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Multivariate analysis: geography, demographics, and Texas' post-COVID education

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ABSTRACT

This study examines the impact of geographic locale on educational outcomes in Texas, focusing on the post-COVID-19 educational landscape. The study evaluates the impact of geographical location on the educational outcomes of eighth-grade students by analyzing STAAR test scores as indicators of academic achievement while adjusting for previous academic results and demographic factors. A sample of 1,145 public school districts across Texas was analyzed, encompassing city, suburban, town, and rural settings. The findings indicate that while geographic locale has a discernible impact on academic achievement, this effect is moderate and intertwined with demographic factors. The research found that rural students unexpectedly outperformed their urban counterpart's post-pandemic, controlling for their pre-pandemic performance. However, the persistent lower performance in urban districts emphasizes the need to reevaluate educational dynamics. The integration of demographic variables reveals that while they mitigate the influence of geography, they emerge as strong influencers of academic performance on their own. This underscores the need for policies that address the complex interplay between geographic, demographic, and socio-economic factors to narrow educational disparities. The study suggests that targeted interventions are necessary to address the specific needs of different locales, considering the nuanced effects of the pandemic on educational equity.

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1. INTRODUCTION

Educational disparities in the United States are manifested in many variables, such as socio-economic status (SES), race, and geographic location [1], [2]. Schools in rural districts are constrained by limited resources, which has been worsened by their tight budgets, preventing them from offering advanced courses or extracurricular activities [3]. Conversely, schools in urban areas have faced the challenges of overcrowding and insufficient resources, which complicated efforts to achieve education equity [4]. Suburban schools are often well-resourced and greatly influenced by their local fiscal policy, zoning, and socio-economic segregation [5]. The impact of geography on academic outcomes is not merely spatial but entangled by various socio-economic, policy-oriented factors, necessitating a comprehensive empirical evaluation of these influences.

After the COVID-19 pandemic, educational disparities have magnified and transformed into a complex matrix of variables, which calls for immediate investigation [6]. For example, the pandemic's abrupt transition to remote education has acutely marginalized students in geographically remote areas, further widening an already-existing digital divide – devices, internet access, and live interaction with teachers [7]. Simultaneously, the psychosocial effects of the pandemic—evident in various levels of anxiety and a decrease in intrinsic motivation—have had a differential impact on students across various geographic locations [8]. Consequently, thoroughly examining these worsened educational inequities is indispensable for designing effective policy remedies, especially in an educational context irrevocably reshaped by the pandemic's widespread consequences.

The state of Texas serves as a suitable microcosmic lens, embodying a diverse educational landscape that includes rural, urban, and suburban contexts. Schools in rural areas face significant obstacles, such as high teacher retention rates and limited access to specialized courses [9]. Contrastingly, large city areas like Houston and Dallas are dealing with issues caused by too many students in schools and ongoing separation and inequality based on race and social-economic status. Therefore, Texas can be a model location for an analytical examination of educational disparities enhanced by COVID-19 due to the unusual convergence of pre-existing educational challenges and pandemic-induced perturbations.

Focusing on this state allows region-specific insights and broader understandings applicable to diverse geographic locales across the United States. Upon recognizing the detailed and various complexities of educational inequalities across different geographic areas, and considering the increased challenges presented by the COVID-19 pandemic, we aim to provide a detailed and evidence-based contribution to understanding how location interacts with different demographic factors affecting educational results in the period following the pandemic. Thus, two research questions (RQ) guide this study:

i) Controlling for district-level Grade 8 students' performance in 2019 before COVID-19 in reading, math, and science, does location (rural, town, city, and suburban) significantly impact district-level Grade 8 students' reading, math, and science achievements in Texas in 2023? (RQ1)
ii) Controlling district-level Grade 8 students' 2019 performance in reading, math and science and demographic characteristics, does location (rural, town, city, and suburban) significantly impact district-level Grade 8 students' reading, math, and science achievements in Texas in 2023? (RQ2)

The geographic disparities in academic achievement are not mere coincidences; they result from complex socio-economic and political factors. Historically, rural schools in the United States have served functions extending beyond academic instruction, playing a central role in maintaining community identities and social cohesion [10]. Moreover, the geographic dispersion of rural schools affects many aspects of education, including education resources, school funding and choices, teacher recruitment and transportation [11]. For example, Chingos and Blagg [12] found that students' proximity to schools significantly varies by urbanicity with rural families having far less proximity to school across sectors. These institutions' educational challenges are intrinsically linked to broader concerns of community viability and local economic stability [13]. Similarly, urban and suburban schools have complex historical narratives of their own. Urban schools frequently confront various challenges, including overcrowding, insufficient funding, and lower high school completion rates [4]. Conversely, suburban schools, while often benefiting from more substantial resources, have their own challenges. These institutions face difficulties stemming from socio-economic and racial segregation, which subsequently contribute to disparities in educational outcomes [14].

