discriminate downstream to those below them in favor of team members who shared the same tribal affiliation. This meant that suppliers would undersupply processors of other ethnic groups, giving them less flowers, and in turn reducing the teams output. This would cause overall firm output to decrease, as not all co-ethnic processors were the most productive within the team. In the horizontal dimension, heterogeneous teams were 5% less productive than homogeneous teams. These findings seem to contradict that of Marx et. al(2018), whose study focused on a Kenyan voter canvassing organization to determine the effects of team diversity on management effectiveness. The study consisted of 60 canvassers divided into subgroups and pairs. Each canvassing team consisted of two canvassers who would report to one manager. Each manager was allocated four or five teams. Similar to Hjort(2014), "horizontally diverse teams" were defined as teams in which both canvassers had unique ethnic backgrounds." Vertically diverse" teams were defined as teams in which the ethnicity of the manager differed from that of both team members. Their study found that vertically homogenous teams performed poorly compared to the heterogeneous groups based on their performance

metrics.[20] However, they also find that ethnically homogenous teams in the horizontal dimension perform better by the same measurements of productivity, which supports the findings by Hjort (2014).

The contrasting results between the two studies around vertical diversity may be attributed to the nature of the defined output between the two studies. In the Hjort (2014) study, the manager of the vertically mixed team directly contributed to overall team output, supplying the resources to the downstream workers. However, in the Marx et. al(2018) study, the team manager had a more indirect contribution to team output, as they simply monitored canvassing activities, rather than completing the voter canvassing themselves. Furthermore, managers in the Marx et. al (2018) study acted as the manager role for multiple teams at once, unlike the managers in the Hjort (2014) study, who worked with only one team.

2.2 Contribution to Literature

The aforementioned studies make important strides in further understanding the effects of ethnic diversity on performance. This thesis contributes to this literature along several dimensions. First, most research on the impacts of ethnic diversity on performance has focused predominantly on economic outcomes related to firms, factories, and industry at large. Even in the most broad context, particularly in the study done by Hoogendoorn and Praag(2012), performance outcomes are derived entirely from "business" centric definitions of success. This paper uniquely extends the previous definitions of performance and productivity in this research by strictly analyzing school-based performance outcomes. I examine both vertical and horizontal diversity, and generate several variables to capture "team" demographics in a school

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[20]Marx, Benjamin, Vincent Pons, and Tavneet Suri. *Diversity and Team Performance in a Kenyan Organization*(Boston, MA: Harvard Business School, 2018),2.

environment. Horizontal diversity is defined by the characteristics of the teacher groups. To study diversity in the vertical dimension, the characteristics of the head teacher are also included, which account for the hierarchical structure of the work environment. This is similar to the construction of the teams analyzed in Hjort(2014) and Marx et. al(2018), as all teachers report to one head teacher(also known as a "headmaster"), who acts in a role similar to that of a firm manager, overseeing all teachers in a school. By expanding previous definitions of "firm success" and applying them to a school setting, this research can now look at the economic effects of diverse team environments through a new lens outside of existing research. To do this, I use a sample of primary schools in Uganda, which similar to Kenya, has a very distinct history of ethnic fractionalization. By studying the relationship between team composition, ethnic diversity, and performance, one can analyze how education(an important metric for economic success) is affected by the presence of ethnic homogeneity in learning environments.

III. DATA SECTION:

The analysis for this paper heavily relies on the data provided by the Centre for the Study of African Economies(CSAE) at the University of Oxford. The data was collected as the baseline survey for the project "Management and Motivation in Ugandan Primary Schools" in 2008. The project was part of a national initiative in close collaboration with the Ministry of Education and Sports(MoES) to improve the quality of education in primary schools funded by the Ugandan government.[21] The project collected information from four districts, each representing one of the four regions of Uganda. The districts, Kiboga (Central Region), Apac (Northern Region), Hoima(Western Region), and Iganga (Eastern Region) provided information on 25 primary

[21]"Centre for the Study of African Economies," management-and-motivation-in-ugandan-primary-schools-survey-2011 | General | Dataset, 2010, https://www.csae.ox.ac.uk/general/management-and-motivation-in-ugandan-primary-schools-survey-2011, 3.

schools(See Figure 3 in Appendix). A two-stage sampling procedure was also used in order to ensure that five sub-counties within each district contributed five schools per county.

My analysis specifically focuses on the report from the school questionnaire, which provided information regarding student, teacher, and headmaster demographics, as well as attendance rates and student PLE performance information. Each questionnaire was completed by the highest ranked school official, who was most often the headmaster. In order to maintain most accurate results, the observations used in the analysis only consist of schools which fully reported teacher group and head teacher demographics, which reduced the sample to 86 schools in the dataset.

3.1 Measurements of Diversity

I examine both horizontal and vertical diversity. First in the horizontal dimension, I identify if there is a tribe that represents at least 50% of the total teacher group(known as the "dominant tribe"). *Vertical homogeneity* acts as indicator variable which equates to 1 if the self-reported tribal affiliation of the head teacher(represented as *head teacher tribe)* matches the tribal affiliation of the dominant teacher group. I also look at vertical diversity by gender. Similarly, I identify if there is a dominant gender within the teacher group, and use *gender vertical homogeneity* to indicate whether the gender of the head teacher(represented as *head teacher gender)* matches that of the identified dominant gender within the teacher group. For teacher groups in which there were no calculated dominant gender or dominant tribal affiliation, the indicator variables automatically equate to 0. For example, if a teacher group of ten teachers consists of six teachers who identify as Kikuyu, the dominant teacher group is defined as Kikuyu. If the head teacher of the same school also identifies as Kikuyu, the *vertical homogeneity* variable equates to 1. However, If the head teacher were to identify as another

ethnicity, the variable would equate to 0. Similarly, if the teacher group had no tribal affiliation that represented more than 50% of the whole group, the *vertical homogeneity* variable equates to 0 regardless of the head teacher's tribal affiliation.

