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Empirical Analysis of Causes of Income Inequality: A Level Playing Field for Children at the Start of School Career

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Presented to

The Faculty of the Department of Economics, Scripps College

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Abstract

Numerous and countless factors have been theorized to be causes of inequality. This paper started with identifying the most important determinants of income inequality through theoretical research. Among the various theories of causes of inequality, I hypothesized creating a level playing for children at the very start of their career as students as an important determinant. In order to test the hypothesis that a level playing field is important to help fight inequality, a regression tailored for this question is created. I develop a regression model using the variable public expenditure on primary education as the variable to be tested while controlling for other important determinants of inequality including public expenditure per student on all stages of education, unemployment rate, GDP per capita, GDP growth, and governance indicator. The empirical model confirms theory that quality of primary education is highly beneficial for students. I conduct further theoretical research concerning ways to improve the quality of primary education and included them in policy recommendation section.

Introduction

Economic inequality, namely income inequality and wealth inequality has been a large concern for most people from every country of the world. There are inequalities inside a country as well as across countries. While the major topics of discussion include unequal wealth distribution within a country, Bauman (2013, 2) discussed that the richest country, Qatar, boasts an average income per head 428 times higher than that in the poorest, Zimbabwe. This paper offers theoretical overview of the most important causes of income inequality and builds an empirical model to confirm theory.

The topic of inequality has been debated from various perspectives by policy makers, economists, labor economists, researchers, immigration officials and education specialists just to name a few. Growing inequality has been a concern for most people. George Irvin (2008) pointed out that particularly in the UK and USA, following the neo-liberal revolution period, economic growth has made top income earners vastly richer while much of the population has struggled to maintain its standard of living. As with many other scholars, Irvin calls for attention that unequal income distribution is not a minor issue to leave without addressing and that higher minimum wage and progressive taxes need to be considered with urgency. According to Irvin, it is alarming that US economy has grown by one hundred and fifty per cent and labor productivity has increased by 80 per cent, while the typical earnings of male workers have hardly increased in real terms. Bauman also discussed that growing inequality does not necessarily matter if everyone is getting richer together which is not the case. He believes that most of the rewards of economic progress are going to a comparatively small number of already high-income earners.

Numerous countless factors have been theorized to be causes of inequality. The factor of being born into a poor family or a rich family is repeatedly contributed to be the cause of inequality. If the root cause of this is found in this paper, a lack of level playing can be addressed with education equality. However, when we say equality in something, it is not merely giving the same opportunity to the advantaged and disadvantaged people but catering to the special needs of the disadvantaged. Many sources in the literature attribute income inequality to differences in tertiary education, college degrees, and types of studies. I am more interested to look at the education at the start as children first set off their career as students in primary school. In order to test the hypothesis that a level playing field is an important determinant to help reduce income inequality, a regression tailored for this question is created.

This interdisciplinary research is important because there are economists who try to identify the causes of inequality and there are education professionals who try to point out that education reform and improving quality of education is very important. However, there is not an empirical research that I know of that has tried to put together the two fields and shows the quantitatively the importance of quality primary education on inequality reduction.

Inequality in Picture

Inequality Within Countries and Across Countries

While inequality within countries is a focus of most policy makers and citizens, inequality across countries is a focus of the international organizations including United Nations and World Bank. My empirical research will focus on inequality within countries.

Example of Inequality within Countries: Wealth Distribution in the United States

“In the United States, wealth is highly concentrated in a relatively few hands. As of 2010, the top 1% of households (the upper class) owned 35.4% of all privately held wealth, and the next 19% (the managerial, professional, and small business stratum) had 53.5%, which means that just 20% of the people owned a remarkable 89%, leaving only 11% of the wealth for the bottom 80% (wage and salary workers)” (Domhoff 2012).