The academic landscape is shaped by a complex interplay of factors, including SES variations within both rural and urban educational districts [15]. These multi-faceted SES variations, influenced by parental income, occupation, and educational attainment, collectively contribute to students' heterogeneous distribution of family, cultural, and social capital [16]. This complexity calls for a detailed understanding of students' educational experiences and challenges across various geographic regions and within specific local areas. For instance, families with higher SES often have the resources to enrich their children's educational experiences through extracurricular activities and private tutoring, thereby affording them specific advantages [17]. Conversely, students from lower SES backgrounds frequently require additional external educational support, exacerbating existing achievement gaps. Further contextualizing this issue are demographic factors that serve as significant determinants of students' educational development, notably differences in SES that impact academic performance disparities between rural and nonrural settings [2]. Conversely, students from lower SES backgrounds frequently require additional external educational support, exacerbating existing achievement gaps. Further contextualizing this issue are demographic factors that serve as significant determinants of students' educational development, notably differences in SES that impact academic performance disparities between rural and nonrural settings [2].

Additionally, English language proficiency is indispensable for academic success in core subjects like reading, mathematics, and science [18]–[20]. Contemporary research also emphasizes the notable influence of teacher attrition and student mobility rates on academic performance across various subjects [18]–[20]. Consequently, any analysis of geographic disparities in academic outcomes must consider these multi-faceted, intersecting variables that significantly influence students' educational trajectories. However, it is also essential to acknowledge the fiscal limitations that educational systems encounter, as these financial constraints introduce another layer of complexity to the quest for academic equity [15], [21], [22]. These budgetary limitations result in tangible deficiencies, such as outdated educational materials and substandard facilities, affecting teacher effectiveness, and student engagement [23].

Furthermore, the financial restrictions impact human resources, evidenced by elevated teacher turnover rates in districts with fewer funds, often leading to less experienced or even less qualified educators in the classroom [24]. Students in these underfunded districts consequently find themselves in a detrimental cycle, needing both the material and human resources necessary for a learning environment that fosters academic success. Notably, the challenge of equitable resource allocation is not limited to economically disadvantaged districts; even in wealthier areas, the distribution of resources is frequently a politicized issue that may favor certain academic programs over others [25].

The COVID-19 pandemic has tremendously changed how education is delivered. In Texas, which has about 5.3 million students in 1,220 public school districts [26], the pandemic caused a quick move from regular classrooms to online learning, following guidelines for social distancing from the centers for disease control and prevention [27]. At first, spring breaks were extended, but then the shift to long-term online learning happened. This created several challenges, especially for teachers unfamiliar with online teaching [28]. Even with guidance from the Texas Education Agency [29], performance in online math courses decreased by 46.7% between January 2020 and January 2022.

By October of the same year, 53.8% of students were back in physical classrooms, and 38.9% and 7.2% were doing asynchronous and synchronous online learning, respectively [26]. Teachers had to figure out what to focus on due to reduced time for teaching [30]. Younger students showed a clear drop in reading levels [31]. The move to online also made it clear that not all students have the same access to technology, leading to questions about fairness in education [32], [33]. It was assumed that students would need devices and fast internet, but this was different for students from low-income families and rural areas [34], [35].

Before COVID, Texas rural school students already faced a series of challenges, including limited educational resources [36], low instructional expenditures [37], and professional isolation for teachers [38] due to its geographic isolation. The combination of these aspects contributes to the educational disparities of Texas rural and nonrural school districts. For instance, recent studies have pointed out that Texas rural students exhibit relatively lower performance in key academic areas, including reading [17] and science [18].