I use several methods in order to measure diversity in the horizontal dimension, all of which aim to capture homogeneity within the teacher groups. First I use the variable *dominant tribe proportion* to calculate the overall proportion of the identified dominant tribe within the teacher pool. Therefore, using the aforementioned example, a teacher group of ten that includes six Kikuyu teachers would have a *dominant tribe proportion* of .60. Second, the *shannon index* acts as an index measurement of diversity based on the Shannon Index for biodiversity used in Ecology.[22] The index accounts for both the abundance and the evenness of the various groups present, and is calculated with the formula:

(1) $$H' = \sum_{i=1}^{s} p_i \ln p_i$$

In which one first calculates the proportion of species *i* relative to the total number of species (p_i).Then the result is multiplied by the natural logarithm of this proportion ($\ln p_i$). Finally, the resulting product is summed across species, and multiplied by -1. Lower values indicate more diversity while higher values indicate less diversity. Although typically used to study eco-diversity, the Shannon Index has been used in previous literature to study racial and ethnic diversity among groups of people, as it allows for both the distribution and concentration of ethnic compositions to be taken into account at the same time.[23] Based on the observations in the sample, the *shannon index* ranges from 0 to 1.54. Lastly, when looking at the gender

[22] *M., Beals. "DIVERSITY INDICES: SHANNON'S H AND E." DIVERSITY INDICES, 2000. http://www.tiem.utk.edu/~gross/bioed/bealsmodules/shannonDI.html.*

[23] Jacqueline E. Mclaughlin, Gerald W. Mclaughlin, and Josetta Mclaughlin, "Using Composite Metrics to Measure Student Diversity in Higher Education," *Journal of Higher Education Policy and Management* 37, no. 2 (April 2015): pp. 222-240, https://doi.org/10.1080/1360080x.2015.1019124.

composition of the teacher groups, it is evident that most teacher groups are male dominated. Therefore, in order to analyze gender diversity, I calculate the proportion of women out of the total teacher group, and define this as the *female teacher ratio*.

3.2 Measurements of Performance

To analyze performance, the paper takes a unique approach by using attendance measurements. The *total dropout ratio* measures the proportion of students who dropped out of grade *x* out of all grade *x* students. The variables are measured for primary 1 through primary 7 (later referenced as p1 through p7). Second, the *total repeating ratio* measures the proportion of students who repeat grade *x* out of all grade *x* students. Both statistics have variables to capture total proportions as well as specific differences between male and female students. Each variable is also calculated for male and female populations separately.

The paper also includes analysis on the PLE exam. Due to the structure of the exam, all analysis of the PLE only describes specific effects on p7 students. However, the information gathered from this analysis is extremely relevant, as p7 determines the trajectory of the student for the rest of their academic careers. First the *total exam participation rate* calculates the proportion of students who sat the PLE exam out of all eligible students(all p7 students). The variable *total pass ratio* calculates the proportion of students who received a passing score on the exam out of all exam takers. To pass the exam, students must achieve a score from any of the scoring levels d1 to d4. For this analysis, the *total pass ratio* does not differentiate between the four score levels, and includes them all in the numerator of the calculation. Both the *total exam participation rate* and the *total pass ratio* are calculated twice for exam years 2006 and 2007. Similar to the attendance calculations, both variables are also repeated to analyze the effects on

male and female students separately in addition to the total student calculations. See Table 1 for all variable definitions.

Table 2 describes the summary statistics for the students across all grade levels for 2007 and 2008. One can see a significant decrease in the average enrollment as grade levels increase from p1-p7 for both male and female students in both years. These effects persist when comparing districts as well. Based on the data collected in 2008, Kiboga district had the lowest enrollment rates on average for both male and female class years, while the Apac district had the largest enrollment rates for both male and female class years. Table 3 presents the summary statistics for the teacher groups by district. In total, the survey reported information on 796 teachers. Similar to the student statistics, Apac district also had the largest sample of teachers. Conversely, the Hoima district was reported to have the lowest sample of teachers. Out of all schools surveyed, the teacher groups ranged from 1 to 12 teachers, with a significant proportion of more male teachers in comparison to female teachers, which is evident in all districts.

Table 4 presents the summary information for the PLE exam for both 2006 and 2007. The table presents the by-district means of both exam statistics. The standard deviations of each reported mean are below in parenthesis. In both years, the Hoima district achieved the highest calculated pass ratios relative to all other districts, and the Iganga district reports the lowest pass ratios in both years. Participation rates across all districts range from 70% to 90%. Table 3 does not depict any significant gender disparities in overall exam participation rates aside from the Hoima district's reported statistics in 2006.

It is important to note that there are some limitations to the use of the CSAE data. First, although the survey questionnaire provides a wide array of information regarding teacher demographics, the study does not examine student tribal affiliations in detail. The survey asks

schools to disclose information on the first, second, and third most present tribal groups, but does not delve further, which makes it difficult to analyze interactions between teachers and students in relation to ethnic diversity. Second, some schools fail to fully answer all questions in the survey, which resulted in gaps in reported student exam performance information. Lastly, the dataset uploaded to CSAE's database had significant missing sections and variables, which may have compromised later calculations. I hypothesize that vertical ethnic homogeneity will have positive effects on student attendance metrics and test scores.

Drawing on the research of Prat(2002), I hypothesize that the desired product outcomes of the primary schools (student success) depend on the exploitation of new opportunities, as student learning must be adapted to work for various student needs. Therefore in the horizontal dimension, teacher groups that are more diverse(both in ethnicity and gender) will see positive effects on student attendance and exam performance. In the vertical dimension, one can draw parallels between the role of a head teacher and the role of the managers in the study conducted by Marx et. al(2018), as both groups have indirect impacts on "firm" outcomes. Head teachers do not actually teach, but rather oversee teacher groups and monitor overall school logistics. For this reason, I hypothesize that more vertically homogeneous school teams (both in ethnicity and gender) will see positive effects on student attendance and exam performance, as head teachers who better identify with their teacher groups will produce more cohesive and effective work environments.

IV. EMPIRICAL STRATEGY & RESULTS

I use separate models to estimate the effects of diversity on attendance and PLE performance. For all models, I use OLS with robust standard errors. Each regression is run for

every grade when possible, and all PLE exam-related regressions are run twice for exam year 2006 and 2007.