Inequality across Countries: Wealth Distribution in the world

According to Davies (2008), Western Europe, North America, and rich Asian-Pacific nations (principally Japan, South Korea, Taiwan, Australia and New Zealand) stand out as the richest areas, with per capita wealth exceeding \$50,000 in the year 2000. “Next come some prosperous developing and transition countries—for example Mexico, Chile, Argentina, Poland, the Czech Republic, and Ukraine—in the \$10,000 to \$50,000 band. The large transition countries, Russia and China, fall in the \$2,000 to \$10,000 range along with Turkey,

Brazil, Egypt, Thailand, and South Africa. Finally, in the category below \$2,000 is found India, Pakistan, Indonesia, and most of Central and West Africa” (Davies 2008).

“Roughly 30 per cent of world wealth is found in each of North America, Europe, and the rich Asian-Pacific countries... If current growth trends continue, India, China and the transition countries will move up in the global distribution, and the lower deciles will be increasingly dominated by countries in Africa, Latin American and poor parts of the Asian-Pacific region. Thus wealth may continue to be lowest in areas where it is needed the most” (Davies 2008).

Why Care About Inequality

Concerns resulting from inequality include the shrinking middle class, a declining consumer base, a threat to democracy, deteriorating family life, and looming economic depression (Hall 1991). “The inequality story in the USA is not exclusively, or even primarily, about the poor getting poorer; it is primarily about the rich getting very much richer and leaving the middle class (and those below it) far behind” (Irvin 2008, 131). He also discusses the scope of this problem by pointing out that the problem is not just of the poor and uneducated but a problem of everyone “across the income spectrum, across the racial divide, across lines of geography and gender” (Irvin 2008, 134).

Another major concern is the growing insecurity felt by the middle-class as there are fewer employment opportunities which “mean that there is unemployment for some and fewer hours for others” (Irvin 2008, 139). “Between 2000 and 2002, the number of workers who felt that it would not be at all easy to find comparable work if they lost their current job

rose from 29% to 39%” (Irvin 2008, 142). Some of the various concerns of workers include whether their jobs will be outsourced to a subcontractor or off-shored to another country, and whether a full-time, permanent job will be converted into a part-time or temporary job” (Irvin 2008, 142). Haseler also discusses that “new capitalism was ensuring that labor was both less secure and less valued and that increasing job insecurity is followed naturally from the progressive introduction of the ‘flexible labor market’” (2000, 54). This issue concerning flexible labor market and workers getting to work less hours will be discussed in a later section that covers some of the counter arguments by Reynolds against stagnant or decreasing real wages. This relationship between unemployment and inequality will also be analyzed in my empirical look at the problem. Setting all of the above reasons aside, inequality is obviously something not desirable from social perspective.

Other negative consequences of inequality include psychological wellbeing, health, self-interested behaviors, community relations, and violence. Inequality is indeed not desirable for many obvious reasons other than from social reasons. Offer (2006) points out that

“Inequality is the reason why the United States, the wealthiest economy scores so poorly on the indicators of psychological well-being... [where] high productivity and longer working hours are driven by the risks of degradation like that already suffered by the majority of Afro-Americans” (See Irvin 2008 , 128).

And since the threat of absolute deprivation has almost ceased to exist at least in the developed countries, “poverty itself began to be redefined in relative terms” (Irvin 2008, 149). This relative inequality has been found to bear health costs.

“Although the income disparity between rural Bangladesh and the Harlem district of New York City is huge, infant mortality (indeed, at most ages) is higher in the latter than the former. The apparent paradox is resolved if we accept that what affects health is not absolute income, but income relative to others – a key marker of social status in society” (Irvin 2008, 150).

“[In addition], inequality promotes social inequality that are more self-interested, less affiliative, often highly anti-social, more stressful and likely to give rise to higher levels of violence, poorer community relations, and worse health” (Irvin 2008, 151).

Causes of Inequality within country

Many questions have arisen in trying to explain growing inequality. “Is globalization to blame? Has corporate governance been so weak that top executives have been able to raise their pay more than they deserve? Have advances in technology favored skilled workers relative to unskilled ones?” (Vanessa 2013). With the preceding questions and more, the causes of rising inequality have long been an interest of many scholars from various fields.

