Feasibility of the "American Dream"
Education and Income Inequality Statistical Review by State

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Abstract:

This paper explores the complex association between education quality and economic inequality. Within the paper the independent variables of per pupil spending, percent spent on education by state, and average reading and math scores from grades four and eight and multiple dependent variables of GINI coefficient, unemployment rates, and GDP per capita are examined. This examination was done by a developed literature review and a breakdown of the variables with summary statistics and multiple linear regression. The findings from this paper hope to reflect the complex nature of the independent and dependent variables and a need for further research and investment into a deeper understanding of how to improve how education can enhance the economic landscape and inequality. The final results conclude that the "American Dream" of equality in all may need improving. Though the project can not lead to any true conclusions or explanations for the current and past state of the United States.

Keywords:

Education Quality, Economic Inequality, GINI Coefficient, Government Education Spending, United States of America

Introduction:

The United States was founded on the ideals of three words "Equality for all" ; though that comes with hidden strings it has radiated through each system in the country. This radiation of natural "equality" may however be a falsehood more understood by looking at education quality and economic inequality throughout the USA. Education and change usually go hand in hand, however, in recent years the United States may have become a stagnated economy by GDP per capita and affect those already at a disadvantage (McCormack & Novello, 2020). This economy also has a growing divide between the top and bottom economic classes as well, thus furthering already existing inequalities (Connor & Storper, 2020). Though the United States has the top GDP - they are ranked 27th in the Social Mobility Index out of 82 countries, which leads to questions of what is the source of this great divide between GDP and economic availability statuses (World Economic Forum, 2020). This rank will be further expanded within the literature review portion. To hopefully find more information and correlation on inequality this study will focus on the relation of primary and secondary education on economic inequality with a focus on the GINI coefficient . The research will be focused around the following question: *How does primary and secondary education quality affect the overall economic inequality of the United States?*

Economic inequality has always been an important indicator of opportunity within a country. Today, as countries continue to grow economically and in population there may also be a change in opportunity within each. However, these changes have been expressed as the need for new outlooks on how we see the economy and what is held as important qualities of society (Connor & Storper, 2020). While some countries have led to a more conservative approach to conquer their inequality, others, such as Nordic countries, have chosen a very liberal approach (World Economic Forum, 2020). Primary and secondary education have always been important parts of the early stages of human development and may reflect future outcomes of an individual such as cognitive and behavioral functions (Eccles & Roeser, 1999). Thus, the study will focus on the lens of the age group from 5-18 educational experience with both

academic quality and monetary quality of education. By focusing on this time period and both types of quality this paper anticipates how education can affect inequality within the United States.

There has been a lot of academic and institutional research done to tackle the problems of inequality availability and its indicators (Cysne, 2009, Galbraith & Hale, 2014 &). Also, within its indicators there is data on the correlation between education and economic availability especially within the wider global scope (World Economic Forum, 2020). However, there is a country focus approach on the effects of education (primary and secondary) quality on the economic outcome of the United States with an overall state approach and also a high amount of focus on high education and its effects on inequality as well (Haveman & Smeeding, 2006). This paper will thus focus on the United States as a whole and and by region as well. With this difference this paper hopes to help observe patterns within the United States to see if any region has kept the ''American Dream'' alive by hopefully containing a positive association between education quality and economic inequality.

The paper will be formulated with the first section including the methodology and overall approach to tackle this research question with understanding of how literature review and data analysis will be done. Section two will indeed be the literature analysis of education quality and economic inequality with multiple types of sources being included. Section three then will go into the results of the data analysis with both summary statistics and regression analysis. After the results section four will be the discussion of the results from mainly the data analysis with back up from the literature review. Finally section five concludes the paper with final remarks and limitations to the paper.

Methodology:

The research question this paper aims to tackle is as follows : How does education quality affect economic inequality within the United States? This project used both a literature review and data analysis to discover the outcome of educational quality on economic inequality. Both are being used as tools for

research due to the need for a full picture of the environment and the current situation of economic inequality within the United States.

This literature review will include a wide array of sources from accredited news agencies, economic reports, academic literature, and education/economic policy reports. Information from news agencies will be used for local sources as well as current discussion on the topic. Before using news agencies for resources, they will be checked for quality as well as for any bias within the text. The news articles will be looked upon with a neutral point of view and their authors will also be looked into. Economic reports such as PISA Scores and Social Mobility Index for a meta-analysis of the current problem areas to reflect the United States overall when compared to other countries. Though the GINI coefficient will also be focused upon as the main variable of economic inequality, unemployment and gdp per capita trends will also be reflected as indicators and dependent variables of economic inequality. The peer-reviewed academic literature will be used to back up ideas in addition to providing an academic lens to the effects of education quality and other variables connected to economic inequality such as unemployment and GDP capita as a base . Finally, education and economic policies both current and past will also be used to develop an idea of the political landscape concerning both education quality and economic inequality .

Within quantitative research, the main use of analysis will be to display information. The variables that will be used for this project are economic inequality and education quality with a mix of variables. The indicator for economic inequality being used is the dependent variables of the GINI coefficient while sub dependent variables will be unemployment and GDP per capita. The Gini Change in the sub dependent variables of unemployment and GDP per capita were measured using the US Census by the Bureau of Economic Analysis over time from 2000 to 2020 (BEA, 2022). Within education quality indicators used will be a variable of average test scores from math and reading from 1992 to 2011 provided by the National Center for Educational Statistics and education spending in the variable per

pupil spending and percent spent on education out of a state's total real GDP from 1992 to 2011 are also from the US Census (NCES, 2022 & US Census Bureau, 2022).

Once the data was collected from the sources data cleaning was done on the data to formulate the final table. This data cleaning included transposing data sets to get results for each state by year and collecting the certain variables needed from mass data sets. By collecting data from multiple sources to one data set there may be error between each data set thus multiple checks and insurances took place between each step to hopefully decrease the amount of error during data collection. Many variables that were included in the final dataset that are not discussed within the data analysis either due to their non significance or because they were used to create the final variables.

Before regression analysis summary statistics will be presented on each variable to understand each's own pattern within the United States as a whole and the regions. These summary statistics will be in the form of heat maps of the United States as a whole and a table of the means of each variable. Both will use three different time series. These time series will be referred to as time series 1: the independent variables from 1992 against the dependent variable from 2000, time series 2: the independent variables from 2002 against the dependent variable from 2010, and time series 3:the independent variables from 2011 against the dependent variable from 2020. Each time series tried to be between 8-9 years due to the future impact that education has rather than current effect. There is a slight difference in time series 3 due to the availability of data from 2012 on test scores from reading and math.

Using these variables regression analysis was done to determine the correlation or connection between economic inequality and education quality. For this analysis, the dependent variable will be economic inequality (GINI coefficient) while the independent variable is education quality both monetary and academic quality. Regression analysis was chosen due to the statistical value it presents to reflect the correlation between the dependent and independent variables. Before analysis heterdoscity tests

were done to determine the type of final models created. There may be heterdasity within the data thus changes were made to final data regression. Also correlation tests and regression were done within each the dependent variables and independent variables to understand their relation with each other. Within the final regression dummy variables were added to determine the difference in the regions as well. The final regressions were done by first taking the whole United States then separating the data by region to do analysis by region as well.

