Educations Effect on Income Inequality: A Panel Data Analysis

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Abstract:

This paper investigates the effects of education amongst other factors on income inequality in Europe. This study examines if countries who have higher educational attainment have lower income inequality or if having higher educational attainment has no effect on income inequality. The study will include data from several European countries over two different time periods and the results will then be compared at a country level and at an overall level to see how education affects income inequality. The regression results show that a country that has higher educational attainment is more likely to have lower income inequality. These findings are in line with most past research.

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1.0 INTRODUCTION

Education plays a key role in many different aspects of society. Some of the benefits of having a higher educated population include economic growth, reduced poverty, social and cultural, increased innovation and creativity and improved health and wellbeing. All these will profoundly impact the wellbeing of the country as well as the people within the country. Throughout this paper we will explore how educational attainment affects some of the countries for which are in the European Union. This study will specifically investigate how educational attainment among other factors affects income inequality.

This study is significant because of the fact that the issue of income inequality is seemingly becoming worse and worse. Now there are surely many reasons to explain why income inequality is so large and continually growing, I believe that educational attainment plays a very large role in income inequality. Because if a person is unable to get a college degree, then that will limit this person's options to work and achieve a higher wage. It then makes it more difficult for that person to be able to pay for their children's college tuition so that they may be able to receive a higher wage. Not only that but college tuition is rising more rapidly than any other commodity as seen in Figure 1. Every year tuition is rising which is making it more and more difficult for the average student to be able to receive a college education.

Looking into high school educational attainment is also important. In Europe it has been reported that around 85% of people age 20-24 have completed upper secondary education in 2021. While a high school or upper secondary education is good it does not necessarily provide one with some important skills and necessary tools to be truly successful. So when people are unable to go to college or any other higher educational institution they are less likely to make more money and less than half the population aged 25-34 had completed college and received a bachelor's degree.

The main questions that are driving this research are: How can higher educational attainment influence a society and lower the income inequality gap; Second, how can education be made more available to the general public which in tail should help limit the income inequality gap; Finally, what can low income families do to break out of poverty and achieve higher wages.

The rest of the paper is as follows: Section 2 is a trend related to the study. Section 3 is a literature review. Section 4.1 data and estimation methodology. Section 4.2 outlines the empirical model and its variables. Section 5 presents and discusses the empirical findings based on the model. Section 6 presentS policy recommendations and research limitations. Finally, section 7 is the conclusions that have been made.

2.0 INFLATION OF TUITION AND INCOME INEQUALITY GAP

College tuition is one of the fastest rising commodities that there is. Every year college tuition at universities around the world rises and its rises at an alarming rate. The average tuition in 1963 for a four-year college education was $243.34 per year, and if you were to adjust for inflation that would me that a four-year college education should be around $2,348.67 per year according to Hanson (2022). But in reality students are having to pay on average around $40,000 annually for private institutions and around $10,000 annually for public in state institutions in America. Comparing what it was expected to be by adjusting for inflation to what tuition actually cost is very alarming to say the least. Since 1963 with adjusting for currency inflation, tuition has risen 747.8%. Something for which I found interesting is that over these past 5 years two-year institutions have seen larger increases in tuition than four-year institutions have which is evident from Figure 1. In some cases it is only a small gap but in the years 2016-17 and 2020-21 the gap equated to more than a 3%. While every case maybe be different there are some theories that have been developed to explain why college tuition has risen so rapidly. The first one being the Bennett Hypothesis, which states that the more aid that a student receives the more they are willing to pay. The second being the golden ticket fallacy, which states that the promise of a college education will result in improved future earnings, leads individuals to not look into college expenses as much. The last one that I will talk about is the Excessive Regulation theory, which states that because of the mass amounts of regulations, accreditations and federal subsidiaries it makes it difficult for innovative providers of higher education to provide and offer competition to existing universities which allows them to have higher control over price. Again every situation is different and these are not the only reasons to explain why college tuition rises so rapidly.