Some theories and findings of causes of inequality include trade or globalization (Heckscher 1931; Ohlin 1933; Stolper and Samuelson 1941), increasing returns to generalists rather than specialists (Murphy and Zabojnik 2004; Frydman 2007), theories of managerial power (Bebchuk and Fried 2004), social norms (Piketty and Saez 2006; Levy and Temin 2007), greater scale (Gabaix and Landier 2008), skill-biased technological change (Katz and Murphy 1992; Garicano and Rossi-Hansberg 2006; Autor, Katz, and Kearney 2006; Garicano

and Hubbard 2007), and superstar theory (Rosen 1981). According to Reynolds, Barry Bluestone of Northeastern University wrote that “in our rogues’ gallery, we have ten suspects: skill-biased technological change, deindustrialization, industry deregulation, the decline of unions, lean production, winner-take-all labor markets, free trade, transnational capital mobility, immigration, and a persistent trade deficit.” (Reynolds 2006, 186). Other causes of inequality discussed by other authors include democracy. Bauman put it as “the prime victim of deepening inequality will be democracy” (Bauman 2013, 3).

Hidden unemployment or ‘reserve army of the unemployed’, as Karl Marx famously coined, acts as a weapon that could be used by employers to discipline workers. ‘Reserve army’ of workers grew since capitalism designed workforce such that the number of core workers has shrunk and that of contingent workers has risen (Haseler 2000, 56). Other factors repeated discussed by various scholars include institutional policy and economic shifts, effects of politics, policy, and economic factors, rightward shift in Congress, the decline of labor unions, lower tax rates on high incomes, increased trade openness, and asset bubbles in stock and real estate markets, financialization of the economy.

In a study by Public Policy Institute of California, the rising income inequality in California which is higher than other states in the United States was found to be caused by immigration and higher returns to skill. Immigration accounted for 45% of income inequality while higher returns to skill accounted for one third (Reed 2014). Policy considerations to reduce income inequality that Reed suggested include:

1. To improve the opportunity to finish high school and enter college
2. To Improve training for people who do not go on to college, and

3. To promote the economic progress of immigrants through education and training.

A look at the causes of income inequality in Korea by Fields and Yoo (2014) in “Falling labor income inequality in Korea’s economic growth: patterns and underlying causes” show that the most important factors were found to be job tenure, gender, years of education, and occupation. The most important factors that explain the *change* in income inequality were found to be years of education, industry, occupation, and potential experience. The importance of education is pointed out by many scholars as an important determinant of inequality.

In “Unequal we stand: An empirical analysis of economic inequality in the United States, 1967-2006” by Heathcote (2014), the common causes of inequality were extensively discussed “in order to understand how different dimensions of inequality are related to choices, markets, and institutions.” Heathcote did not find much inequality in wages but in earnings, which points out that unemployment, hours worked, and differences in labor force participation caused by early retirement and age distribution are some of the causes of income inequality. Unemployment is indeed a real issue after the recessions. Abramsky (2013) notes that “families whose breadwinners lost their jobs during the recession that followed the financial collapse of 2008” had a hard time and had to apply for food stamps (Abramsky 2013, 19). A woman Abramsky interviewed told him that “I was on unemployment and I became more introverted, especially after getting rejected [from jobs she applied for] over and over and over again” (Abramsky 2013, 19).

In the same article, Heathcote discusses that business cycles such as recessions cause income inequality to worsen since they are dramatic events. According to Heathcote,

“household earnings at lower percentiles of the income distribution decline very rapidly in recessions, such that recessions are times when earnings inequality widens sharply. Since we do not find similar dynamics for individual wages, we conclude that the root of such large fluctuations in earnings cyclicality is labor supply, especially unemployment” (2014).