Literature Review:

Is the American Dream real?

The true American dream has been discussed, hypothesized, and rationalized in many different areas of study as well as within society but this dream may be portrayed in one way or another this paper will focus on the foundations of this dream. The foundation in this paper's case is as follows: equal economic opportunity and availability for all (more specifically American citizens). This dream or fantasy had driven many Americans throughout history from the original proclamation of nationhood to boths sides of the polarized nation we have now (Wolak & Peterson, 2020). However as the equal opportunity lens fades away from experienced economic inequality many Americans have started to ask is this "dream" over or has it ever truly existed within the United States of America (Wolak & Peterson, 2020)? This shift overtime has also affected how individuals spend and also how they perceive society and their place within it thus leading to no longer focusing on the future but rather the present (Bak & Yi, 2020). This also is not just due to economic status but the reveal of the broken American system (Bak & Yi, 2020). The American Dream continues to be within the American mindset however it may no longer be a positive view thus the economic paradigm is shifting.

This American dream is deeply connected to the idea of a meritocracy within the reasoning for continuing this fallacy. Meritocracy, the idea that the most able will come to power no matter their background and upbringing, helps certain political classes put the blame on "less-able" individuals instead

of the system that created the inequalities of ability (Littler, 2017). The connection between the American Dream and a meritocracy is rather a new tool, used based on old ideals, but has been used recently to shift the political and economic spheres (Petersen, 2020). If American meritocracy was true it would not matter your background just how much effort you put in thus within if you were born to the richest or the poorest quartile of income then you should have the same ability to be in the richest quartile later in life (Galbraith & Hale, 2014). This however is not the case within the United States (PEW Research Center, 2020). Within the United States the middle class share of the economy is declining as well as the top 5% continue to gain more and more than any others(PEW Research Center, 2020).

An important indicator of the current economic inequality and inequality from a global perspective is reflected in the Global Social Mobility Index done by the world economic forum. This indicator includes 10 different indicators/measures of economic inequality listed below:

1. Health

2. Education Access

3. Education Quality

4. Lifelong Learning

5. Social Protection

6. Technology Access

7. Work Opportunities

8. Fair Wages

9. Working Conditions

10. Inclusive Institutions (*Global Social Mobility Index 2020*, 2020)

For the case of this paper education access/quality and fair wages will be discussed within the United States. Education access was rated 40th, education quality ranked 25th, and fair wages ranked at 53rd all ranked on a global scale (*Global Social Mobility Index 2020*, 2020). These rankings again are some of the lowest with any high income country or Western country (*Global Social Mobility Index 2020*, 2020).

From a global scale then the United States is way behind their peers with economic and education quality and as a whole within the Social Mobility index. Social mobility is associated with the GINI coefficient and thus social mobility is important to understand the inequality within the United States (*Global Social Mobility Index 2020*, 2020).

The United States may have had the original ideals of "equality for all" but is currently lower than the world average (38.2) measure of inequality (GINI Coefficient) with a most current score of 41.5 (*Gini Index*, 2020). This score takes into account many indicators for inequality such as poverty rates and gaps but is important to the current situation within the United States because the United States should be able to be comparable to similar countries which this shows may not be the case (*Gini Index*, 2020). A similar country to the United States by GDP per capita within 2021 to be used as a tool to compare on a basic economic level is Iceland with a GDP per capita of $68,844 while the US is slightly higher with $69,375 (a difference of $531) (*Global Social Mobility Index 2020*, 2020). Within the GINI Coefficient Iceland has a score of 26. 1 a score that is within the top 10 of total countries (*Global Social Mobility Index 2020*, 2020). There is no country with a higher gdp per capita with a such a high GINI score as well than the United States and the closest gdp per capita that also has a higher GINI score is Chile with a gdp per capita of $16,078.7 and GINI score of 46.6 (*Global Social Mobility Index 2020*, 2020).

Throughout the whole United States the rates of inequality and social mobility are both going in negative directions however certain populations are even more worse off than others. Unless an individual is born to a rich family as a white straight male they will be worse off than their parents were generation after generation (PEW Research Center, 2020). Past income inequality rising, wage inequality is also rising as well which is to be predicted due to the connection between wages and income (Heathcote et al., 2009). As wages within different industries continued to become even more divided within the United States due to the 2008 recession there were two avenues to take, one with governmental support and quick and temporary inequality growth or even greater inequality and slower economic rebound (Heathcote et

al., 2009). However unfortunately the United States went down the taken path and its already divided economy became even worse off with certain industries able to grow as well as the extremely wealthy continue to be more well off than before than the average American (Galbraith & Hale, 2014).

Though the idea of the super-rich being able to give back to the less fortunate is also an old idea from trickle-down economics, within the US the rich also have power over government and institutions thus this inequality remains true within the United States (Smeeding, 2005). The difference between poor and rich goes past money then and also becomes institutionalized as the basis of how American society works. Thus it may be also important to look at other economic factors as well that are associated with inequality such as unemployment to see other pathways to and from inequality (Cysne, 2009).

Are we truly educated?

The idea of education has changed throughout history with the first similar appearing Western education system to the United States first starting in the 14th century (Rury & Tamura, 2019). The original system of education was created though for the rich/upper-middle class white boys within the West and it took till the end of the 19th century for a sliver of equality within this system for females and racial minorities (Rury & Tamura, 2019). This system has evolved over hundreds of years to how we see education today within the United States. The first industrialized education system within the United States started at the same time as the beginning of the countyhood (1775) since the originally English colony had already implemented the idea of a system of education (Beadie, 2019). However, unlike the rest of North America, the United States of America took a different historical approach to how they tackle their education system (Beadie, 2019). This different approach has put the hands of education jurisdiction into states rather than having a whole unionized approach to education curriculum and approach (Beadie, 2019). This historical difference between how the USA approaches education may be reflected in the differences in quality of education by state later on.

Besides how the United States distributes control on education it is very similar to its North American counterparts as well as Western-European countries within how neo-liberal ideals affect education quality(Rury & Tamura, 2019). Neo-liberal education developed during the late 20th century especially within capitalist countries to create more unionization with standardized tests to be comparability globally (Beadie, 2019). The United States would also use these standardized tests to combat progressive education styles and promote competition between schools to get funding based on these standardized tests (Putnam, 2016 & Schroeder et al., 2018). These standardized tests, though efficient to be able to compare countries on a basic level, do not add to education quality but may be leading to a more divided system (Schroeder et al., 2018). This division caused by standardized tests comes from the need for high test scores thus those with worse test scores get less funding thus leading possibly even worse test scores causing a negative loop within the a high-stakes system of allocation (Cizek, 2005). So different approaches to gain funding have been done to create a more equitable approach to education such as giving even more funding to worsening schools to bring them up to the same standard as others (Wiliam, 2010). Though test scores have been debated both ways they are still an important indicator for education quality within academic quality of the schools.