Figure 1: Annual Tuition Inflation
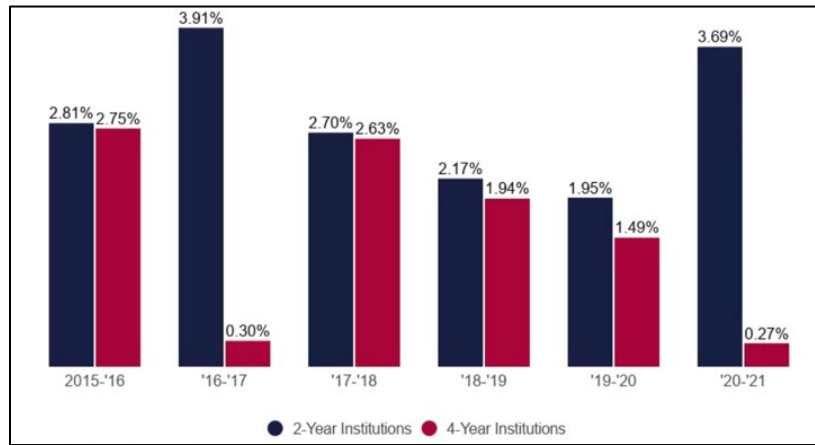
Source: National Center for Education Statistics

The second trend for which we will look at is the growing gap in income inequality. In Figure 2 you can see that around 1980 is when this gap started to expand and since this point the gap has continued to grow year after year. In regards to wealth the top 10% own around 80% of the wealth in the U.S. while the top 1% own half of that wealth. These statistics indicate how unevenly the wealth in the U.S. is spread. Looking into historical trends you can see that from the 1940s to the 1970s all income groups grow at around the same rate showing that there is less income inequality present back then. While all income groups are seemingly growing the top 5% is growing at a faster rate and endless something changes then the gap will continue to grow.

Figure 2: Family Income Gap
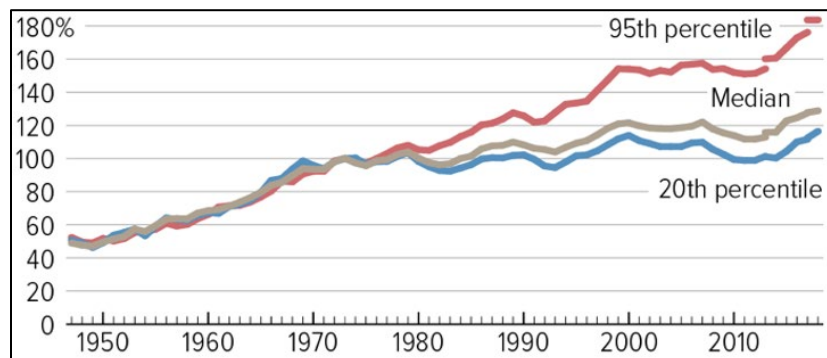
Source: CBPP calculations based on U.S. Census Bureau Data

3.0 LITERATURE REVIEW

Education plays a large role in society and its development. There have been many different papers that discuss the role of education in societies. In the case of this research there are also a number of papers that discuss how educational attainment effects income inequality in various countries. When deciding on which papers I would include in my research I thought it was important to look at how various studies examined the effect of education on income inequality. So, I looked into studies that used poverty, migration, entrepreneurship and educational policy along with education attainment and income inequality. In a study done by Joshua Dennis Hall (2018) conclusions were made that generally when country has greater quality and quantity of education there is less income inequality. Similarly, to the study conducted by Hall (2018) a study conducted by Checchi and Werfhorst (2014) also concluded that countries that have better quality and higher quantity of education with result in lower earning gaps within their countries. When looking into developing countries the evidence is even stronger and shows a larger correlation amongst education attainment and quality of educational systems with income inequality. Education does not necessarily tell the whole story though as it is important to include other factors that are related to education or may have an impact on education. (Hall, 2018)

Educational policy can also have a large impact on income inequality. In a study done by Keller (2010), she looks into how and what type of educational policy will have an impact on income inequality. Keller (2010) concluded that countries that had higher expenditures on education would see less income inequality, specifically with developing countries. This conclusion is very logical and makes a good amount of sense. When more money is put into any resource one would expect to see better results because of it. Based on findings of all the papers that I have examined in this paper all conclude that higher educational attainment will result in lower income inequality so when countries invest in education it makes good sense that educational attainment would go up thus lowering income inequality. The study conducted by Checchi and Werfhorst (2014) also found that educational attainment is responsive to educational reform, indicating that when governments put resources into education the results will show higher educational attainment. Another study conducted by Gregorio and Lee (2002) also found that government expenditure on education as well as of general expenditures on public resources will result in lower income inequality. This was a secondary finding for Gregorio and Lee (2002) as their main finding was that education does have a negative and

significant effect on the GINI index. Which is in line with all other research. They also wanted to find out in what ways education effects income inequality, and they concluded that education has a significant impact on the labor market, including increasing the supply of skilled labor and reducing the wage premium for skilled workers.