Among the above numerous explanations, changes in technology, globalization, and CEO compensation have been repeatedly explained to be the causes of inequality by many researchers. Robert F. Dalzell, Jr. in his book *The Good Rich and What They Cost Us*, discussed that Janet Yellen, who was speaking as president and CEO of the Federal Reserve Bank of San Francisco, concentrated on factors like changes in technology, globalization, and CEO compensation (P. 157). In *Super Rich: The Rise of Inequality in Britain and the United States*, George Irvin discusses the growing premium placed on highly educated labor (including top entrepreneurial talent) (Irvin 2008, 9). Irvin included in his discussion the explanations in income disparities of Levy and Temin (P. 23) including reversals in an institutional pattern of domination by unions, progressive taxes, and a high minimum wage. Other explanations Levy and Temin stresses included skill-biased technical change and international trade that are operating within this broader institutional story (Levy and Temin, 2007) in (Irvin 2008, 23).

Irvin also argued that this growing inequality is due to extravagant bonuses, conservative political and economic revolution under Thatcher and Reagan, expansion in financial services, deindustrialization and inflation, rise of capitalism, high tech sector, and finance, meritocracy, skill-biased technical change, international trade and free trade, ‘winner-take-all’ markets, de-unionization, and immigration. Among the causes of

inequality, growing premium placed on highly educated labor (including top entrepreneurial and extremely high pay for chief executives) has been a major concern. The factors discussed above that have been repeatedly found to be causes of inequality including meritocracy, skill-biased technological change, growing premium on highly educated labor, “winner-take-all” markets, and extravagant bonuses on highly educated labor are pointing to the fact that the system that has become highly competitive is the root cause to blame.

Efficiency versus Equity

Efficiency versus equity debate deserves to be discussed here since it is the center of many debates. Some think that “the pie shrinks as it becomes more equally distributed” (Lanyard, 2005). However, Irvin argues that efficiency and equity may be in fact positive if we look at the evidence that “in the twenty-five years following the Second World War, Britain and America achieved high growth and a more equal distribution” (2008, 124). Other scholars have argued that efficiency may be affected in two ways: first through reduced incentives for high income earners to work harder and second through the laid back attitudes that may be acquired by low income earners who are receiving social provisions (Reynolds 2006).

Schneider (2004) points out that there may be different effects of redistribution on efficiency for a close economy and open economy. He discusses that in the case of an open economy, reducing inequality in the distribution of wealth may not decrease the amount of aggregate wealth available to be distributed. By contrast, in the case of an open economy, wealth may flow out to an economy with lower taxation of wealth. However, the efficiency versus equity debate applies only to the situations in which welfare is distributed using

direct approach to tackling inequality and progressive taxation is implemented. This paper focuses on creating a level playing field as soon as children start school, which is not a concern for decreasing efficiency.

James discusses that having access to education has become much more important than having extensive wealth and inheriting family businesses because education provides not only skills but also access to networks. James points out that evidence from the identity of the super-rich suggest that the premium for technological skill has continued to rise in the right-tail of wealth outcomes. Kaplan and Rauh (2013) found that 69 percent of those on the billionaire list in 2011 started their own businesses, compared with only 40 percent in 1982. "Being super rich no longer requires being born wealthy, but wealth does confer advantages, particularly in access to education," says Rauh (2013). Therefore, education and skills seem to be most important variables in order to keep up with the changing economy that requires skills.

Determinant factors of income and wealth inequality, as pointed out by Bernstein and Swan, at individual levels include education, intelligence, drive, risk, luck, and timing (Bernstein and Swan 2007). Other determinants discussed by Schneider include unequal forces including thrift, ability, industry, luck, fraud, and inheritance. The distribution of earned income, propensity to save, and rate of return on wealth are the factors that are not impossible to be addressed with the right kind of skills improvement, education, personal finance for increased willingness to save and investment for better rate of return on their savings. While these skills may be taken for granted by the children born into wealthy or upper middle class families due to their exposure to wealth management, investment, and

other financial and career related words, concepts, and conversations, children from poor families have not heard about or thought about these concepts. Therefore, introducing these concepts or giving higher education and college degrees will not be enough without creating a level playing at the very start as soon as children start their elementary school.