4.1 Dropout Ratio

I first estimate the effects of diversity on dropout rates using a model of the following form:

(2)

$$DropoutRatio_{TP} = \alpha + \delta_1(Dominant\ Tribe\ Proportion) + \delta_2(female\ teacher\ ratio) + \beta_1(Vertical\ Homogeneity) + \beta_2(Gender\ Vertical\ Homogeneity) + \beta_3 X + \beta_4 Y + \epsilon_{TP}$$

where '$DropoutRatio_{TY}$' is the calculated ratio of students who dropout of grade 'P'. 'T' defines the analysis type: total class (T); a female-student-specific calculation(F); or a male-student-specific calculation(M). The first set of independent variables are the horizontal calculations, followed by the vertical diversity measurements. X is a vector of observable characteristics consisting of 'log*schoolsize'* , '*logschoolage*',and '*rurality'*. The variable '*logschoolage'* is adapted from the reported year of establishment of each school in the year 2007. The variable '*logschoolsize'* follows the same methodology based on the total number of students from the reported numbers of students currently enrolled. The log of each observation is taken to respond to the variance of reported school "ages". '*Rurality*' is adapted from reported distance (in kilometers) to the nearest town. The Y vector consists of variables representing the reported school districts. As previously mentioned, all participating schools were reported to reside within one of four districts. There are significant differences between the four districts, particularly the wealth by GDP. In 2017, Iganga District reported a GPA per capita that was $511 USD, the highest GDP per capita among all four districts surveyed. This is followed by Hoima district, Apac, and Kiboga with GDPs per capita of $449, $228, and $206 USD

respectively[24]. To account for this, I run the last regression model twice, the second time with district fixed effects. The variable 'ε' is an error term with the usual properties.

Table 4a shows the results for the full regression of the aforementioned effects on dropout ratios for the total student population in grade p6, ending with Model 5, with all control variables and district fixed effects. Models 6-9 present the regression results of the replicated Model 5 for grades p2-p5. The discussion of results for the attendance rates will focus on grades p6 and p7, the two oldest grades in the primary schools, in order to connect discussion to the PLE results, which solely focus on p7. Dropout ratio calculations are not available for grade p1, as it is the entry-level grade. Table 4a, Model 1-9 shows no significant effects of *dominant tribe proportion* on dropout ratios. However, the coefficient for *female teacher ratio* is negative and significant for grade p6(Coefficient = -.402; s.e. = 0.239) with district fixed effects. This is also evident in Models 6 and 9. Although the coefficient is negative, this is a positive effect, as it suggests that schools with an increase in female teaching staff saw lower dropout ratios. Additionally, one can see positive and significant coefficients for *vertical homogeneity*. As controls are added into the regression, the significance of the variable decreases. However, even with all controls and district fixed effects, *vertical homogeneity* is still found to be significant at the .01 level(Coefficient= 0.331; s.e= 0.175). The variable coefficient is positive, which suggests that vertically homogenous teams increased dropout ratios. The results support the research by Marx et. al(2018), which found vertical homogeneity to have negative effects on performance, as here dropout ratios being increased can be seen as a negative effect. However this result is not found

[24] Wang, Xuantong, Mickey Rafa, Jonathan D. Moyer, Jing Li, Paul Sutton, and Jennifer Scheer. "Estimation and Mapping of Sub-National GDP in Uganda Using NPP-VIIRS Imagery." *Frederick S. Pardee Center for International Futures, Josef Korbel School of International Studies, University of Denver*, 2018. https://doi.org/10.20944/preprints201811.0520.v1. p. 10

to be significant for grades p2-p5, which suggests the diversity effects on younger grades is less severe. Lastly, one can see a negative effect of *gender vertical homogeneity* with district fixed effects(Coefficient =-.117; s.e = 0.093), which suggests that vertically homogeneous teams had lower dropout ratios. This is also seen in Model 7 for grade p3.

Table 4b shows the results of the regression models for p7 students' total dropout ratios. The results show that there is a positive and significant effect of *dominant tribe proportion* on dropout ratios in Model 3(Coefficient = .332; s.e = 0.158). These results are unique, as no other grade level regression finds effects from horizontal ethnic homogeneity. This suggests that, particularly for p7 students, more homogeneity amongst teacher groups increases dropout ratios. However, this effect becomes insignificant when adding district controls to the regression. Vertical homogeneity effects persist through each model in the regression. Model 5 results show that the coefficient on *vertical homogeneity* is negative and significant at the .001 level(Coefficient = -.676; s.e. = 0.190) This shows that unlike all other grades, p7 students see better outcomes when teacher groups are vertically homogeneous. However the results for p7 students by gender differ significantly.

Table 4c and 4d show the regression models for p7 male students and female students respectively. Looking at the coefficients for *dominant tribe proportion*, it is evident that the variable had stronger effects on male students than female students. Models 3 and 4 in Table 4c and 4d show that the coefficient of the variable to be higher for male students than female students, and the difference increases as the model adds more controls into the regression. One can also see larger coefficients for *vertical homogeneity*. Although for both male and female students, the variable is highly significant. It is also important to note that when looking at the regressions separately there are significant positive effects from *logschoolsize*. The results

suggest that larger school sizes increased dropout ratios, which is to be expected, as larger student populations may decrease individualized assistance from teachers, making it more difficult for struggling students to succeed.

4.2 Repeating Ratios

The total repeating ratio, estimates the proportion of students who repeat a specific grade level. I estimate the effects of diversity on the dropout rates using a model of the following form: (3)

$$RepeatingRatio_{TP} = \alpha + \delta_1(Dominant\ Tribe\ Proportion) + \delta_2(female\ teacher\ ratio) + \beta_1(Vertical\ Homogeneity) + \beta_2(Gender\ Vertical\ Homogeneity) + \beta_3 X + \beta_4 Y + \epsilon_{TP}$$

Table 5a presents the results for the full regression starting with grade p6, followed by the regressions with fixed effects for grades p2 through p5 in columns 7-10. The results show no significant effects for *dominant tribe proportion* on total student repeating ratios for any grade level. The coefficient for *female teacher ratio* appears to only be significant for grade p2 with district fixed effects(Model 7). However, one can see significant coefficients for *vertical homogeneity* in Models 2, 3 , and 4. The positive coefficients suggest that vertical homogeneity increases repeating ratios, similar to the results found in the dropout ratio analysis. The coefficient becomes insignificant once school and district effects are added to the model, and this effect is consistent for every grade year except for p5, in which the coefficient was found to be significant at the .10 level. Looking at grade p7 separately, there are no significant effects from any of the diversity variables in the regression. Similar to the dropout ratio analysis, there are some differences in regression results when comparing between the genders. Tables 5c and 5d show the regression analysis for grade p7 for male students and female students respectively. For female students, the *dominant tribe proportion* seems to have a negative effect on repeating

ratios when adding district fixed effects (Coefficient = -0.160; s.e = 0.074). However the variable has no significant effect on male students.