One paper that I found very interesting was written by Fisher et al. (2007), and they were investigating the role of migration on education and poverty. The authors wanted to see how individuals migrating from rural areas to urban areas affected poverty in those rural areas and how education influences both poverty and migration. Controlling for the fact that better-educated rural adults are more likely to move to urban areas, the study finds that migration has an influence on the likelihood of being poor (Fisher et al. 2007). A study by Balan et al. (2016) investigates how entrepreneurship affects educational attainment. The authors found that per capita GDP does Granger-cause both the level of educational attainment and total entrepreneurial activities of total population.

Throughout researching all these various papers all the authors concluded very similar results yet by conducting different studies. The authors used a wide range of variables to see how education affects income inequality, yet they all found that generally speaking when countries have higher educational attainment and better educational systems income inequality is lower compared to countries that have lower educational attainment. I think it's also important to note that the effects of education were very significant when it came to developing countries. Many studies also found that when governments spend more on education, this will result in better educated individuals and lower income inequality. All of these findings are in congruence with the hypothesis that I came up with before conducting this research.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The data utilized in this study is an annual panel data set from 2010-2020. Much of the data that was gathered was from the World Development Indicators provided by the world bank. Other resources of data include the World Governance Indicators and OECD data. Data regarding control on corruption was from the World Governance Indicators and data about educational expenditures came from the OECD dataset. The study investigates 10 countries for

which are a part of the EU: Spain, Italy, Malta, Sweden, Netherlands, Portugal, Lithuania, Latvia, France, Cyprus and Austria. When deciding which countries to include in the study I decided to pick countries with various levels of educational attainment based on 2019 data so that I was not looking at countries that all had high educational attainment.

4.2 Empirical Model

Applying much of the model constructed by Hall (2018) to this study, whilst drawing influence from all studies that were investigated for this paper. The model for which I came up with is:

$$GINI = \beta 0 + \beta 1 GDP + \beta 2\ edu + \beta 3\ edu\_exp + \beta 4\ corrup + \beta 5 trade\_export + \varepsilon$$

GINI represents the GINI index, which measures income inequality for any given country. The GINI coefficient is a number from the range of 0 to 1, 1 representing perfect income inequality and 0 representing perfect income equality. So, the lower that the GINI coefficient if for a given country to more equally the wealth is spread out amongst its population. The Gini index is calculated by plotting the cumulative percentage of the population on the horizontal axis and the cumulative percentage of income or wealth on the vertical axis, and then calculating the area between the line of perfect equality (where the cumulative percentage of the population and income/wealth are equal) and the actual curve. *GINI* will represent the dependent variable for this study. When running the regression for this study the *GINI* variable is represented using natural log, similarly to how Hall (2018) used the *GINI* coefficient in his study.

I have included 5 independent variables within the empirical model. The first independent variable is *GDP* which represents GDP per capita of the countries involved. The second independent variable is *edu* which represents post-secondary educational attainment. My decision to choose post-secondary educational attainment rather than secondary educational attainment was influenced by the study conducted by Fisher et al. (2007) which was investigating the effect of educational attainment (at the post-secondary level) on migration and poverty. Fisher et al. (2007) opened my eyes up to the idea that I should be looking at the best source of education available because typically that is how your get the highest paying jobs so it should give me a good idea of how education can truly affect income inequality. Now if I were

to conduct this study again, I believe that it would be interesting to investigate educational attainment at all levels and run separate regressions for all of them. I think solid results would be uncovered in that case. The third independent variable utilized in this study is *edu_exp* which represents the amount of money spent per student on post-secondary education. I drew influence from 3 of the paper for which are included in my literature review which are Checchi and Werfhorst (2014), Keller (2010) and Gregorio and Lee (2002), which concluded that higher educational expenditures lead higher educational attainment and lower income inequality. Because of these findings I thought it was important to include them in my study. The fourth independent variable included is *corrup* which is the measurement of control of corruption. Hall (2018) included this in his model, and I believe that it is obvious that countries with lower corruption will result in less income inequality. The final independent variable for which I included in my model is *trade_export* which represents the high technological exports of a given country. This variable is important because to have high tech exports you need skilled laborers and to do that you need a solid educational system.