Meritocracy, Competitive Systems, and Level Playing Field

As mentioned above, numerous repeatedly discussed causes of inequality can be traced back to the now more competitive system. As we have seen, meritocracy and competitive system contribute a large part to income inequality. And, “meritocracy assumes a level playing field that simply does not exist”, Gorski (2013, 17) states. I would like to especially look into creating a level playing field because it can be fixed. Other emphases such as being born to a father who is a CEO is sometime talked about as the cause but it is not something that can be fixed unless all the babies born are switched randomly to be adopted. However, the knowledge and education and foundation for networks can be fixed to some extent.

Evidence has suggested that differences in education contribute significantly to differences in income. Jencks found that family background (composed of socio economic status and cultural psychological characteristics) have great influence on individual’s educational attainment. Since children are largely influenced a lot by what happens at home, it is important to start bringing them to the same level playing field at the very start. It is important because it has been shown that a large reason for dropping out of schools is students’ lack of motivation and confidence as a result of not being able to perform up to the standard at school.

According to Jencks (1972), there are two options to reduce inequality. The first is to make the system less competitive and reduce meritocracy. Scholars have criticized this option arguing that it can potentially reduce efficiency as well. The debates are still going on because the argument makes sense intuitively while many scholars are at the same time

arguing that making the system less competitive does not reduce efficiency. I will focus on the latter option for reducing inequality by creating a level playing field.

This latter option is to ensure that everybody enters the competition with equal advantages and disadvantages. This can be achieved by giving quality education to the children from poor families to make up for the skills they did not acquire that the children from rich families did. In fact, while reducing inequality, this option also reduces poverty. In fact, bringing the poor children to the level playing field by giving them compensatory education for improved cognitive skills is a solution advocated for eliminating poverty. While this option is so, the first option of reducing inequality by reducing competitiveness is not a way to reduce poverty.

Since equality does not merely means giving the same chance to achieve something by everyone, it is catering to the need of the specific group of people. This educational support needs to start in primary school since the differences need to be addressed as early as possible. Irvin discusses that the playing field was not level since the children were very young.

“Some stunningly painstaking and sophisticated American research has shown just how large the gradient of class inequality in talk is: ‘The longitudinal data showed that in everyday interactions at home, the average (rounded) number of words children heard per hour was 2,150 in professional families, 1,250 in working-class families and 620 in the welfare families.’ There was also a sharp gradient in the complexity of language used... By the age of three, children from middle-class

families are already twelve months ahead of children from disadvantaged families in their understanding of colors, letters, numbers, sizes and shapes.” (Irvin 2008, 202).

In addition to the differences in exposure of language at home the current challenges and opportunity gap for children from low-income families include disparities in access to preschool, well-funded schools, adequately resourced schools, shadow education, school support services, affirming school environments, high academic expectations, well-paid, certified, and experienced teachers, student-centered, higher-order curricula and pedagogies, opportunities for family involvement, and instructional technologies (Gorski 2013, 89).

More evidences from various researches argue for the importance of education in creating a level playing field.

“The poorer the family one was born into, the higher the likelihood that a child would struggle in school. Even if he or she did well in the classroom, there was a lower likelihood that the child would be able to attend college. Fridman noted that the most successful eighth graders from poor economic backgrounds had only the same chance of attaining a bachelor’s degree as the least successful eighth graders from the wealthiest echelon of society.” (Abramsky 2013, 25)

“Reading score differences between low-income and wealthier students could be explained largely by discrepancies in the sorts of institutions to which they had access throughout early childhood” (Gorski 2013, 65). Therefore, starting at a young age is very important in order to create a level playing field at the start. Jencks (1972) concludes that

differences between high schools contribute almost nothing to the overall level of cognitive inequality while differences between elementary schools may be more important. There are two main reasons why an attempt to create a level playing field in order to reduce inequality should be focused on primary education that happens as soon as children start school.

