Impact Of Family Income Statues On The Academic Growth In Children's Early Childhood Education

Assignment 3

INF2178

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Introduction

It is often a common interpretation by the general public that people with better social economic statues would prefer to inject more resources and money into improving their children's education. It could also be interpreted that the parents with better social economic status can provide a better learning experience and environment for their children, therefore creates a better learning outcome. Understandably this study requires intensive study over which attributes from the parent's economic statues, which could be a lot of things, ultimately affects the children's early academic developments. In this research, we can focus on one attribute, which is the incomes of the parents. We are conducting the research on the impact of family income statues on the academic growth in children's early childhood education.

Method

- **Dataset**
  - This dataset INF2178_A3_data records their academic performances across reading, math, and general knowledge from the beginning (fall) to the end (spring) of an academic year, providing a window into their growth trajectories. Beyond academic scores, it also categorizes students into income groups by creating a tier list (1 being the lowest income group, 2 being the middle-income group, 3 being the highest income group) based on family incomes.
- **One-way ANCOVA**
  - The one-way ANCOVA stands out for its ability to dissect the impact of a categorical independent variable (in this case, the income groups) on a continuous dependent variable (the growth scores in reading, math, and general knowledge), while controlling for the potential confounding effects of other continuous variables (the initial scores in fall).
  - In the code, I have conducted a comprehensive ANCOVA test sets for all three categories of learning scores for students. Including an extra score of combined learning scores of all three categories to illustrate an overall academic improvements.

- **Research Questions:**
  - Research Question
    - Does family income status influence the overall academic growth of children in early childhood education when considering equal weight for reading, math, and general knowledge scores?
  - Hypotheses
    - Null Hypothesis (H0): Family income status has no significant effect on the overall academic growth of children in early childhood education after controlling for their initial overall ability.
    - Alternative Hypothesis (H1): Family income status has a significant effect on the overall academic growth of children in early childhood education after controlling for their initial overall ability.

Results Interpretations

Interpretation of Individual Academic Achievement Growth Scores (See Figure 1)

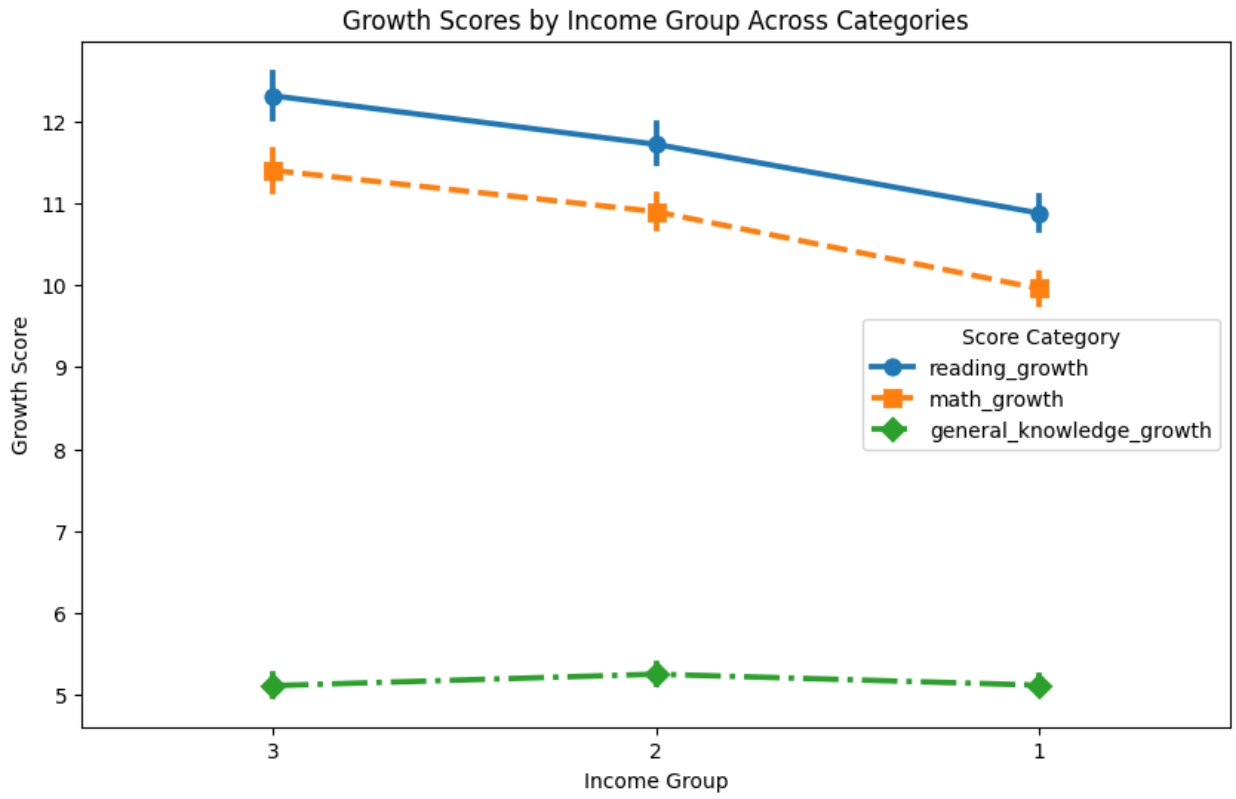

Figure 1 Individual Academic Achievements Growth

Reading Growth: The ANCOVA results reveal that income group has a statistically significant effect on reading growth. Specifically, children from the higher-income groups (2 and 3) demonstrate greater gains in reading proficiency compared to their peers from the lowest income bracket, after adjusting for initial reading ability. The coefficients for income groups 2 and 3

illustrate this benefit, ultimately suggesting that these groups have an advantage in reading development that correlates with their families' income status.