5.0 EMPIRICAL RESULTS

The empirical results are represented by Figure 3. I ran a simple OLS regression to see what the impact of all my dependent variables specifically, the *edu* dependent variable would have on the independent variable *GINI*. When running the regression, it is important to note that I used the natural log for the variables *GINI, GDP* and *edu.*

Figure 3: Regression Results

| GINI Index	Coefficent	Std. err.	t	P-Value
R-Squared: .7669				
Number if Observations: 52				
GDP per capita	-0.06356	0.0313	-2.03	.048**
Educational attainment	-0.05996	0.0259	-2.31	.025**
Expenditure on education	-0.05317	0.1995	-0.27	0.791
High tech exports	-1.46E-12	6.05E-13	-2.41	.020**
Control on corruption	-0.05567	0.0201	-2.77	.008***
_cons	4.1706	0.2788	14.96	0.000

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively.

The first thing to note is that the regression results showed that there are 4 significant independent variables present in this model. There are three variables that are significant at 5% which are GDP per capita, educational attainment and high-tech exports. Then there is also one variable for which is significant at the 1% level which is control on corruption. The one variable that is considered insignificant in this study is the expenditure on education. All these findings were expected except for the non-significance of the expenditure on education variable. As seen from past research it is significant, now the one reason that I have for it being insignificant is that the data was not entirely present and so that certainly may have played a role in it being insignificant. But in regard to all the significant variables these findings were more or less hypothesized and expected. Another notable finding from these regression results is that they are negatively correlated with the GINI index variable, and this is also expected as the lower the GINI index is the more equal income distribution is. So, if all the independent variables increase, we would see a decrease in the GINI coefficient but an increase in income equality.

Now looking at Figure 4 we can see the average GINI coefficient for the 10 countries involved in this study over the past 10 years. Then looking into Figure 5 we can see the average educational attainment for each country involved in this study over the past 10 years. My reasoning for creating these graphs was because I wanted to see how true my regression results are and by doing this, we get a good look into how the raw data that I collected compares to those results. The most significant results found from looking at these graphs is seeing that Lithuania had the highest level of educational attainment, yet they have the highest GINI coefficient, which shows that they have the highest level of income inequality. The other countries with the highest GINI coefficient are Spain, Italy, Portugal, and Lativa. For Spain, Italy, and Portugal these findings make sense and are inline with my regression results because these three countries represent the lowest levels of educational attainment in the study, but Latvia is the country with the second highest educational attainment behind Lithuania. So, these results are certainly confusing yet make sense at the same time. I believe that this shows that there are a lot of variables that affect income inequality and not one variable is responsible for a country's income inequality.

Figure 4: Average GINI Coefficient
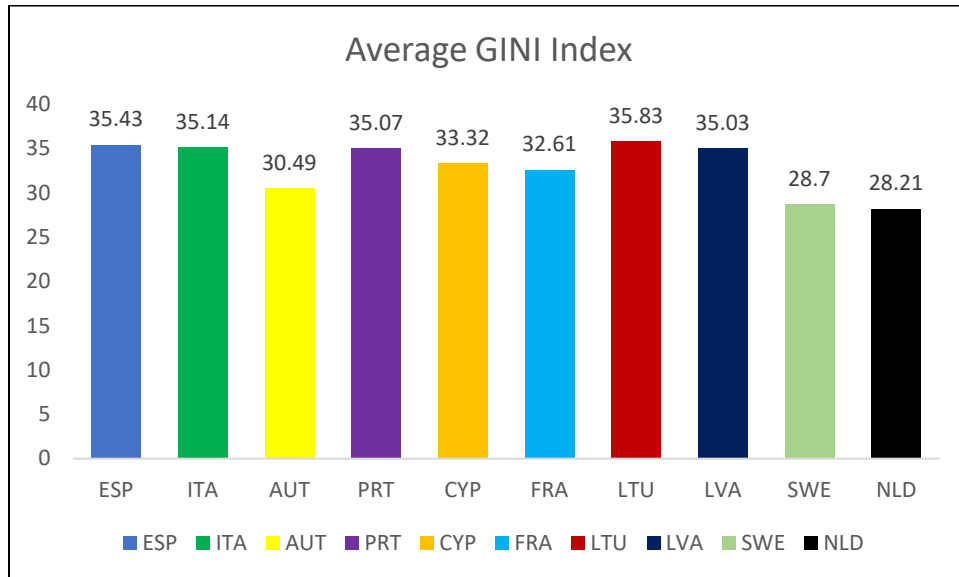
Source: Author Calculations Based on Data Provided by the World Bank