1. "Variations in what children learn in school depend largely on variations in what they bring to school" (Jencks 1972, 53). Since the learning of something is dependent upon what they know, it is very important to bring poor children to a similar level of cognitive skills and knowledge as soon as they start school.

2. The assumption that the students who score high when they are young will continue to score high throughout their lives and that those who do poorly when they are young will remain at a permanent disadvantage is correct only for older children and not for young children (Jencks 1972, 58).

Effects of poverty and class bias on the school experiences of poor and working class students. Gorski argues that it is crucial to "make up for the inequalities poor youth begin to experience at birth, or even prior to birth if we consider who has access to prenatal care" (Gorski 2013, 2). This includes children's access to nurses, to art and music education, and to recess and physical education. Poor families do not afford "the exorbitant costs of tutors, music lessons, academic camps, and other forms of "shadow" education, not to mention the costs of computers and high-speed Internet access and bedrooms full of books" (Gorski 2013, 17). "Poor and working class families often cannot afford to participate in out-of-school academic training or tutoring, music lessons, athletics, or other extra-curricular

activities, whether because the activities themselves are too expensive or because they do not have access to adequate amounts of time or to dependable sources of transportation. What makes this disparity in access especially frustrating is that participation in all of these activities has been correlated with higher levels of academic achievement and lower rates of truancy” (Gorski 2013, 81).

Underlying Assumptions in Empirical Research

Quality education that will actually bring the students from poor families to the same level playing field by improving cognitive skills as soon as they start school is required. In my empirical research, the quality of education for children at young age at the start of the competition is measured by public spending on primary education. The improved quality of education through more spending does not necessarily need to target only poor students. Even if the overall quality of education at a school is improved, poor students benefit greatly and much more than rich students based on the economic theory of diminishing marginal utility (explained more in Assumption 1). I also assume that spending on education is spent most on expenditures that bring the most benefits to the students. We will assume that the more public spending on education there is, the better education a country provides. Jencks (1972) assumes a similar assumption of using the resources on the most beneficial expenditures in the following quote.

“We cannot say which of these expenditures does the most to improve the quality of people’s lives and which does the least. All we can do is assume that each school district does the best it can to make school life more satisfactory with whatever resources it has....” (Jencks 1972, 24).

Although there is not data for all countries in the regression concerning on which expenditures public spending on primary education are spent on, it is based on two assumptions that this empirical research is done:

Assumption 1. Children from poor families benefit largely from better education than children from rich families because they need it the most. Evidence shows that children from poor families do much worse during the break than during the school year. It shows that students from poor families benefit the most from good education since they are the ones who need it more than children from rich families who receive other forms of cognitive skills improvements such as hearing a large number of vocabularies at home and receiving extra-curriculum lessons outside of school. This assumption is based on diminishing marginal utility that shows that the first few units bring a lot more utility or benefits than the next units when someone has got some units already. For instance, building a playground helps much more for the children whose families do not have the time and resources including transportation to send the children to a playground than for the children whose families do send them to playgrounds already. A similar reasoning applies to other curricula and extracurricular programs and activities including extra tutoring programs and music lessons that improve students' cognitive and "noncognitive" skills.

Assumption 2. It is assumed that higher spending on education means more programs like "no child left behind" programs that attempt to fill in the gaps or equalize the performances. This assumption is based on the observation that once an institution has reached a certain level of education, it will naturally start to spread its attention and spending on extra value-added programs and activities such as bringing more opportunity

for economically and racially disadvantaged children and building facilities for disabled students.

Method, Data and Modeling

Research Method

This paper uses data from The World Development Indicators from World Data Bank. The observations include 158 countries that have complete data for the dependent variables and all of the independent variables. The dependent variable is the GINI coefficients that measure income inequality within country. The independent variable of interest is public expenditure on primary education. Other independent variables that are shown in the literature to be important determinants of inequality are included as control variables. They include public expenditure on education at all stages, unemployment rate, GDP per capita, GDP growth, and governance indicator.