The impact of the pandemic on education in Texas is also affected by its unique features, especially in rural areas. These areas have different resources and needs [39]. Being far from cities and having different populations, such as income levels and ethnic groups, can lead to different educational results [40]. In some rural areas, the challenges of online learning may be even greater due to fewer resources. Future educational policy changes need to consider these factors to effectively address the increased educational gaps caused by the COVID-19 pandemic. Demographic variables at both the teacher level and student level are significant indicators of students' academic performance. Some commonly cited factors that affect students' academic outcomes are teacher experience [41], [42], teacher turnover rate [43], [44], teacher-student ratio [45], and student mobility rate [46], [47].

Specifically, in Texas, Tang *et al.* [18] identified three demographic factors that significantly negatively influence students' performance in math: percentage of economically challenged students, student mobility rate, and teacher turnover rate. Emphasizing the complexity of rural school districts necessitates individual analysis, as they exhibit substantial differences in their challenges and demographics. A comparative examination of Lindsay Independent School District (ISD) and Santa Maria ISD, both rural districts in Texas, illustrates this diversity as an example. The variance between them is pronounced despite sharing common hurdles—such as constrained per-student funding, inconsistent financial support, limited transportation budgets, high student turnover, and significant poverty levels [48]. Lindsay ISD, for instance, features a relatively low percentage of economically disadvantaged (ED) students at 14.9% and a minuscule proportion of English learners (EL) at 0.2%. Their student mobility rate stands at 4.7%, with a teacher turnover rate of 28.9%, and the teachers possess an average of 13.9 years of experience.

In contrast, Santa Maria ISD reports a drastically higher proportion of ED students at 99.6%, dwarfing Lindsay ISD's figures and the state average of 60.6%. It also has a significant EL population of 39.7%, a student mobility rate of 8%, and a teacher turnover rate of 16.9%, with the average teacher experience lagging at 6.1 years, below the state's average. These discrepancies underscore the necessity of recognizing the rich diversity within rural education districts. They also highlight the need to understand how demographic variations, constraints on data, resource allocation, and the influence of geographical location collectively pose unique challenges that can impact educational outcomes.

Bridging the gap to the analysis, it becomes evident that existing literature lacks comprehensive analyses examining how demographic and geographical factors influence educational outcomes. Furthermore, there is a noticeable scarcity of research on the efficacy of educational services designed specifically for vulnerable student populations, including English learners and students with disabilities. This disparity emphasizes the necessity of a focused inquiry into how specific interventions can be customized to address the unique needs of these groups within the multi-faceted context of rural education.

2. METHOD

2.1. Research design and data collection

Per the National Center for Education Statistics (NCES), public school districts could be categorized into four main groups based on their location and population: city, suburban, town, and rural. Specifically, a district is classified as a "city" if it is located inside an urbanized area and a principal city. A district is classified as "suburban" if it is located outside a principal city and inside an urbanized area. A district is classified as a "town" if it is located inside an urban cluster. A district is classified as "rural" if it is located somewhere away from an urbanized area and an urban cluster [49]. In this study, the final sample for analysis consisted of 1,145 public school districts, including 637 rural, 167 cities, 134 suburban, and 207 towns.

To investigate the relationship between school locale and students' academic performance, we collected school districts across Texas about STAAR reading, math, and science through the Texas assessment management system (TAMS). More precisely, the data acquisition efforts targeted 8th-grade district-level data for the 2018-2019 and 2022-2023 academic years. Eleven district-level demographic data from the school year of 2018-2019 were also gathered from the Texas academic performance reports (TAPR), including teacher full-time equivalence, teacher and principal experience, teacher-student ratio, teacher turnover rate, student mobility rate, percentage of students identified as economically challenged, percentage of students identified as limited English proficiency, percentage of students identified as at risk, instructional expenditure ratio, and education aide.

2.2. Measurement

STAAR is a state-level, mandatory standardized testing program aligned with the Texas essential knowledge and skills (TEKS) standards. It evaluates grade 3 to 8 students' abilities in core subjects, including reading, math, science, and writing. STAAR uses four performance-level descriptors to capture students' academic performance: did not meet, approaches, meets, and masters grade level. Students classified as "approaches grade level" will likely succeed in the next grade level with tailored academic intervention. Students can use the assessed knowledge and skills in familiar contexts at this stage. Students classified as "meets grade level" are highly likely to succeed in the next grade level with potential short-term, tailored academic intervention. Students can demonstrate critical thinking skills and use assessed knowledge and skills in familiar contexts at this stage. Students who are classified as "masters grade level" will be successful in the next grade level with limited or no tailored academic intervention. Students can demonstrate critical thinking skills at this stage and use assessed knowledge and skills in all contexts. Given that "approaches grade level" serves as a gauge for passing the tests and the percentage of students rated as "approaches grade level" includes any students rated as approaches, meets, and masters grade level, the current study focuses on the percentage of students who achieved the "approaches grade level" in grade 8 STAAR reading, math and science tests.