4.3 Exam Participation

I estimate the effects of diversity on total exam participation rates using a model of the following form:

(3)

$$EPRate_{TY} = \alpha + \delta_1(Shannon\ Index) + \delta_2(female\ teacher\ ratio) + \beta_1(Vertical\ Homogeneity) + \beta_2(Gender\ Vertical\ Homogeneity) + \beta_3 X + \beta_4 Y + \epsilon_{TP}$$

in which the variable *EPRate* is the calculated exam participation rate. The subscript 'T' defines the population type of the ratio, and the subscript 'Y' defines the year of the calculation. It is also important to note that for all PLE exam related regressions, the *shannon index* acts as the horizontal measurement of diversity rather than the *dominant tribe proportion*. Table 6a presents the results for the regressions for both 2006 and 2007. Table 6a does not show any significant effects from either vertical or horizontal diversity metrics. However, Table 6b and 6c reveal that there is a slight disparity in effects by gender. Although there appear to be no significant effects from either horizontal measurement of diversity on male students' exam participation rates, the coefficient for the *shannon index* to be positive and significant (before adding district fixed effects)for female students. The result is interesting, as it appears that the *dominant tribe proportion* only has significant effects for the 2006 exam participation rates. The coefficient for *female teacher ratio* is also significant with district fixed effects in Model 9 (Coefficient = -0.483; s.e = 0.283). This suggests that female students were more negatively impacted by increased teacher gender diversity in teacher groups. One can also see effects from *vertical homogeneity* and *gender vertical homogeneity* in the same year. The coefficient for *vertical*

homogeneity is negative and significant without adding district fixed effects, as seen in Model 5 (Coefficient = -0.182; s.e = 0.098) and Model 7(Coefficient = -0.221; s.e = 0.107). This suggests that homogeneity in teacher groups in the vertical dimension decreased female exam participation rates. The coefficients for *gender vertical homogeneity* are also significant, and maintain significance with district effects. They suggest that gender-based vertical homogeneity had a negative effect on female exam participation rates.

4.4 Pass Ratios

I estimate the effects of diversity on total pass ratios using a model of the following form: (4)

$$PassRatio_{TY} = \alpha + \delta_1(Shannon\ Index) + \delta_2(female\ teacher\ ratio) +$$

$$\beta_1(Vertical\ Homogeneity) + \beta_2(Gender\ Vertical\ Homogeneity) + \beta_3 X + \beta_4 Y + \epsilon_{TP}$$

Table 7a presents the results for the model for both 2006 and 2007. The coefficient for the *shannon index* is positive and significant in columns 7(Coefficient = 0.125, s.e = 0.072) and 9(Coefficient = 0.143, s.e =0.069). The effect increases and becomes more significant as controls are added. This suggests that more diverse teacher groups had a positive effect on student pass ratios. However it is also important to note that although statistically insignificant, the coefficients for the *shannon index* are negative for student pass ratios in 2007, seen in Models 6,8, and 10. A similar effect is seen with the coefficients for the *female teacher ratio*, which are positive and significant for pass ratios for the year 2007, but insignificant for 2006 pass ratios. There is .013 decrease between Model 6 (Coefficient:0.245, s.e:0.127) and Model 8(Coefficient:0.232, s.e: 0.134), which suggests that controlling for school and district effects weaken the overall effect of the variable. There are also significant effects from *logschoolsize* in Model10(Coefficient: 0.169, s.e:0.057), which imply that larger schools saw better pass ratios for

total students, which is not to be expected as larger school sizes implies larger class sizes, which would typically harm student learning.

Table 7b and 7c describe the gender-specific regressions. Table 7c shows that the positive effects from the *shannon index* variable are mainly driven by the female students. Model 7(Coefficient:0.134, s.e:0.079) and 9 (Coefficient:0.192, s.e: 0.086) show the same effects found in Table 7a, and these effects are not found in Table 7c for male students. Both male and female students show significant effects from the *female teacher ratio.* It is also important to note that the effects are still only persistent for the year 2006. The effects in both 7b and 7c show the coefficients of the variable to be positive, and therefore one can infer that both male and female students see positive impacts on pass ratios from increased female teachers in teacher groups.

V. CONCLUSION

The role of diversity in work performance and productivity has long been a topic of economic research. Existing literature has established that diversity can have significant impacts on economic outcomes by encouraging intergroup behavior, changing transaction strategies, and acting as in input into the production function(Alesina and Waczairg 2000). Previous studies suggest that vertically mixed teams experience reduced productivity due to worker downstream discrimination. However, there is conflicting research that finds both positive and negative effects from horizontal homogeneity.

To contribute to this literature, I examine ethnic and gender diversity in two dimensions and its effects on teacher groups within Ugandan primary schools. I create two diversity measurements using the proportions of the dominant tribe within the teacher groups and the Shannon Index. This research uniquely extends previous understanding of horizontal and vertical

diversity by examining school performance metrics as an important indicator of economic outcomes.

I find that more ethnically diverse teacher groups in the horizontal dimension have positive effects on student outcomes, particularly on student dropout ratios and student pass ratios. This supports my hypothesis, but contradicts the finding by Hjort(2014) and Marx et. al(2018). However, these effects are also found to be minimally significant. In regards to gender, the effects of horizontal homogeneity are inconclusive, as increased diversity had a positive effect on dropout ratios but little to no effect on the other measurements of performance. In the vertical dimension, ethnic homogeneity increased dropout ratios and repeat ratios, but decreased pass ratios. Although this finding rejects my hypothesis, it supports the findings of Marx et. al(2018) which found negative effects on productivity from vertical homogeneity. Although my results also find negative impacts on exam participation, gender homogeneity in the vertical dimension had mainly positive effects, reducing drop out ratios and increasing pass ratios. Overall, my results suggest a minimally significant, but positive effect of gender and ethnic diversity on student performance outcomes. The contradictory findings of my research to that of existing research may be in part due to the difference in work structure that my study uses for the analysis.

5.1 Limitations and Future Research

There are some limitations to my research. First, as previously mentioned, my research utilizes data from the CSAE "Management and Motivation in Ugandan Primary Schools" project. Because of the limited information regarding specific student tribal affiliations, my research could not identify the demographic makeup of the classes, nor identify which tribal group was teaching them. This would have made the analysis stronger in regards to how different

ethnic backgrounds interact in the same environment. Furthermore, most of my regressions relied heavily on limited data points, as some schools failed to report important performance metrics that were incorporated into my calculations, this in turn may have impacted my findings. Lastly, the teacher groups for most of the schools were heavily male-dominated, making male teacher groups overrepresented in the data. Future research could continue to examine vertical and horizontal diversity through the lens of school work environments, as the area of research is still rarely explored. Further analysis that takes into account student demographics, as well as more school-related controls could also lead to more interesting findings in this subject of research.