Since there are a limited number of observations (158 observations from different countries), I was not able to include in the model a lot of the variables that are found to cause income inequality. I carefully chose these control variables among the various candidates by running various regressions to identify the most important variables that do not cause omitted variable bias. The model has evolved from approximately twenty variables including public expenditure per student on tertiary education, public spending on total education, percentage of population ages 15 to 64, political stability and absence of violence/terrorism, labor force participation rate, social contributions, tax revenue, enrollment in tertiary education, CPIA transparency, accountability, and corruption in the public sector rating, scientific and technical journal articles, ease of doing business index, exports and imports of goods and services, GNI per capita or GDP per capita, gross capital formation, total tax rate, and high-technology exports. A few of these variables were

included at a time in various models in order to test whether they have statistical significance and economic importance and whether they can cause omitted variable bias. It was found that they are neither statistically significant nor change the coefficients and t statistics of the included variables in my final model by a large amount. Therefore, my model measures that these variables neither seem to be important determinants of income inequality nor are related to the variables included in my model, and thereby do not cause omitted variable bias in my final model.

Data and Modeling

My final model is as follows:

$$\text{Gini} = \beta_0 + \beta_1 \text{ expenditureprimary} + \beta_2 \text{ expenditureretotal} + \beta_3 \text{ unemployment} + \beta_4 \text{ gdppercapita} + \beta_5 \text{ gdpgrowth} + \beta_6 \text{ governanceindicator} + \varepsilon$$

Dependent variable

This section presents a detailed explanation for each of the variables used in my final model.

Gini (Gini Index, in %)

Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line.

Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality¹.

Independent variables

Expenditure per student, primary (% of GDP per capita)

Public expenditure per pupil as a % of GDP per capita, primary is the total public expenditure per student in primary education as a percentage of GDP per capita. Public expenditure (current and capital) includes government spending on educational institutions (both public and private), education administration as well as subsidies for private entities (students/households and other private entities)².

Expenditure per student, total (% of GDP)

Public expenditure on education as % of GDP is the total public expenditure (current and capital) on education expressed as a percentage of the Gross Domestic Product (GDP) in a given year. Public expenditure on education includes government spending on educational institutions (both public and private), education administration, and transfers/subsidies for private entities (students/households and other private entities)³.

¹ World Bank, Development Research Group. Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. For more information and methodology, please see PovcalNet (<http://iresearch.worldbank.org/PovcalNet/index.htm>). Catalog Sources World Development Indicators

² UNESCO Institute for Statistics Catalog Sources World Development Indicators

³ UNESCO Institute for Statistics Catalog Sources World Development Indicators

Unemployment (Total unemployment, % of labor force):

Unemployment refers to the share of the labor force that is without work but available for and seeking employment. Definitions of labor force and unemployment differ by country⁴.

GDP per capita (Current US\$ in ten thousands):

GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars⁵.

Gdpgrowth (GDP growth, annual %):

Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources⁶.

⁴ International Labour Organization, Key Indicators of the Labour Market database. Catalog Sources World Development Indicators

⁵ World Bank national accounts data, and OECD National Accounts data files. Catalog Sources World Development Indicators

⁶ World Bank national accounts data, and OECD National Accounts data files. Catalog Sources World Development Indicators

World Governance Indicators (Percentile rank):

Aggregate and individual governance indicators for 215 countries and territories over the period 1996–2012, for six dimensions of governance⁷. The six dimensions of governance measured are voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Each of the dimensions are measured in percentile ranks and averaged with the same weight in order to form an overall governance indicator.