Figure 5: Average Educational Attainment
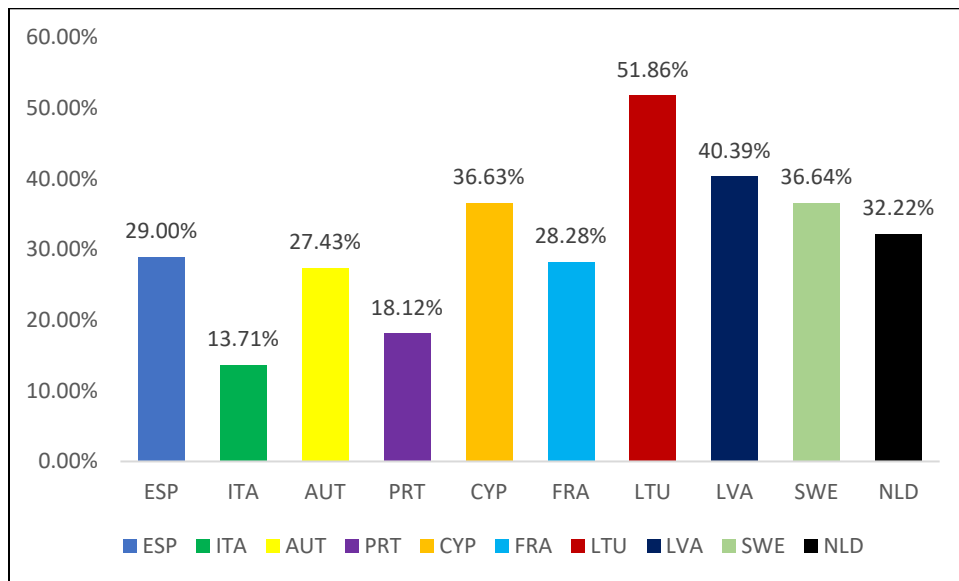
Source: Authors Calculations Based on Data Provided by the World Bank

6.0 LIMITATIONS AND POLICY RECOMMENDATIONS

Regarding policy recommendations there are many things that can be down but this paper will just go over a few of them. The first is that countries should do their best to lower education

costs. By doing this in theory education should be more readily available to more of the population. One risk in doing this is that the quality of the education may decrease. The second recommendation would be to invest more in schools and ensure that the schools are using the best technology and teaching the most relative information to their students. This would increase the overall quality of education being provided and result in individuals getting higher paying jobs. The last recommendation that I will give would be to increase and improve alternatives to education. As it is evident that education is not the only variable that impacts income inequality and having strong alternatives that may be cheaper than going to a post-secondary school can be very beneficial. Developing trade schools could be very beneficial as a lot of money can be made from jobs that can be obtained by going to a trade school.

Regarding the limitations of this research, I believe that I could have had a larger sample and larger spread of countries being analyzed. I only focused on countries that are a part of the EU, because I saw an interesting trend of EU countries income inequality decreasing over the past 10 years. But to be able to draw conclusions on several different areas of the world would be very interesting and would likely produce some interesting results. Another limitation here is that I only investigated post-secondary educational attainment and didn't look into lower-level educational attainment. If I were to investigate all levels, I could draw conclusions about which level is most beneficial and lower income inequality the most. The last limitation that I will discuss is that I only investigated the quantity of education and not the quality of education.

7.0 CONCLUSIONS

In summary, I concluded that educational attainment does in fact have an effect of income inequality, along with control of corruption, high-tech exports, and GDP. Control on corruption is the most significant result of the regression which I was not anticipating but makes sense and I believe that control on corruption would be significant and effect many economic variables as it is very important to keep corruption low for countries especially those that are developing. Whilst this paper found expenditures on education to be insignificant, I do still believe that is can positively impact both educational attainment and income inequality, which is evident by the three papers done by Checchi and Werfhorst (2014), Keller (2010) and Gregorio and Lee (2002). While it is important for countries to work towards increasing educational attainment, it is certainly not the only variable that affects income inequality and, in some cases,

it does not have as large of an affect as one would expect. Which is evident in both Lithuania and Latvia's case. If I were to conduct this study again there are two things for which I would want to do. The first being to look at the various levels of education and run separate regressions for each level, and the second would be to investigate the quality of education as I believe this will tell an interesting story.

Appendix A: Variable Description and Data Source

Acronym	Description	Data Source
GINI	Measures income inequality for a given country	World Development Indicators
GDP	Measures gross domestic products produced per capita	World Development Indicators
Edu	Measures post-secondary school educational attainment (%)	World Development Indicators
edu_exp	Measures the total expenditures on education per student of said nation	OECD Database
trade_export	Measures the total amount in dollars of a country's high technological exports	World Development Indicators
corrup	Measures the level of control on corruption a country has	World Governance Indicators

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