When compared abroad with PISA scores the reading score is similar to most other "Western" countries though the math score is not like other more developed countries (NCES, 2015a & NCES, 2015b). With the average reading score world wide being 493 and the United States being 497 the United States is slightly above average though the country (Singapore) with the highest score has a score of 535 (NCES, 2015a). For average math scores though the world average is 490 and the United States had a score of 470 and again Singapore had the highest score of 564 (NCES, 2015b).

What does education mean to economics?

The United States has both declining equality as well as education quality over the ages thus the research question of the paper becomes clear. *How does primary and secondary education quality affect*

the overall economic inequality of the United States?   The importance of education on the American dream is not up for discussion, due to the strong ties between high quality education and lower inequality (Rumberger, 2010), but how this connection affects various variables as well as differences between the states over time. American schools, the ideal foundation of the American dream, can both hinder the progress of an individual through systems such as disenfranchisement or boost them forward through such systems such as human capital (Hochschild & Scovronick, 2004). These two different paths will be further discussed in detail to understand the influence of the other dependent variables both on education quality and economic inequality.

Education, the beginning point for almost all Americans, is influential to an individual's own ability and opportunity. From the age 5-18 49.4 million Americans attend public schools, the private sector has not seen much change in quality or attendance rates thus is not included, this time's goal to create an individual that can work and thrive in today's society (NCES, 2021). Factors out of the child's control such as their race or social class may from the beginning may hinder a child's education outcomes and quality received (Garcia & Weiss, 2017). Lower social class may not just have adverse effects on a child's education quality but also their cognitive and behavioral health (Tomer, 2014). Examples of how class may affect learning outcomes is the accessibility to tools and support outside of schools may be lower in lower income families as well as school districts redlining on the basis of neighborhood incomes and racial populations (Tomer, 2014). Thus even with the same public school education many students may differ due to the non equitable approach of not understanding the deeper layers of inequality around education.

Though primary and secondary education may cause original problems within an individual there are many different tools used to counter these obstacles to true educational success. The main tool used to ensure academic success leads to economic success is school funding (Smeeding, 2005 & Hanushek & Woessmann, 2007). Thus funding mainly relies also on the standardized test scores many have started to

opt-out of these tests due to the discrimination they may place with schools and have chosen different ways to express a schools value (Schroeder et al., 2018).

Also within school funding is the relationship between per pupil spending and amount given by state and federal for education. If per pupil spending is increased it should help decrease the path of low income students to the same as their other income counterparts (Jackson et al., 2015). However there are many other variables that may affect education success to then income success, education spending is a key important player to hopefully decreasing poverty and inequality over time (Jackson et al., 2015).

Another layer within this connection is the geographical place they take place within the United States. As mentioned earlier the United States does not have a unified way of tackling education curriculum or education quality due to each state having different paths towards their own (Carnoy et al., 2015). Thus it is more important to focus on the United States by region rather than worldwide due to the regions each being within the same cultural and structural system as each other (Carnoy et al., 2015).

Results:

The beginning of the analysis first was to examine the variables within the final date set. The table below shows all variables included within the data analysis. There are two different times frames that were looked into with one attached to the dependent variable of inequality (2000,2010, and 2020) and once attached to the independent variable of education quality (1992, 2002, and 2012). There are two different time spans to be able to show the effect of the independent variable on the dependent over time with a 8-9 year time difference in between. As well as different time frames the data was also divided by state , geographical region, and economic region as previously mentioned. Though the state was to determine regions and economic regions were not significantly important due to their low observations.

The different areas were also examined against each other to understand the true divisions and correlations within and outside of them.

The means of each variable as well as their time period is found in the table below to summarize all of the key variables.

Table 1. Independent and Dependent Variables Over Time and by Region

	National - The United States	The West	The South	The Midwest	The Northeast
Per Pupil Spending 1992	$5,156	$4,837	$4,652	$5,036	$6,727
Per Pupil Spending 2002	$8,027	$7,273	$7,421	$7,907	$10,419
Per Pupil Spending 2011	$11,222	$10,048	$10,303	$10,538	$15,567
State Spending Percentage 1992	2.0601%	2.511%	2.1184%	1.793%	1.6533%
State Spending Percentage 2002	2.049%	2.3105%	1.906%	2.004%	2.000%

State Spending Percentage 2011	3.690%	3.381%	3.473%	3.725%	4.500%
GINI Coefficient 2000	.4402	.4318	.4522	.4291	.4444
Average Math scores Grade 4 1992	215.3	213.6	209.9	221.3	222.1
Average Math scores Grade 4 2002	217.6	219.9	213.7	222.1	225.3
Average Math scores Grade 4 2011	220.8	216.4	218.2	222.6	227.2
GINI Coefficient 2010	.4538	.4423	.4660	.4427	.4620
GINI Coefficient 2020	.4651	.4534	.4782	.4510	.4717
Unemploymen	3.941%	4.492%	4.212%	3.350	3.422

t 2000					
Unemploymen t 2010	8.784%	9.292%	9.188%	7.900%	8.467%
Unemploymen t 2020	7.367%	8.038%	7.141%	6.467%	8.022%
Per Capita GDP 2000	$44,678	$44,021	$46,064	$41,563	47,162
Per Capita GDP 2010	$48,634	$47,974	$49,666	$45,725	$51,517
Per Capita GDP 2020	$61,809	$59,424	$62,260	$60,683	$65,901

Independent Variables:

Each one of these variables has changed over time both statewide and regionally. The image below shows these changes of our independent variables of per pupil spending, percentage of state and local spending out of the total states real GDP, and math and reading scores from grade 4 and grade 8 from 1992, 2002, and 2011. These variables were put against together in correlation and did not have too high of a correlation thus each added different layers of importance.