VI. Appendix

Figure 3: Map of Uganda with highlighted survey regions

Table 1
Data Definitions

Variable	
shannon	Index measurement of diversity;lower values indicate more diversity while higher values indicate less
dominant tribe	Tribe that represents at least 50% of the teacher group
dominant gender	Gender that represents at least 50% of the teacher group
dominant tribe proportion	Proportion of the dominant tribe in the teacher group
female teacher ratio	Proprotion of female teachers in the teacher group
vertical homogeneity	Indicator variable; equal to 1 if the head teacher tribe matches the dominant tribe
gender vertical homogogeneity	Indicator variable; equal to 1 if the head teacher gender matches the dominant gender of the teacher group
head teacher tribe	Tribe of the head teacher
head teacher gender	Gender of the head teacher
logschoolsize	Logged value of total number of students in all grade levels
logschoolage	Logged reported age tof each school in the year 2007
rurality	Reported distance (in kilometers) to the nearest town
exam participation rate	Ratio of students who took the exam out of all eligible students(all p7 students)
repeating ratio	Ratio of students repeating p7 from last year
pass ratio	Ratio of students who passed(received a d1-d4 score) the exam out of total students who took the exam

Table 2

Student Summary Statistics

	2007				2008			
District	**Male**		**Female**		**Male**		**Female**	
APAIC	**mean**	**sd**	**mean**	**sd**	**mean**	**sd**	**mean**	**sd**
p1	58.04	36.09	29.79	38.9	70.54	26.67	71.58	28.76
p2	51.42	30.42	30.04	30.96	59.42	25.4	61.88	25.89
p3	50.38	29.25	30.63	33.13	59.13	25.08	61.5	26.98
p4	46.08	25.02	30.75	30.9	59.88	22.44	61	23.95
p5	46.5	27.52	26.33	23.67	55.96	23.51	56.63	30.33
p6	44.5	28.69	26.46	26.64	46.46	22.59	46.88	30.52
p7	25.29	15.61	16.33	13.15	28.96	15.77	23.13	13.83
HOIMA								
p1	54.94	42	35.29	31.04	56.24	44	47.71	39.87
p2	44.94	32.04	29	22.62	44.76	30.77	40.65	23.09
p3	41.71	26.2	31.25	20.54	42.59	21.98	39.41	22.52
p4	38.12	23.76	22.69	19.7	37	22.7	30.71	16.65
p5	29.76	17.5	21.71	18.31	34.06	16.96	29.82	17.57
p6	24.35	15.42	22.82	16.51	27.12	16.22	24.94	14.6
p7	11.65	10.21	12.35	10.15	15.65	10.51	17.35	10.79
IGANGA								
p1	66.91	30.76	66.74	25.55	63.26	21.32	65.35	22.21
p2	44.09	18.18	45.3	18.59	48.78	19.66	48.91	18.83
p3	49.13	21.56	49.48	19.98	48.09	17.49	49.57	19.37
p4	44	20.14	45.13	17.66	46.7	19.56	49.3	21.39
p5	42.09	16.85	43.04	18.72	43.87	18.27	40.83	18.04
p6	31.83	15.17	32.43	16.96	32.35	13.64	33.09	15.95
p7	19.09	14.06	19.22	13.49	22.71	15.15	19.76	12.59
KIBOGA								
p1	55.89	23.79	43.98	23.08	42.55	22.05	39.65	23.74
p2	42.83	14.19	34.23	13.28	29.95	15.15	32.58	18.71
p3	43.18	19	35.91	21.17	29.74	18.28	30.42	19.74
p4	39.65	17.42	32.95	18.79	29.26	16.36	30.95	17.61
p5	36.71	22.22	29.22	20.55	23.74	17.53	23.89	19.17
p6	31.19	18.47	26.24	20.79	18.56	19.22	20.79	20.76
p7	17.93	10.88	15.76	11.46	14.95	12.9	15.79	14.32

Table 3

Teacher Summary Statistics

	Male			Female			
district	**mean**	**min**	**max**	**mean**	**min**	**max**	**Total**
APAIC	8.13	1	12	2.08	0	6	248
HOIMA	4.94	2	9	3.83	0	7	163
IGANGA	5.48	3	8	3.48	0	9	213
KIBOGA	5.14	2	8	2.91	0	9	172

Table 4a

Dependent Variable: Total Dropout Ratio(grades p2-p6)									
Independent Variable	(1) p6	(2) p6	(3) p6	(4) p6	(5) p6	(6) p2	(7) p3	(8) p4	(9) p5
dominant tribe proportion	0.040		0.040	0.034	-0.027	-0.032	0.067	-0.021	-0.099
	(0.112)		(0.107)	(0.120)	(0.127)	(0.142)	(0.149)	(0.138)	(0.153)
female teacher ratio	-0.151		-0.164	-0.175	-0.402*	-0.481*	-0.431	-0.420	-0.527*
	(0.174)		(0.189)	(0.202)	(0.239)	(0.272)	(0.286)	(0.265)	(0.293)
vertical homogeneity		0.310***	0.273***	0.253***	0.331*	0.223	0.242	0.251	0.277
		(0.070)	(0.082)	(0.092)	(0.175)	(0.200)	(0.211)	(0.195)	(0.214)
gender vertical homogeneity		-0.060	-0.098	-0.121	-0.177*	-0.152	-0.218*	-0.094	-0.140
		(0.067)	(0.079)	(0.088)	(0.093)	(0.106)	(0.111)	(0.103)	(0.113)
logschoolsize				0.046	0.065	0.141	0.091	0.157	0.119
				(0.090)	(0.098)	(0.107)	(0.113)	(0.104)	(0.117)
logschoolage				0.007	0.004	-0.056	-0.020	-0.056	-0.053
				(0.056)	(0.056)	(0.064)	(0.067)	(0.062)	(0.069)
rurality				-0.0003	-0.0018	0.0001	-0.0001	-0.0010	-0.0006
				(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
District Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes
_cons	0.242*	0.181***	0.242*	-0.031	0.037	-0.203	-0.047	-0.363	0.007
	(0.128)	(0.056)	(0.132)	(0.515)	(0.560)	(0.591)	(0.621)	(0.575)	(0.651)
N	73	73	73	69	69	71	71	71	70