2.3. Data analysis and model specification

The RQ1 aimed to investigate whether there was a significant difference in Texas 8th-grade students' academic performance as measured by STARR reading, math, and science tests among different school locales (city, rural, suburban, and town). To this end, we conducted a multivariate analysis of covariance (MANCOVA). The three dependent variables are the percentage of 8th-grade students who achieved "approaches grade level" in STAAR reading, math and science tests, respectively. District location is included as a grouping variable, and students' performance in 2019 was used as a covariate.

The RQ2 aimed to investigate whether adding additional district-level demographic characteristics impacted the results of the previous research question. The dependent variables used were the same as in the RQ1. To address RQ2, district-level demographic variables, including teacher full-time equivalence, teacher and principal experience, teacher-student ratio, teacher turnover rate, student mobility rate, percentage of students identified as economically challenged, percentage of students identified as limited English proficiency, percentage of students identified as at risk, instructional expenditure ratio, and education aide, were added as covariate besides the covariates used in the RQ1.

3. RESULTS

3.1. Research question 1

A MANCOVA was conducted to analyze the effects of school locale on 8th-grade students' STAAR academic performance after controlling for their performance in 2019. Means and adjusted means were very similar as shown in Table 1. Results indicated that there was a statistically significant difference among school districts of different locale on STAAR academic performance in reading, math, and science after controlling for their STAAR performance in 2019, $F(9, 2655)=5.228$, $p<.001$, Wilks' $\Lambda=.958$, partial $\eta^2=.014$. Follow-up univariate one-way ANCOVAs were performed. There were statistically significant differences in adjusted means for percentage of students achieved approaches grade level in reading ($F(3,1093)=8.889$, $p<.001$, partial $\eta^2=.024$), percentage of students achieved approaches grade level in math ($F(3,1093)=7.781$, $p<.001$, partial $\eta^2=.021$), and percentage of students achieved approaches grade level in science ($F(3,1093)=7.530$, $p<.001$, partial $\eta^2=.020$).

Pairwise comparisons with a Bonferroni-adjusted *p*-value were made for all three academic outcomes. The students in city, suburban, and town school districts had statistically significantly lower adjusted mean percentage approach grade level in STAAR reading tests compared to students in the rural school district, an adjusted mean difference of 3.065%, 95% CI [.908, 5.221], $p<.01$, 2.515%, 95% CI [.222, 4.808], $p=.023$, and 2.856%, 95% CI [.912, 4.800], $p<.01$, respectively. The students in the city school districts had statistically significantly lower adjusted mean percentage approaches grade level in STAAR math tests than rural school district students, with an adjusted mean difference of 5.175%, 95% CI [2.113, 8.236], $p<.001$. Additionally, students in the city school districts had statistically significantly lower adjusted mean percentage approaches grade level in STAAR science tests than students in rural school districts, with an adjusted mean difference of 5.595%, 95% CI [2.459, 8.731], $p<.001$. Students in the city school districts also had statistically significant lower adjusted mean percentage approaches grade level in STAAR science tests compared to the students in town school districts, with an adjusted mean difference of 4.595%, 95% CI [.910, 8.280], $p=.006$. All other pairwise comparisons were not statistically significant as presented in Table 2.

Table 1. Mean, adjusted mean, standard deviations, and standard errors for the three academic outcome measures for each locale school district

	STAAR academic outcomes					
	%Approaches_Reading		%Approaches_Math		%Approaches_Science	
Locale	M (SD)	M_{adj} (SE)	M (SD)	M_{adj} (SE)	M (SD)	M_{adj} (SE)
City	80.27 (12.85)	81.79 (0.73)	69.69 (18.89)	72.06 (1.03)	65.48 (18.61)	67.67 (1.06)
Rural	85.55 (11.00)	84.85 (0.37)	78.15 (15.36)	77.23 (0.52)	74.21 (16.47)	73.27 (0.53)
Suburban	83.85 (8.71)	82.34 (0.79)	76.23 (13.14)	74.14 (1.12)	73.92 (13.49)	71.53 (1.15)
Town	80.09 (9.67)	82.00 (0.63)	72.93 (13.41)	75.20 (0.90)	69.59 (13.50)	72.27 (0.92)