Image 1. Per Pupil Spending & State Percent Spending on Education from 1992, 2002 & 2011
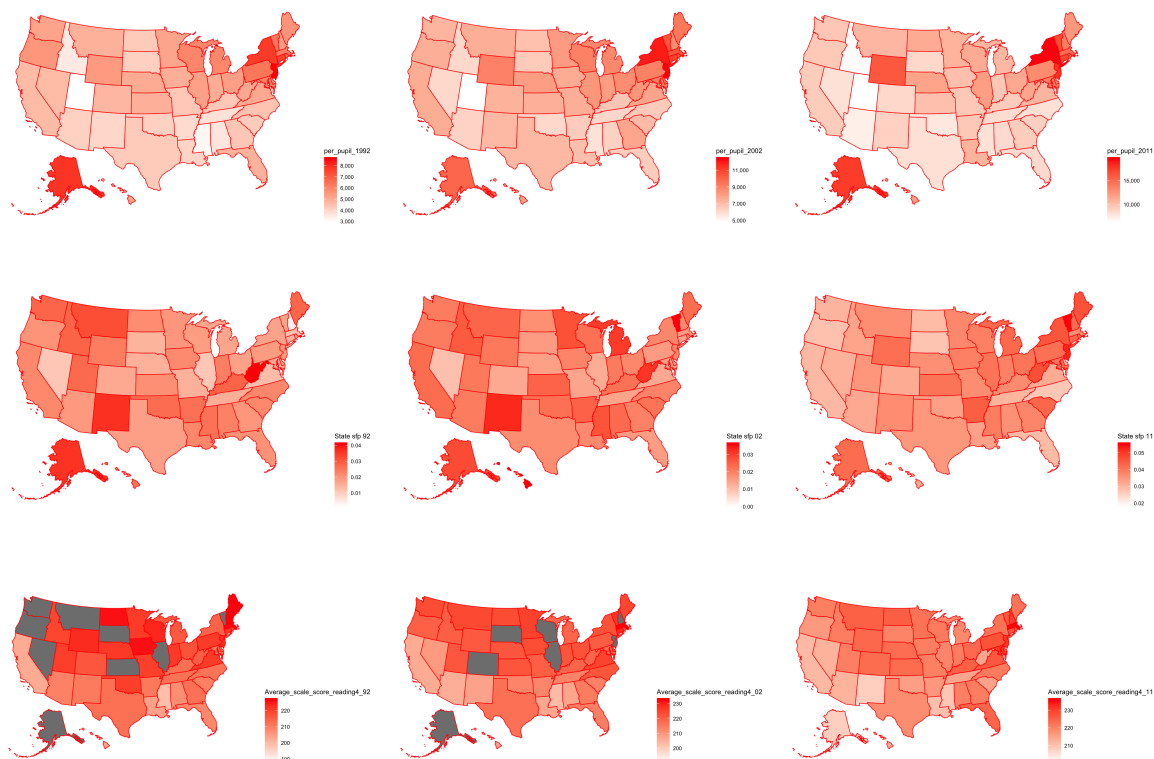
From this image it is shown that the most change over time is each area almost doubling their per pupil spending. The West, South, and Midwest have all raised around the same mean amount from 1992 to 2011 while the Northern states started at a higher mean rate and continued at a higher rate than any other region. The final means for the West, South, Midwest, and Northeast are shown below in table 1. The table reflects the similarities between the three regions with the Northeast being the only true different pattern.

The other independent variable of local spending out of the total states real gdp. This value was calculated by dividing state and local education spending by the state's real gdp to create the percentage of the amount towards education. Local funding was by counties and cities to their education systems while the state measured the amount given by the state government to all schools throughout the state. From 1992 the region with the lowest percentage was the Northeast (1.6533%) who then became the largest

percentage by 2011 (4.500%) a 2.8467% growth in the 19 years. The South was the only region to go down from 1992 (2.1184%) to 2002 (1.906%) then back up in 2012 (3.473%).

The only measure of reading and math scores that was available for each three years was average reading scores for grade 4. Though there are missing values within the first two time series. For the sake of continuity this variable is the only one within the heat maps in Image 1. Though the map looks very different in each time series the West barely differed within their mean ein each time series starting at 213.1 in 2000 and ending in 216.4 while the Midwest differed even less starting with 222.3 in 2000 and ending in 221.6 in 2020. While as a whole the United States only increased in scores from 2000 to 2020 (215.3, 217.6, and 220.8 respectively) only two regions increased only through each time series. The only two regions to steadily increase were the South and the Northeast.

Dependent Variables:

The dependent variables of income inequality have also changed over time as well. The maps below show the change of GINI index, unemployment rates, and per capita real gdp from 2000, 2010, and 2020. With the increase in shading again meaning an increase in the variable.

Image 2. GINI Coefficient, Unemployment Rates, and Per Capita Real GDP from 2000, 2010 & 2020
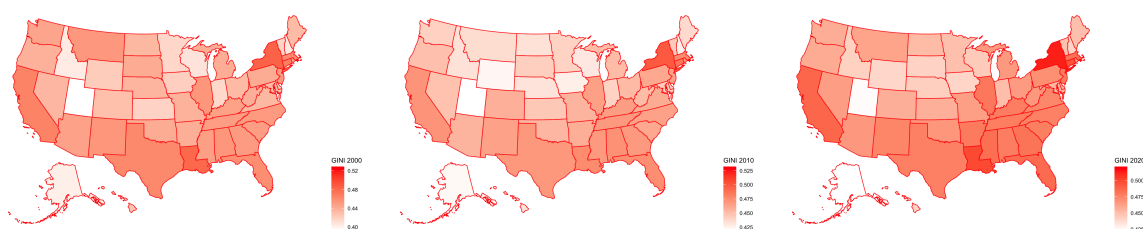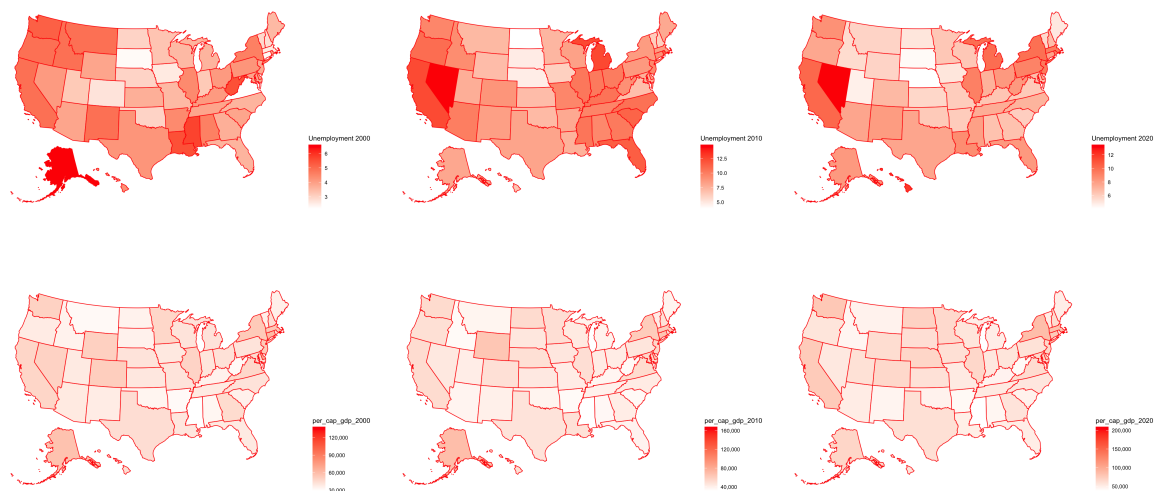
Again there is much change over time with each variable. Within the GINI index over all there has been a steady increase in the mean overall GINI variable within the United States as a whole as well as by region. The mean of the GINI index overall went from a mean of .4402 in 2000 to .4651 in 2020, an increase of .0249. Below shows the change of all the means for the regions as well as their percent change.