Math Growth: Income group emerges as an even more influential factor in math growth. The significance and magnitude of the coefficients for income groups 2 and 3 are pronounced, indicating substantial growth in math scores among students from middle and high-income families comparing to low-income family. These findings point to the critical role socioeconomic factors may play in the cultivation of math skills.

General Knowledge Growth: The ANCOVA for general knowledge growth scores also indicates a significant relationship with income group, with children from wealthier families exhibiting notable gains throughout the terms. This suggests that a higher family income could be linked to broader educational experiences, enriching a child's general knowledge.

Interpretation of Combined Academic Growth Scores (See Figure 2)

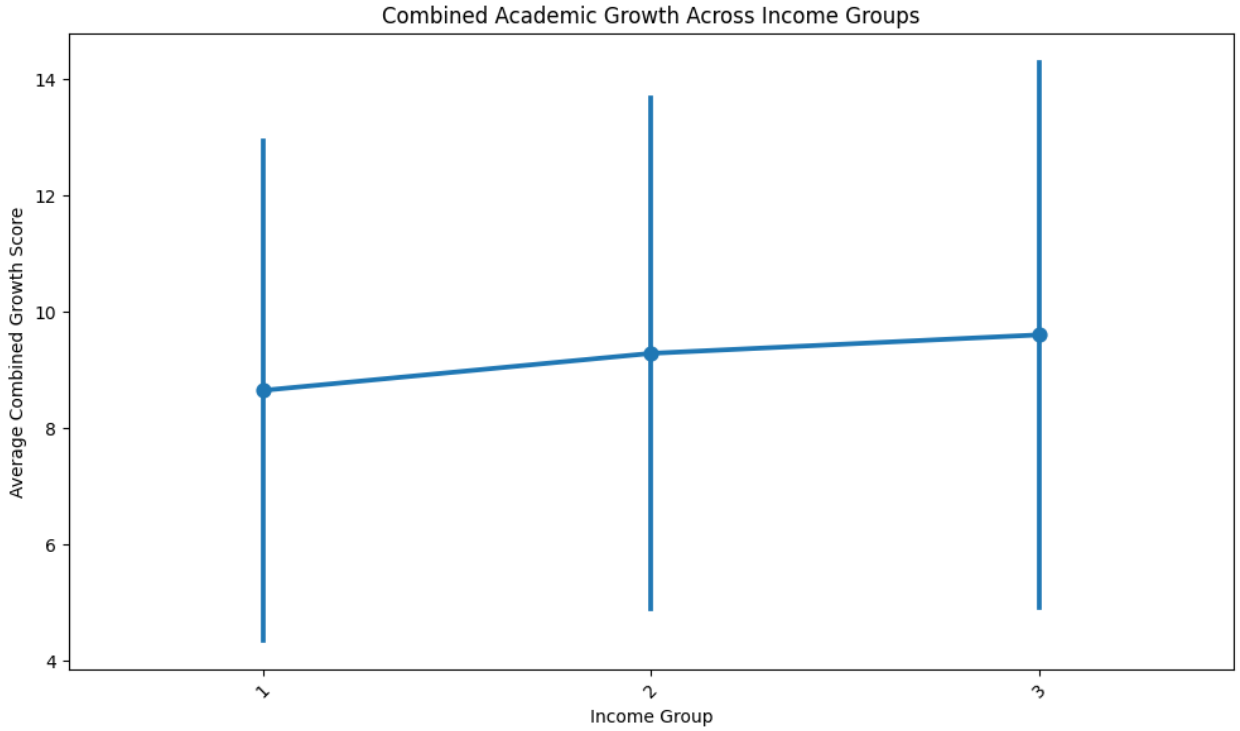

Figure 2 Combined Growth

Examining the combined growth scores that equally weigh reading, math, and general knowledge, the influence of income group is significant but displays more subtlety. The middle-income group shows statistically significant growth, albeit less pronounced than when looking at individual subjects, while the high-income group's growth is not statistically significant in this composite measure. This finding implies that while family's income level has a clear influence

on overall academic growth, the strength of this influence may differ when analyzing a composite score that encapsulates multiple academic domains.

Assumption Checks and Violations Justification

Assumption checks highlight that homogeneity of variances is not met for reading and math growth scores, as evidenced by Levene's test. However, for general knowledge growth, the assumption holds. The variances in reading and math suggest there may be unaccounted-for factors, possibly the inequitable allocation of educational resources, influencing these scores.

Normality of residuals, tested using the Shapiro-Wilk method, indicated significant departures from normality for all score categories. It's important to note that the Shapiro-Wilk test can be overly sensitive with large sample sizes, possibly flagging inconsequential deviations from normality. Therefore, the interpretation of these results should be approached with caution, especially given the large number of observations in this study.

Conclusions

The ANCOVA analyses, both individual and combined, underscore the role of family income in the academic growth of children in early childhood education. The ANCOVA results for the individual subjects of reading, math, and general knowledge, as well as the composite growth scores, strongly support the alternative hypothesis, suggesting that children in higher-income families tend to make more academic progress. After controlling for initial ability levels, this result is consistent across income groups, particularly between the lowest and middle-income groups. These results affirm the influence of family income factors on educational progress and emphasize the need to consider these factors in educational planning and policymaking to narrow the gap in academic achievement due to economic disparities. Despite some violations of statistical assumptions, the patterns observed across different income groups are significant and in line with existing literature that links family income statues to educational outcomes. While the individual scores provide insight into specific areas of growth, the combined score captures a holistic view of a child's development, affirming the role of family income.