Table 2. Pairwise contrasts for adjusted means for three academic outcome measures for each local school district

	Difference in adjusted mean (95% CI)					
STAAR academic outcomes	Rural vs. City	Rural vs. Suburb	Rural vs. Town	City vs. Suburb	City vs. Town	Suburb vs. Town
%Approaches_Reading	3.07 (0.91, 5.22)*	2.52 (0.22, 4.81)*	2.86 (0.91, 4.80)*	-0.55 (-3.40, 2.30)	-0.21 (-2.74, 2.33)	0.34 (-2.35, 3.03)
%Approaches_Math	5.18 (2.11, 8.24)*	3.10 (-0.16, 6.35)	2.03 (-0.73, 4.79)	-2.08 (-6.12, 1.97)	-3.14 (-6.74, 0.45)	-1.07 (-4.88, 2.75)
%Approaches_Science	5.60 (2.46, 8.73)*	1.73 (-1.60, 5.07)	1.00 (-1.83, 3.83)	-3.86 (-8.00, 0.28)	-4.60 (-8.28, -0.91)*	-0.73 (-4.64, 3.18)

3.2. Research question 2

To further understand the impact of district-level demographic variables on students' academic performance, 11 additional variables were added to the previous model. These additional variables are: teacher full-time equivalence, teacher and principal experience, teacher-student ratio, teacher turnover rate, student mobility rate, percentage of students identified as economically challenged, percentage of students identified as limited English proficiency, percentage of students identified as at risk, instructional expenditure ratio, and education aide. Results indicated no significant difference among school districts of different locales on STAAR academic performance in reading, math, and science after controlling for their STAAR performance in 2019 and demographic variables, $F(9, 2619)=1.638$, $p=.099$, Wilks' $\Lambda=.986$, partial $\eta^2=.005$.

4. DISCUSSION

The study explores the complex interplay between geographic location and academic achievement, focusing on Grade 8 students in Texas, situated in the context of the post-COVID-19 educational landscape.

It aims to unravel two pivotal research questions: i) the role of school locale in academic achievement as evidenced by STAAR performance, with controls for performance in 2019 and ii) the degree to which demographic variables influence the effect of locale on academic performance. The ensuing discussion is intended to contextualize these findings within the larger educational discourse, shedding light on their implications for educational policy and instructional approaches.

4.1. The impact of geographic locale on academic performance in eighth-grade students

The first research question aimed to explain the influence of geographic locale on the academic performance, specifically STAAR test results, of eighth-grade students. This analysis accounted for prior academic performance data from 2019. Statistical evidence substantiated a discernible yet moderate effect size, indicating that disparate academic outcomes can be attributed to distinct school districts' geographical settings. Such results corroborate earlier research [1], [2], emphasizing persistent educational attainment disparities contingent upon geographic factors. Such findings are particularly significant in the context of educational settings post-pandemic. Structural inequalities, including school funding, teacher retention rates, and the availability of specialized educational programs, have been identified as reasons for the geographic differences in academic success. Our study adds further understanding by indicating that these disparities have either persisted or intensified following the COVID-19 pandemic, thereby underscoring the pandemic's exacerbating effect on these structural elements. However, focusing on the small yet statistically significant effect size is important, indicated by a partial η^2 value of .014. Such a result advises caution against attributing differences in educational achievement solely to geographic location. This careful interpretation aligns with Bourdieu's theoretical framework [16], which recommends a multi-faceted analysis of the factors contributing to educational inequalities, going beyond just the single aspect of geographic location.