With means of the GINI index increasing it can be seen within the maps the overall change of where the GINI index increases by region as well. The map shows the most areas, especially the South and West, have increased in the color shading over time the most from first look with New york being the exemption. With the mean of GINI increasing over time there was also increasing with the minimum values within each area however the maximum GINI index decreased over time within the Southern region by .0075. There was no other decrease within the GINI index within the normal statistical values such as quartiles, median, and mean for all regions.

Unemployment is a more dynamic variable than its other counterparts. From the map each year sees changes in the geographical locations of unemployment levels. The beginning of 2000 saw lower levels of unemployment with the mean of the United States being 3.90% then a mean of 8.784% in 2010

and then a mean of 7.367%. The pattern of an increase in 2010 versus the other years can be seen in all regions plus an overall increase from 2000 to 2020.

The per capita real GDP has also increased over time with certain areas such as the District of Columbia each year being an outlier among all states each year making their maps diluted by this extreme outlier. Over the years the District of Columbia has gone from $138,628 to $209,471 ($70,843 difference) for their real gdp per capita while the lowest state over time (Mississippi) went from $29,166 to $38,502 ($9,336 difference) over a 20 year period. Within the beginning of the 21st century the Northeast had the highest mean gdp per capita($47,162)out of all the regions and 20 years later they were still the highest region with ($65,901) while also being the highest in 2010 as well ($51,517). The region with the lowest changed over time with the lowest in 2000 being the Midwest $41563.

Multi-Linear Regression Analysis:

For the regression analysis the three variables of GINI index, unemployment rates, and per capita real gdp were looked into and plotted against each other to also ensure correlation between GINI index and its indicator variables over time. The model below shows these correlations on a basic national level.

Model 1. Multi-Linear Regression Analysis of GINI ~ log(GDP Per Capita) + Unemployment Rate (Time Series 1: T1, Time Series 2: T2 & Time Series 3: T3)

	National - T1	National - T2	National - T3
(Intercept)	0.038	0.060	0.255*
	(0.128)	(0.104)	(0.114)
log(GDP Per Capita)	0.035**	0.033**	0.016
	(0.012)	(0.010)	(0.010)
Unemployment Rate	0.006*	0.005***	0.004**
	(0.003)	(0.001)	(0.001)
Num.Obs.	51	51	51
R2	0.226	0.340	0.197
R2 Adj.	0.194	0.312	0.163
AIC	-245.3	-264.0	-256.9
BIC	-237.6	-256.3	-249.2
Log.Lik.	126.659	136.009	132.463
F	7.009	12.340	5.875
RMSE	0.02	0.02	0.02

Model 1 shows these variables have a strong correlation with the GINI index thus are to be added to final regression analysis as sub dependent variables. While the GINI index was most associated with unemployment and per capita real GDP, education quality through per pupil spending was not associated greatly with other education quality variables of math and reading scores. The education quality measure of per pupil spending had a strong correlation with the percent of money spent on education out of the state's real GDP while not with total education spending. Thus the percent spent on education was used as a control for the independent variable.

For the purpose of this paper regions were focused upon solely instead of by state for statistical analysis. The final regression analysis used the dependent variable of Gini Coefficient with its indicator of

unemployment rates and per capita real GDP against the independent variable of per pupil spending with its control of percent spent on education by state. This regression was done by first a 8 year time lag then another 8 year time lag and then finally a 9 year time span due to available data.

The regression analysis was done against each three dependent variables (GINI coefficient, Unemployment, and Gdp per capita) in three different models against the independent variables (per pupil spending, percent state spent on education, and math & reading test scores) in each. Each will be quickly explained within the context of their significance and sign. They will each follow each other within the layout to provide more space to expand the full table for review.

Model 2. Multi-Linear Regression Analysis of GINI ~ Per Pupil + Percent Spent on Education + Average Reading and Math Scores across each time series (Time Series 1: T1, Time Series 2: T2 & Time Series 3: T3)

	National - T1	The West - T1	The South - T1	The Midwest - T1	The Northeast- T1	National - T2	The West - T2	The South - T2	The Midwest - T2	The Northeast- T2	National - T3	The West - T3	The South - T3	The Midwest - T3	The Northeast- T3
(Intercept)	0.868***	1.798**	0.920***	0.756	2.260	0.817***	0.658**	1.062***	1.066	0.385	1.094***	1.604**	0.936***	0.385	1.043
	(0.059)	(0.488)	(0.342)	(1.238)	(3.625)	(0.145)	(0.172)	(0.335)	(2.910)	(2.038)	(0.137)	(0.647)	(0.256)	(1.521)	(1.102)
Per Pupil Spending	0.000***	0.000	0.000	0.000	0.000	0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Percent Spent on Education	-0.238	-2.312*	-0.461	-2.304	-0.406	-0.886*	-0.453	-1.244*	-0.026	-1.722	0.169	-0.089	-0.647	1.525	-0.958
	(0.447)	(1.024)	(0.619)	(4.207)	(4.885)	(0.470)	(1.100)	(1.045)	(2.433)	(4.166)	(0.396)	(2.962)	(0.668)	(2.184)	(3.251)
Average Math Score Grade 4	-0.002	-0.010**	-0.003	-0.005	0.011						-0.005**	-0.009+	0.000	-0.002	-0.010+
	(0.003)	(0.005)	(0.005)	(0.019)	(0.023)						(0.002)	(0.007)	(0.002)	(0.007)	(0.015)
Average Math Score Grade 8	0.000	-0.004*	0.000	0.002	-0.012						0.002	0.006	0.000	0.001	0.002
	(0.001)	(0.003)	(0.003)	(0.010)	(0.029)						(0.001)	(0.007)	(0.001)	(0.008)	(0.012)
Average Reading Score Grade 4	0.000	0.008*	0.000	0.001	-0.005	-0.001	-0.003+	0.000	-0.003	0.000	0.004***	0.008	0.000	0.000	0.007
	(0.002)	(0.005)	(0.003)	(0.014)	(0.014)	(0.001)	(0.004)	(0.001)	(0.010)	(0.007)	(0.002)	(0.007)	(0.002)	(0.005)	(0.008)
Average Reading Score Grade 8	0.000					-0.001	0.002	-0.002	0.000	0.000	-0.004**	-0.009	-0.001	0.001	-0.001
	(0.001)					(0.001)	(0.004)	(0.001)	(0.004)	(0.013)	(0.002)	(0.011)	(0.003)	(0.010)	(0.010)
Num.Obs.	42	8	17	9	8	42	11	17	7	7	51	13	17	12	9
R2	0.658	0.995	0.740	0.676	0.723	0.545	0.582	0.829	0.350	0.941	0.522	0.690	0.705	0.446	0.969
R2 Adj.	0.611	0.982	0.622	0.137	0.031	0.496	0.303	0.772	-0.951	0.823	0.456	0.379	0.529	-0.219	0.877
AIC	-225.9	-65.9	-89.5	-51.7	-34.0	-228.0	-57.9	-104.1	-37.8	-42.4	-275.4	-66.8	-99.5	-64.0	-58.2
BIC	-213.7	-65.3	-83.3	-50.3	-33.5	-217.6	-55.5	-99.1	-38.1	-42.8	-259.9	-62.3	-92.8	-60.1	-56.6
Log.Lik.	119.929	39.928	51.583	32.859	24.020	120.010	34.959	58.068	24.878	27.223	145.683	41.415	57.730	40.009	37.088