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, ***p<0.01

Table 4b

Dependent Variable: Total Dropout Ratio(p7)					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	0.0391		0.332**	0.279	0.0937
	(0.141)		(0.158)	(0.174)	(0.150)
gender horizontal homogeneity	0.0576		-0.186	-0.193	0.326
	(0.219)		(0.285)	(0.297)	(0.284)
vertical homogeneity		-0.554***	-0.374***	-0.436***	-0.676***
		(0.162)	(0.119)	(0.131)	(0.190)
gender vertical homogeneity		0.030	0.080	0.098	0.080
		(0.078)	(0.116)	(0.126)	(0.105)
logschoolsize				0.225*	-0.050
				(0.127)	(0.107)
logschoolage				-0.054	0.045
				(0.078)	(0.063)
rurality				-0.0007	0.0028
				(0.003)	(0.003)
District Fixed Effects	No	No	No	No	Yes
_cons	0.166	0.333	0.118	-1.05	0.337
	(0.27)	(0.22)	(0.20)	(0.73)	(0.62)
N	69	69	69	65	65

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 4c

Dependent Variable: Male Dropout Ratio(p7)					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	0.0718		0.361**	0.307**	0.119
	(0.131)		(0.141)	(0.149)	(0.121)
gender horizontal homogeneity	-0.0698		-0.221	-0.233	0.187
	(0.204)		(0.255)	(0.253)	(0.230)
vertical homogeneity		-0.650***	-0.525***	-0.586***	-0.752***
		(0.143)	(0.106)	(0.112)	(0.154)
gender vertical homogeneity		0.08	0.119	0.167	0.133
		(0.069)	(0.104)	(0.108)	(0.085)
logschoolsize				0.245**	0.00877
				(0.108)	(0.087)
logschoolage				-0.071	0.0142
				(0.067)	(0.051)
rurality				-0.000721	0.00247
				(0.003)	(0.002)
District Fixed Effects	No	No	No	No	Yes
_cons	0.166	0.333	0.118	-1.05	0.337
	(0.27)	(0.22)	(0.20)	(0.73)	(0.62)
N	69	69	69	65	65

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 4d

Dependent Variable: Female Dropout Ratio(p7)					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	0.007		0.302*	0.241	0.060
	(0.147)		(0.164)	(0.181)	(0.159)
gender horizontal homogeneity	0.132		-0.120	-0.142	0.400
	(0.229)		(0.296)	(0.308)	(0.302)
vertical homogeneity		-0.534***	-0.328***	-0.392***	-0.661***
		(0.171)	(0.124)	(0.136)	(0.203)
gender vertical homogeneity		0.015	0.080	0.082	0.069
		(0.083)	(0.120)	(0.131)	(0.112)
logschoolsize				0.235*	-0.042
				(0.132)	(0.114)
logschoolage				-0.036	0.062
				(0.081)	(0.067)
rurality				-0.0012	0.0024
				(0.003)	(0.003)
District Fixed Effects	No	No	No	No	Yes
_cons	0.149	0.324	0.0906	-1.171	0.225
	(0.269)	(0.213)	(0.203)	(0.759)	(0.658)
N	69	69	69	65	65

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 5a

	Dependent Variable: Total Repeating Ratio(grades p1-p6)									
Independent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	p6	p6	p6	p6	p6	p6	p2	p3	p4	p5
dominant tribe proportion	0.091		0.064	0.076	0.019	0.060	0.025	0.012	0.057	-0.015
	(0.057)		(0.060)	(0.065)	(0.067)	(0.075)	(0.047)	(0.048)	(0.060)	(0.061)
female teacher ratio	0.035		0.097	0.086	-0.037	0.016	-0.164**	-0.090	-0.122	-0.089
	(0.082)		(0.098)	(0.100)	(0.104)	(0.119)	(0.074)	(0.076)	(0.096)	(0.097)
vertical homogeneity		0.0894*	0.0804*	0.0949**	0.150	0.080	0.021	0.043	0.062	0.126*
		(0.050)	(0.045)	(0.048)	(0.090)	(0.092)	(0.057)	(0.058)	(0.074)	(0.074)
gender vertical homogeneity		-0.024	0.001	-0.002	-0.041	-0.067	-0.041	-0.012	-0.040	-0.033
		(0.039)	(0.044)	(0.046)	(0.047)	(0.053)	(0.033)	(0.034)	(0.043)	(0.043)
logschoolsize				-0.030	-0.031	0.003	-0.049	-0.0627*	-0.0880**	-0.028
				(0.047)	(0.048)	(0.054)	(0.033)	(0.034)	(0.043)	(0.044)
logschoolage				0.041	0.041	0.033	-0.012	0.015	0.011	0.026
				(0.029)	(0.028)	(0.033)	(0.021)	(0.021)	(0.027)	(0.027)
rurality				-0.001	-0.00219*	-0.002	-0.00150**	-0.00128*	-0.00184**	-0.00158*
				(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
District Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
_cons	0.0792*	0.124***	0.0809+	0.524*	0.783**	0.043	0.631*	0.544*	0.354	0.332
	(0.040)	(0.031)	(0.048)	(0.228)	(0.293)	(0.240)	(0.259)	(0.255)	(0.236)	(0.306)
N	80	80	80	77	77	77	77	77	76	73

Note: Standard errors in parentheses

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

5b

Dependent Variable: Total Repeating Ratio(p7)					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	0.038		0.014	0.037	-0.062
	(0.060)		(0.065)	(0.071)	(0.075)
female teacher ratio	0.021		0.062	0.056	-0.032
	(0.085)		(0.105)	(0.109)	(0.110)
vertical homogeneity		0.044	0.051	0.075	0.108
		(0.039)	(0.047)	(0.050)	(0.084)
gender vertical homogeneity		-0.010	0.001	0.007	-0.037
		(0.040)	(0.047)	(0.050)	(0.050)
logschoolsize				-0.063	-0.0863*
				(0.050)	(0.051)
logschoolage				0.022	0.032
				(0.031)	(0.030)
rurality				-0.001	-0.001
				(0.001)	(0.001)
District Fixed Effects	No	No	No	No	Yes
_cons	0.103	0.135***	0.092	0.392	0.647**
	(0.063)	(0.035)	(0.076)	(0.290)	(0.298)
N	74	74	74	71	71