The following ANCOVAs provide additional insight into the influence of geographic location on specific academic areas. The statistical differences show a notable geographic variation in academic outcomes (i.e., reading, math, and science) after COVID-19. These findings are consistent with the concept of "educational geography" [14], indicating that location can affect educational access and quality, potentially impacting students' academic paths. The comparative analysis showed that students in rural districts performed better than those in urban areas, which differs from the patterns before the pandemic when urban districts often had advantages because of more resources [50]. Several potential factors could account for the improved performance of rural students following the pandemic. To begin with, the pandemic may have changed the educational landscape, altered educational benefit paradigms, and reassessed the differences between rural and urban education [51]. The lower performance in city school districts, such as statistically significant lower scores in STAAR math and science compared to those in rural and town districts, might be due to the complex combination of disruptions related to the pandemic, like higher COVID-19 infection rates and the resulting social and economic turmoil, which affected urban areas more [52]. Second, as rural schools play roles beyond academic education, the leadership team of rural schools significantly impacts the local community and students' learning during the pandemic. Many rural school principals tapped into local resources to equip teachers with support, transforming the school into a central learning hub tailored to the needs of students and their families [53].

Another potential factor that might influence students' academic outcomes during COVID-19 is related to the unique context of the local community. Due to the small school size, rural areas often boast a strengthened bond between the schools and the local community, facilitating closer connections among parents, students, and teachers [54]. Particularly during the pandemic, this closer relationship enabled teachers to forge meaningful connections with students and their families, supporting their academic learning. These findings call for a critical review of the effectiveness of remote learning systems and how they vary in different places.

4.2. The impact of demographics on academic performance in eighth-grade students

The second research question expanded the analysis by incorporating 11 demographic indicators to assess their effect on academic performance. When these demographic factors were included, the importance of geographic location in predicting academic outcomes was reduced to an insignificant level. Such a finding suggests that demographic variables might serve as equalizing factors, balancing educational achievements across different geographic areas. It is a significant addition to existing research, lending empirical support to theoretical arguments [14], [17]. These authors argue that socio-economic factors are crucial in determining educational results. By diminishing the significance of location, our finding suggests that policy attention should shift towards understanding and addressing the impact of demographic factors.

Furthermore, the influence of demographic factors highlights their significant role in determining student performance. This aspect is consistent with several studies [18]–[20], which identified factors such as English language proficiency, economic background, and student mobility as important in academic achievement. Thus, demographic elements not only counterbalance geographical differences but also act as potent influencers in their own regard. This pattern persists even after the COVID-19 pandemic. The findings enhance our comprehension of the complex interaction between geographic and demographic variables in shaping academic success, particularly in the distinctively challenging educational environment following COVID-19.

5. CONCLUSION

The present research emphasizes the need to examine the complicated educational landscape influenced by the post-COVID-19 era. The research indicates that the educational disparities exacerbated by the pandemic are varied and demand a comprehensive policy approach that tackles the intricate interactions among geographic, demographic, and socio-economic factors. The unexpectedly superior performance of students in rural districts compared to urban counterparts challenges conventional beliefs about educational benefits and suggests that the pandemic has necessitated a reassessment of the relationships between urban and rural educational achievements, thereby influencing a possible shift in policy focus. The persistent lower achievement in urban school districts highlights a need for a critical review of remote learning practices and the infrastructure that supports them. Furthermore, our findings emphasize the importance of integrating digital literacy and technological access into educational equity, especially in regions where disparities are more remarkable. The detailed understanding of how geographic and demographic factors come together to affect educational outcomes highlights the need for a comprehensive approach to making policies. This approach should include input from local communities to ensure interventions are appropriate and relevant to their specific cultural and contextual situations. This approach not only promises to address current inequalities but also to build a more resilient educational system capable of adapting to future challenges, ensuring that progress towards educational equity is both inclusive and sustainable.

An evaluation must be thoughtfully crafted to address the specific challenges embedded in different regions while being sensitive to the unequal impacts on various academic subjects and the marked gaps in mathematics and science achievement. Moreover, although small, the reported effect sizes indicate not only the presence of educational disparities but also the possibility of their expansion. These findings align with the concepts of educational capital and the complex patterns of educational inequality. Therefore, we advocate the implementation of interventions tailored to the distinct needs that stem from locale-specific differences. It is also crucial to recognize the limitations of our study, such as the potential influences of unmeasured factors, including teaching effectiveness, curriculum variations, or student motivation and engagement. To further educational equity, research should be broadened to encompass these factors. The policy implications derived from this study are critical. While demographic factors dominate educational outcomes, geographical factors are crucial and should not be overlooked. Once demographic considerations are taken into account, the significance of geography emerges, suggesting that policy efforts should be balanced between these factors. Educational interventions, thus, must be developed with a comprehensive understanding, ensuring that students, regardless of their geographic or demographic backgrounds, receive equitable educational opportunities and outcomes.

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