Model 3. Multi-Linear Regression Analysis of Unemployment Rate ~ Per Pupil + Percent Spent on Education + Average Reading and Math Scores across each time series (Time Series 1: T1, Time Series 2: T2 & Time Series 3: T3)

	National - T1	The West - T1	The South - T1	The Midwest - T1	The Northeast - T1	National - T2	The West - T2	The South - T2	The Midwest - T2	The Northeast - T2	National - T3	The West - T3	The South - T3	The Midwest - T3	The Northeast - T3
(Intercept)	20.092***	-3.150	29.658***	20.261	45.800	52.192***	54.250*	64.932*	310.744	181.318	28.074*	63.762	26.678	73.342	62.815
	(2.028)	(45.494)	(4.286)	(43.078)	(125.479)	(21.796)	(20.968)	(31.673)	(558.505)	(191.117)	(23.973)	(21.090)	(34.455)	(151.366)	(164.528)
Per Pupil Spending	0.000*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.000	0.000	0.000	0.000	0.000
	0.000	(0.001)	0.000	(0.001)	(0.002)	0.000	(0.001)	0.000	(0.004)	(0.002)	0.000	0.000	0.000	(0.001)	(0.003)
Percent Spent on Education	56.476***	167.807	68.201**	-12.702	43.985	-37.449	-278.949*	3.271	-20.982	112.528	-4.220	-157.705	-17.114	330.334	81.768
	(17.310)	(122.926)	(44.836)	(141.422)	(141.095)	(74.145)	(116.031)	(81.096)	(518.261)	(393.213)	(83.513)	(136.488)	(75.695)	(307.754)	(1164.349)
Average Math Score Grade 4	-0.103+	-0.143	0.018	0.014	0.099						0.176	0.230	-0.042	-0.443	-0.512
	(0.053)	(0.337)	(0.118)	(0.541)	(1.062)						(0.202)	(0.205)	(0.406)	(0.779)	(3.015)
Average Math Score Grade 8	0.032	0.234	-0.047	-0.030	-0.134						-0.102	0.717	0.030	0.392	-0.042
	(0.032)	(0.332)	(0.081)	(0.301)	(1.066)						(0.144)	(0.324)	(0.253)	(0.808)	(3.038)
Average Reading Score Grade 4	-0.020	-0.144	-0.090	-0.053	-0.122	0.158	-0.151	0.296	-0.545	0.440	-0.029	0.220	0.072	-0.155	0.906
	(0.031)	(0.441)	(0.083)	(0.345)	(0.624)	(0.148)	(0.687)	(0.249)	(1.987)	(0.635)	(0.125)	(0.208)	(0.331)	(0.572)	(2.311)
Average Reading Score Grade 8						-0.286*	-0.021	-0.447+	-0.732	-0.984	-0.111	-1.354*	-0.127	-0.197	-0.463
						(0.180)	(0.602)	(0.297)	(0.826)	(1.204)	(0.165)	(0.502)	(0.285)	(0.963)	(1.508)
Num.Obs.	42	8	17	9	8	42	11	17	7	7	51	13	17	12	9
R2	0.719	0.869	0.859	0.632	0.643	0.215	0.737	0.301	0.797	0.909	0.200	0.877	0.293	0.672	0.918
R2 Adj.	0.680	0.540	0.794	0.018	-0.249	0.130	0.562	0.068	0.392	0.728	0.091	0.754	-0.131	0.277	0.673
AIC	69.3	16.4	27.0	14.4	24.5	182.5	47.9	66.4	35.8	20.6	212.9	49.2	52.8	50.6	28.9
BIC	81.5	16.9	32.8	15.7	25.1	193.0	50.3	71.4	35.4	20.3	228.4	53.7	59.5	54.5	30.5
Log.Lik.	-27.646	-1.194	-6.496	-0.177	-5.259	-85.264	-17.934	-27.190	-11.877	-4.314	-98.471	-16.609	-18.425	-17.311	-6.444

Model 4. Multi-Linear Regression Analysis of log(Per Capita GDP) ~ Per Pupil + Percent Spent on Education + Average Reading and Math Scores across each time series (Time Series 1: T1, Time Series 2: T2 & Time Series 3: T3)

	National - T1	The West - T1	The South - T1	The Midwest - T1	The Northeast- T1	National - T2	The West - T2	The South - T2	The Midwest - T2	The Northeast- T2	National - T3	The West - T3	The South - T3	The Midwest - T3	The Northeast- T3
(Intercept)	12.268***	10.635	12.027***	14.789*	15.174	13.038***	11.544***	10.647***	1.980	7.774	10.098***	3.058	11.201***	11.924	8.235
	(1.685)	(8.671)	(1.696)	(7.967)	(21.392)	(2.045)	(2.932)	(2.517)	(19.877)	(21.576)	(2.136)	(7.577)	(3.545)	(7.761)	(20.317)
Per Pupil Spending	0.000***	0.000	0.000***	0.000	0.000	0.000***	0.000*	0.000***	0.000	0.000	0.000***	0.000*	0.000***	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Percent Spent on Education	-14.465***	-9.832	-21.090***	6.585	-16.894	-17.747***	-9.074	-26.413***	-2.351	-14.237	-26.096***	-44.931*	-21.994**	-15.011	-25.295
	(5.030)	(34.205)	(5.871)	(28.823)	(26.372)	(7.981)	(12.076)	(6.105)	(19.676)	(44.504)	(6.896)	(45.814)	(9.635)	(13.503)	(48.818)
Average Math Score Grade 4	0.006	-0.014	0.037	0.038	0.051						0.008	0.087	-0.019	0.002	-0.006
	(0.020)	(0.118)	(0.029)	(0.152)	(0.123)						(0.017)	(0.075)	(0.033)	(0.030)	(0.295)
Average Math Score Grade 8	0.002	0.000	-0.042+	-0.010	-0.047						0.003	-0.070	0.025	0.007	0.000
	(0.010)	(0.066)	(0.026)	(0.084)	(0.172)						(0.014)	(0.099)	(0.023)	(0.027)	(0.160)
Average Reading Score Grade 4	-0.017+	0.013	0.006	-0.045	-0.014	-0.001	0.024	-0.017	0.028	0.016	-0.004	-0.065	0.007	-0.002	0.008
	(0.009)	(0.114)	(0.020)	(0.097)	(0.084)	(0.017)	(0.024)	(0.013)	(0.071)	(0.071)	(0.012)	(0.068)	(0.017)	(0.034)	(0.197)
Average Reading Score Grade 8						-0.009	-0.026	0.012	0.011	-0.006	-0.003	0.083	-0.017	-0.012	0.009
						(0.013)	(0.026)	(0.016)	(0.032)	(0.135)	(0.016)	(0.148)	(0.023)	(0.036)	(0.135)
Num.Obs.	42	8	17	9	8	42	11	17	7	7	51	13	17	12	9
R2	0.721	0.786	0.935	0.620	0.795	0.723	0.730	0.956	0.744	0.931	0.772	0.676	0.938	0.712	0.911
R2 Adj.	0.683	0.250	0.906	-0.014	0.284	0.693	0.550	0.941	0.232	0.793	0.741	0.353	0.901	0.366	0.646
AIC	-36.1	-7.2	-19.5	-15.8	-4.6	-31.9	-9.4	-26.2	-10.8	-10.0	-55.4	-7.8	-16.9	-21.0	-10.6
BIC	-23.9	-6.6	-13.7	-14.5	-4.0	-21.5	-7.0	-21.2	-11.1	-10.3	-39.9	-3.2	-10.2	-17.2	-9.1
Log.Lik.	25.039	10.586	16.749	14.924	9.288	21.961	10.688	19.107	11.386	10.981	35.693	11.881	16.434	18.524	13.322