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 5c

Dependent Variable: Male Repeating Ratio					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	0.107		0.086	0.121	0.015
	(0.081)		(0.088)	(0.096)	(0.104)
female teacher ratio	0.091		0.123	0.119	-0.001
	(0.115)		(0.142)	(0.147)	(0.152)
vertical homogeneity		0.047	0.048	0.089	0.115
		(0.065)	(0.063)	(0.068)	(0.115)
gender vertical homogeneity		-0.034	-0.006	-0.002	-0.050
		(0.056)	(0.063)	(0.067)	(0.068)
logschoolsize				-0.110	-0.121*
				(0.068)	(0.070)
logschoolage				0.038	0.044
				(0.042)	(0.042)
rurality				-0.001	-0.002
				(0.002)	(0.002)
District Fixed Effects	No	No	No	No	Yes
_cons	0.0367	0.165***	0.0329	0.564	0.786*
	(0.085)	(0.052)	(0.103)	(0.391)	(0.411)
N	74	74	74	71	71

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 5d

Dependent Variable: Female Repeating Ratio					
Independent Variable	(1) p7	(2) p7	(3) p7	(4) p7	(5) p7
dominant tribe proportion	-0.052		-0.084	-0.079	-0.160**
	(0.057)		(0.062)	(0.069)	(0.074)
female teacher ratio	-0.056		0.012	0.006	-0.041
	(0.081)		(0.099)	(0.105)	(0.108)
vertical homogeneity		0.036	0.057	0.064	0.094
		(0.038)	(0.044)	(0.048)	(0.082)
gender vertical homogeneity		0.012	0.024	0.031	-0.005
		(0.039)	(0.045)	(0.048)	(0.049)
logschoolsize				-0.016	-0.049
				(0.049)	(0.050)
logschoolage				0.007	0.021
				(0.030)	(0.030)
rurality				-0.0001	-0.0001
				(0.001)	(0.001)
District Fixed Effects	No	No	No	No	Yes
_cons	0.190***	0.109***	0.158**	0.223	0.485
	(0.060)	(0.034)	(0.073)	(0.280)	(0.293)
N	74	74	74	71	71

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6a

	Dependent Variable: Total Exam Participation Rate(2006 & 2007)									
Indpendent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
dominant tribe proportion	-0.050	0.081			-0.113	0.053	-0.129	0.067	-0.077	0.095
	(0.077)	(0.060)			(0.083)	(0.070)	(0.087)	(0.077)	(0.093)	(0.086)
female teacher ratio	-0.071	0.091			-0.146	0.028	-0.117	0.002	-0.297	-0.179
	(0.183)	(0.145)			(0.200)	(0.172)	(0.208)	(0.183)	(0.246)	(0.225)
vertical homogeneity			-0.049	-0.086	-0.128	-0.057	-0.147	-0.051	0.012	0.103
			(0.067)	(0.057)	(0.083)	(0.071)	(0.091)	(0.079)	(0.161)	(0.151)
gender vertical homogeneity			-0.020	-0.045	-0.076	-0.027	-0.085	-0.019	-0.143	-0.055
			(0.073)	(0.062)	(0.082)	(0.073)	(0.088)	(0.081)	(0.093)	(0.087)
logschoolsize							0.037	0.033	-0.007	0.036
							(0.084)	(0.075)	(0.097)	(0.086)
logschoolage							-0.029	0.034	-0.004	0.049
							(0.055)	(0.047)	(0.056)	(0.050)
rurality							0.001	0.000	0.001	-0.002
							(0.002)	(0.002)	(0.002)	(0.002)
District Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes
_cons	0.847***	0.749***	0.836***	0.874***	0.994***	0.820***	0.847	0.487	1.065*	0.45
	(0.076)	(0.052)	(0.064)	(0.054)	(0.129)	(0.114)	(0.516)	(0.455)	(0.575)	(0.509)
N	56	60	56	60	56	60	54	56	54	56

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6b

	Dependent Variable: Male Exam Participation Rate(2006 & 2007)									
Indpendent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
dominant tribe proportion	-0.070	0.077			-0.015	0.059	-0.084	0.067	-0.070	0.114
	(0.103)	(0.067)			(0.115)	(0.077)	(0.120)	(0.087)	(0.135)	(0.097)
female teacher ratio	-0.217	0.278*			-0.112	0.236	-0.151	0.224	-0.169	0.122
	(0.239)	(0.161)			(0.291)	(0.191)	(0.298)	(0.205)	(0.359)	(0.252)
vertical homogeneity			0.168	-0.099	0.145	-0.035	0.068	-0.046	0.094	0.022
			(0.104)	(0.064)	(0.126)	(0.079)	(0.135)	(0.088)	(0.263)	(0.170)
gender vertical homogeneity			0.035	-0.079	0.010	-0.019	-0.064	-0.024	-0.078	-0.058
			(0.104)	(0.070)	(0.122)	(0.081)	(0.131)	(0.091)	(0.142)	(0.097)
logschoolsize							0.135	0.045	0.119	-0.002
							(0.123)	(0.084)	(0.139)	(0.097)
logschoolage							-0.079	0.029	-0.072	0.051
							(0.079)	(0.053)	(0.083)	(0.056)
rurality							-0.003	0.001	-0.003	0.001
							(0.003)	(0.002)	(0.004)	(0.003)
District Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes
_cons	0.716***	0.701***	0.542***	0.913***	0.609***	0.748***	0.232	0.353	0.311	0.583
	(0.093)	(0.057)	(0.089)	(0.061)	(0.191)	(0.127)	(0.732)	(0.509)	(0.807)	(0.571)
N	73	60	73	60	73	60	68	56	68	56