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Model 2 reflects the highest significance for per pupil was on a national level in the first time series against the GINI coefficient and decreased in siffcance each time series after within the national level. Also on the national level there was a slight significance and negative correlation in the second time series with percent spent on education by state and high to very high significance with the reading scores in the last time series. The significance with the scores and the GINI coefficient in the last time series was both a positive and negative correlation with grade 4 math and grade 8 reading being slightly negative and grade 8 math and grade 4 reading being slightly positive. The West also had the most significant coefficients in the first time series with low to medium significance with independent variables. The highest significance in the first time series of the West was against grade 4 math scores and had a negative correlation. It additionally had a negative and low correlation with percent spent on education by a state and grade 8 math scores. The West then had very little significance but still held the same positive and negative correlation pattern of variables.

The South had almost no significant correlation with the independent variables though still had the same pattern of negative correlation with percent spent on education by state and certain education scores. While the South had some significance the Midwest reflected no significa values within any time series in this model with the dependent variable being GINI coefficient. Similar to the Midwest the Northeast did not have any significance besides one small significance in the last time series against grade 4 math score. Throughout the whole model the percent the state spent on education was a negative association till the last time series when nationally it was a positive association and also within the Midwest.

Model 3 represents the association between the dependent variable of Unemployment and the independent variables (per pupil spending, percent state spent on education, and math & reading test scores). This model has very little significance with the education scores thus per pupil spending and percent state spent on education will be focused on for this model. On a national level there was high

significance with percent spent on education by state within the first time series then this relationship moved to non significance in the last two time series as well as became a negative association. Nationally there was little significance with per pupil spending in the first time series as well. The Midwest and Northeast had no significance throughout the model. The West and the South each saw a little significance with the South having medium significance with percent spent on education by state in the first time series while the West had slight significance with that variable in the second time series.

Model 4 uses real GDP per capita as the dependent variable and again per pupil spending, percent state spent on education, and math & reading test scores as the independent variables. Similar to the two previous models above the highest significance was found on a national level though with this model the significance grew over the three time series. Also similar to the last model there is very little significance with the test scores from math and reading and will also be excluded from this analysis of this model. Though on a national level the significance grew with the variable of percent spent on education by state it was a negative association through each time series. On the national level per pupil spending was a positive association with the coefficient changing each year. The West had no significance in the first time series then had medium significance with the per pupil spending in both the second and third time series. While per pupil spending was a positive association, percent spent on education became a more negative association over time and had a slight significance in the last time series in the West.

On the same path as the whole United States the South also had high sigicince throughout each time series. The highest significance was with per pupil spending which coefficient though positive lowered each year. Within the South, percent spent on education's coefficient held medium significance through each time series as well as a negative relationship. The Midwest and Northeast once more had very little to no significance within this model. Though each helps the pattern of a negative association with percent spent on education (besides the Midwest in the first time series) and positive associations with per pupil spending (besides the Midwest in the first time series and second time series).

Discussion:

This paper's purpose was to discover the correlations between education quality and economic inequality. With the alternative hypothesis and null hypothesis are as follows: H_1: Poor education quality leads to worse economic inequality, while the null hypothesis is H_0: Poor education quality does not lead to worse economic inequality. While the research question is How does education quality and economic inequality correlate with each other within the United States? There was however little correlation with academic quality and monterey quality of education the focus of education quality moved towards the monetary lens. Each region will be discussed thoroughly with the given results from both the literature analysis and statistical analysis.

National - United States:

The United States as a whole had the highest correlation within each year probably due to the higher number of observations it has (51) while each region is separated into 9-17 variables. It was shown that over all within the United states that there was high significance within each showing that education quality does correlate with inequality. Though this correlation is two-sided with per pupil spending increasing the GINI coefficient at most in the first time series, second in the second series, and third in the third series while the percent spending only holds some significance in the second time series. The percent spending over time reflects a negative correlation between our dependent variables and the percent spent on education out of a state's real GDP thus determining that there is also a negative relationship with GINI coefficient.

This negative relationship shows that the more the government spent out of their total GDP the lower the inequality may be which is in line with earlier research. This negative correlation was only within the first two time series then became positive and not sigicinat. These two different results present a puzzle that then needs solving due to their opposing nature. Another puzzle that presented itself was

within the third time series of Model 2 with the math and reading scores. Between the four different test scores in the last time series within the national model each had significance though the highest was grade 4 reading score, the other more significant one was a negative association from grade 8 reading scores. Thus for grade four reading score it may increase the GINI coefficient but grade 8 may decrease the GINI coefficient.

Test scores having a negative association with inequality thus possibly lowering it which is in lion with some research so far (Duquennois, 2022). Though also within the national level there is also a positive association between test scores and the GINI coefficient as well which is another puzzle. Model 3 on a national level also showed a positive significance within the first time series with percent spent on education against unemployment. Meaning how how the whole united states spent per state on education may increase unemployment when raised but this was only found within the first time series and may not be a true conclusion.

Model 4 had the most interesting results due to the high correlation between gdp per capita and the independent variables. The first time series reflected a high significance for per pupil spending and gdp per capita meaning the more spent of each individual pupil may lead to a decrease in real gdp. This pattern stayed within high significance until being medium significance in the third time series. Though again this may be a misleading association due to the high dependence on real GDP to how much each state can spend. Each region will be looked into to see the patterns that presented themselves in the data as well as back up from litaturer review. However since there is no unified approach to education within the United States thus regions each have their own pattern and relation.