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6c

	Dependent Variable: Female Exam Participation Rate(2006&2007)									
Indpendent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
dominant tribe proportion	-0.052	0.056			-0.154	0.056	-0.179*	0.078	-0.093	0.084
	(0.089)	(0.065)			(0.099)	(0.075)	(0.103)	(0.082)	(0.107)	(0.089)
female teacher ratio	0.012	-0.041			-0.231	-0.035	-0.199	-0.063	-0.483*	-0.365
	(0.218)	(0.160)			(0.238)	(0.192)	(0.245)	(0.200)	(0.283)	(0.247)
vertical homogeneity			-0.068	-0.025	-0.182*	-0.003	-0.221**	0.035	-0.057	0.261
			(0.081)	(0.062)	(0.098)	(0.078)	(0.107)	(0.086)	(0.185)	(0.156)
gender vertical homogeneity			-0.078	0.002	-0.158	0.010	-0.178*	0.051	-0.263**	0.009
			(0.087)	(0.067)	(0.097)	(0.078)	(0.104)	(0.086)	(0.106)	(0.090)
logschoolsize							0.070	0.039	0.027	0.098
							(0.099)	(0.079)	(0.111)	(0.089)
logschoolage							-0.004	0.011	0.026	0.014
							(0.065)	(0.051)	(0.065)	(0.052)
rurality							0.002	-0.003	0.000	-0.00520**
							(0.003)	(0.002)	(0.003)	(0.002)
District Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes
_cons	0.774***	0.795***	0.840***	0.811***	1.072***	0.787***	0.624	0.503	0.876	0.196
	(0.075)	(0.057)	(0.077)	(0.059)	(0.153)	(0.127)	(0.607)	(0.485)	(0.661)	(0.524)
N	73	60	73	60	73	60	68	56	68	56

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 7a

	Dependent Variable: Total Pass Ratio(2006&2007)									
Independent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
shannon index	0.119*	-0.022			0.105	-0.014	0.125*	0.016	0.143**	-0.026
	(0.063)	(0.051)			(0.069)	(0.054)	(0.072)	(0.056)	(0.069)	(0.055)
female teacher ratio	0.140	0.188			0.176	0.245*	0.140	0.232*	0.127	0.228
	(0.145)	(0.116)			(0.167)	(0.133)	(0.170)	(0.132)	(0.184)	(0.143)
vertical homogeneity			-0.094	-0.013	0.120*	0.012	0.123	-0.020	-0.063	-0.053
			(0.099)	(0.082)	(0.069)	(0.055)	(0.075)	(0.056)	(0.120)	(0.096)
gender vertical homogeneity			-0.012	-0.013	0.043	0.035	0.036	0.004	0.043	0.028
			(0.059)	(0.049)	(0.068)	(0.056)	(0.072)	(0.058)	(0.069)	(0.055)
logschoolsize							-0.012	0.077	0.034	0.169***
							(0.069)	(0.054)	(0.072)	(0.055)
logschoolage							0.052	-0.012	0.032	-0.038
							(0.045)	(0.034)	(0.042)	(0.032)
rurality							-0.001	0.000	-0.003	-0.002
							(0.002)	(0.001)	(0.002)	(0.001)
District Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
_cons	0.678***	0.752***	0.814***	0.819***	0.604***	0.694***	0.526	0.280	0.398	(0.159)
	(0.095)	(0.070)	(0.095)	(0.075)	(0.107)	(0.089)	(0.422)	(0.327)	(0.428)	(0.324)
N	56	60	56	60	56	60	54	56	54	56

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 7b

	Dependent Variable: Male Pass Ratio(2006&2007)									
Independent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
shannon index	0.079	0.030			0.055	0.026	0.062	0.053	0.068	0.037
	(0.064)	(0.052)			(0.071)	(0.055)	(0.076)	(0.058)	(0.072)	(0.059)
female teacher ratio	0.252*	0.209*			0.229	0.244*	0.213	0.221	0.189	0.300*
	(0.147)	(0.119)			(0.172)	(0.136)	(0.181)	(0.137)	(0.189)	(0.154)
vertical homogeneity			-0.099	-0.057	0.106	0.059	0.082	0.033	-0.107	-0.138
			(0.102)	(0.078)	(0.071)	(0.056)	(0.079)	(0.059)	(0.123)	(0.104)
gender vertical homogeneity			-0.075	-0.010	-0.020	0.049	-0.029	0.027	-0.015	0.054
			(0.059)	(0.051)	(0.070)	(0.057)	(0.077)	(0.061)	(0.071)	(0.059)
logschoolsize							0.043	0.081	0.116	0.129**
							(0.073)	(0.056)	(0.074)	(0.059)
logschoolage							0.025	0.002	-0.001	-0.020
							(0.048)	(0.036)	(0.043)	(0.035)
rurality							0.000	0.000	-0.002	-0.001
							(0.002)	(0.001)	(0.002)	(0.002)
District Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
_cons	0.699***	0.746***	0.902***	0.853***	0.696***	0.684***	0.344	0.195	0.081	0.015
	(0.105)	(0.065)	(0.107)	(0.065)	(0.111)	(0.090)	(0.448)	(0.341)	(0.442)	(0.350)
N	56	60	56	60	56	60	54	56	54	56

Note: Standard errors in
* p<0.10, ** p<0.05, *** p<0.01

Table 7c

	Dependent Variable: Female Pass Ratio(2006&2007)									
Independent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	06	07	06	07	06	07	06	07	06	07
shannon index	0.103	0.056			0.093	-0.076	0.134	-0.055	0.192**	-0.125
	(0.081)	(0.065)			(0.088)	(0.073)	(0.087)	(0.078)	(0.086)	(0.084)
female teacher ratio	0.076	-0.041			0.165	0.304*	0.102	0.302*	0.111	0.313
	(0.191)	(0.160)			(0.212)	(0.180)	(0.208)	(0.183)	(0.228)	(0.218)
vertical homogeneity			-0.102	-0.066	0.094	-0.084	0.120	-0.111	-0.131	-0.038
			(0.110)	(0.081)	(0.088)	(0.074)	(0.091)	(0.079)	(0.148)	(0.146)
gender vertical homogeneity			0.028	-0.031	0.093	0.006	0.095	-0.044	0.086	-0.016
			(0.076)	(0.068)	(0.087)	(0.076)	(0.088)	(0.082)	(0.086)	(0.084)
logschoolsize							-0.019	0.013	-0.030	0.100
							(0.084)	(0.075)	(0.089)	(0.083)
logschoolage							0.044	0.027	0.035	0.003
							(0.055)	(0.048)	(0.052)	(0.049)
rurality							-0.003	0.001	-0.00388*	0.000
							(0.002)	(0.002)	(0.002)	(0.002)
District Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
_cons	0.631***	0.795***	0.710***	0.778***	0.514***	0.684***	0.545	0.531	0.743	0.063
	(0.085)	(0.057)	(0.088)	(0.067)	(0.136)	(0.120)	(0.516)	(0.456)	(0.531)	(0.493)
N	56	60	56	60	56	60	54	56	54	56

Note: Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

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