The West:

The West has some correlation and significance though not in the same pattern as the national level. Though states such as California and Washington have high real gdp they also have higher real gdp when compared to other states. The West is a mix of both extremely high states as previously stated but also states with very low real gdp and very low gdp per capita. Though an important factor within the West pattern is their unemployment levels that are higher than most regions. Within the 2010 year of unemployment it had the highest mean employment with 9.292% with California and Nevada being also with the highest unemployment rate. These two states had especially low unemployment but not a dip in their GDP due to the recession (Florida, 2016). The recession affected certain states such as Nevada and California the worst due to their type of economies thus overall affecting the region of the West as a whole with certain cities such as San Jose, Los Angeles, and Las Vegas being hurt the most (Florida, 2016). Model 4 that reflected the dependent variable of unemployment against the independent variables did not have any significance besides within the second time series where percent spent on education was slightly negatively associated with it. Meaning that the more spent on education may also lead to less unemployment however this may be a false assumption due to the second time series containing dependent variables from the recession period.

Though the West is the lowest region for per capita gdp as of 2020 it had the second lowest GINI coefficient. This gini coefficient is also lower than the national average of that same year but the West also had the highest amount of unemployment. This is against the normal pattern found by regressing gini and unemployment together to reflect that lower unemployment leads to a lower GINI score. This pattern is also found in many countries and is why it is included as an indicator for the GINI coefficient (Cysne, 2009). The West again is against the normal patterns. However within the first time series there was a negative correlation with both grade 4 and 8 math scores thus this may mean that average test scores of math have a negative association with the GINI coefficient thus lowering the GINI with higher test scores. Although, this association did not have true high significance through the rest thus only within the first time series may this be true.

Unlike its correlation with the GINI coefficient and unemployment the West grew in significance against all independent variables within Model 5. Model 5 reflects a positive association between gdp per capita and per pupil spending meaning the more spent per pupil may be associated with a high gdp per capita. This association continued through each time series with a slight increase then decrease in the coefficient. Though at the same time within each time series the negative association between percent spent on education by a state and real gdp per capita. This would possibly mean that how much the states each a whole may be associated with a lower gdp per capita when the percent spent increases. This negative association may be also explained by states not distributing their gdp as equally within themselves thus meaning that a high gdp per capita may not be only due to percent spent on education.

The South:

From the regression analysis the South had the highest amount of significance within the independent variables within all of the models. Model 2 only found slight significance with the percent spent on education by state and this was a negative association thus leading to meaning that the amount spent on education by the South may have decreased the GINI coefficient. Interesting within that same time series was the only time the South did not have the highest GINI coefficient. Thus how much spent on education may lower a region's inequality.

However within Model 3 there was a positive association between unemployment and percent spent on education within time series 1. Meaning that the more spent on education may also lead to more unemployment however this may be a false assumption due the complex nature of reasons for unemployment. Though within Model 4 the South also held significance within the dependent variable being gdp per capita and the independent variables. This association was very significant in the first two timer series then decreased down to medium significance with the percent spent on education and was a negative relation. Though there was a positive significant coefficient for per pupil spending that was

highly significant through each time series, hopefully reflecting per pupil spending may increase the real gdp per capita inline with current ideals (Jackson et al., 2015).

The Midwest and Northeast:

The Midwest and similar patterns of significance within the 3 models of dependent variables against the independent variables though each was very different from each other within the summary statistics. Such patterns that reflect the two different patterns can be found within their GINI coefficient means where the Northeast had one of the higher means over time while the MiWest had one of the lowest over time. Opposite to that pattern is that the Northeast had the highest gdp per capita over time while the Midwest had the lowest. With these opposing patterns found in most variables they may each be outliers with the regions and have a more complex composition of their economies.

Though there was rather no significance besides each with one significant coefficient within time series 3 these results are still important. Since each are outliers within the data and don't have any true high significance this reflects there is a more complex reasoning for each the independent and dependent variables. Determining how the Northeast has such a high GINI coefficient over time and high gdp per capita is important due to the fact that high gdp capita areas should have lower GINI coefficients as shown earlier *(Global Social Mobility Index 2020*, 2020). It is also important to reason why the Midwest is the opposite with a rather lower GINI coefficient over time and low GDP per capita.

With the opposition of the Midwest and Northeast though was not so similar within average reading and math scores. For example the average grade 4 reading scores were nearly similar through each time series thus each with such complex economic makeups it may be harder to determine the true association between education quality and economic inequality.

Possible Policy Recommendations:

- Focus more on inner inequalities within the United States due to the complex nature of each region and also state. This focus can be in the form of research into educational differences as well as inequality or policy to create more equatiblity between the states and regions. Investigate by comparing state and regions rather than global perspective.

- More research into the effects of educational spending on decreasing inequality within each region as well as research into how spending is allocated within the education system.This is due to the complexity found within each region needs more practical understanding and statistical review.

- An approach to school systems that create a whole equitable foundation for all rather than for certain high scorers or high economic regions.

Limitations:

There are many limitations to using qualitative research that are taken into account when conducting research. Some limitations so this research include possible biased-based writings for both economic profit and for social programs through both of these lenses are also important to understand. This project heavily relied on the US Census to determine the landscape of economic inequality as well as the NCES for the landscape of education quality. Thus these data resources may have determined the outcome of this paper and there may be different data forms out there due to different systems of measurement. Another limitation included is the possibility of missing information and depth of research so far into education quality effects on a population.There may be more policies within each state that may have more influence on the landscape of education quality thus pathways to less inequality. The last limitation to the literature review was not paper can fully explain the true association between education and and inequality to the degree it needs to be to be truly understood.

However, there are also many limitations included within the quantitative research side of this project. The main limitation of this research is the limit of what regression analysis can prove or correlate.

When conducting statistical analysis, it is also easier to miss other confounding or lurking variables that may affect the overall correlation between economic inequality and education quality. Another limitation is the quality of data used for this project due to the sources used being primary sources however filled in by each individual which may cause false reports. The self reports come from within the US Census data within variables such as unemployment rates. Though most data was collected from financial data from across the states thus can not be altered by self bias. By reflecting on all the limitations from using quantitative and qualitative research the project hopes to try to limit these possible obstructions.

Conclusion:

Through using data analysis and backup and foundation from a literature on the topic this paper hopes to understand how education quality and income inequality may be associated. Though there was not high significance throughout the models it is still important to discover the inequality landscape both economically and within the education system. The "American Dream" though does seem to continue to be a complex issue in the sense of growing inequality thus against the normative narrative.

The research question presented of *How does primary and secondary education quality affect the overall economic inequality of the United States?* Though there are conflicting results on the question there does present a blended association between them though over time it has changed and has become even more convoluted. This paper, though tries to understand the nature of the relationship between education quality and economic inequality, can not present true evidence for neither the null hypothesis nor alternative hypothesis. This leads to the conclusion of more investment and research to understand whether the American dream of true economic and educational equality may still be true within the current landscape of the United States. There should continue to be further research into how to improve stem so it works within each region and as a nation so that the "American Dream" can become feasible for all.

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