⁷ www.worlddatabank.org

Regression Results

Table 1. Descriptive Statistics

	Mean	Std. Dev.	Min	Max
Gini coefficient	43.3	10.26	24.93	67.4
Expenditure per student primary	16.2	9.51	2.82	61.48
Expenditure per student total	4.38	1.35	1.15	9.5
Unemployment rate	9.15	5.29	1.2	31.2
GDP per capita	5935	5289.9	275.477	35639.5
GDP Growth	3.82	4.2	-17.95	13.09
Governance Indicator	905.8	351.1	1	1609

Diagnosis of multi-collinearity

Variable	VIF
GDP per capita	1.81
Governance Indicator	1.77
Expenditure per student primary	1.72
Expenditure per student total	1.63
Unemployment rate	1.09
GDP growth	1.05

Table 2. Regression Results

Dependent variable: Gini coefficient (in %)	
Intercept	56.5 (3.07)
Expenditure per student primary	-.58 (.076)***
Expenditure per student total	.87 (.56)
Unemployment rate	.23 (.17)
GDP per capita	-3.5 (1.6)**
GDP growth	-.288 (.134)**
Governance Indicator	-.0073 (.003)**

Number of observations = 158, $R^2 = .441$

Standard errors are heteroscedasticity robust.

*** Significant at 1%, ** Significant at 5%

Interpretation of the Results

The reasoning is that the direction of causation happens in a way that public spending on primary education causes income inequality, rather than the other way around. This reasoning is based on the fact that the regression model was created from the findings from theoretical research and previous findings that creating a level-playing field and differences in educational achievements are important determinants of reducing income inequality within a country.

The regression results show that public expenditure per student for primary education is highly statistically significant (at 1% level, $p=0.000$) and economically important for reducing inequality holding other determinants of inequality in the model constant (see Table 2). 10% increase in percentage of GDP spent as public expenditure per student in primary education is predicted to decrease the Gini index of a country by 5.8 percentage points or brings the country closer to absolute equality by 5.8 percentage points. The descriptive statistics in Table 1 indicate that the lowest rate of public expenditure on primary education is 2.82% and the highest rate is 61.48%. This allows the countries with lowest rate room to increase the expenditure by a maximum of approximately 59%, according to Table 1. Out of this 59% difference in expenditure, increasing the expenditure by, say 20%, seem like an achievable goal that will bring a country towards absolute equality by 11.6 percentage points. Increasing the expenditure by half of this 59% difference will bring a country closer towards absolute equality by over 17 percentage points. The mean expenditure is 16.2% (see Table 1) and it is also important to note that increasing the

maximum possible expenditure of 45% will allow a country with current average expenditure to become over 26 percentage points closer towards absolute equality. On the other hand, increasing the maximum possible expenditure of approximately 59% by the country with the current lowest enrollment rate will result in the country becoming 34.22 percentage points closer to absolute equality, which is over 80% of the possible increase in equality a country can make within the existing range of GINI index of 24.93% and 67.4%.

The economic importance of public expenditure on primary education is very highly significant above and beyond the variable public expenditure per student on all stages of education reflected by the variable public expenditure per student, total. On the other hand, public expenditure per student on all stages of education is not significant above and beyond the variable public expenditure per student on primary education. Therefore, the results confirm the theory that quality of primary education children receive are extremely important in creating a level playing field in the competitive system they are entering.

Among the control variables in the model, public expenditure per student for all stages of education and unemployment rate are not statistically significant. However, GDP per capita, GDP growth rate and world governance indicators are statistically significant at 5% levels ($p < 0.05$). While the economic importance of GDP per capita and GDP growth are noteworthy, that of world governance indicators is negligible. \$10,000 increase in GDP per capita is predicted by the model to result in 3.5% decrease in Gini index, bringing the country 3.5% closer towards absolute equality. 10 percentage point increase in GDP growth is predicted to result in 2.9% decrease in Gini index, bringing the 2.9% closer towards absolute equality. While the economic importance of GDP per capita and GDP growth are

large enough to be of importance, these effects are not as large as the effect of public expenditure on primary education on inequality. On the other hand, the importance of world governance indicators is negligible. 100 percentage point increase in world governance indicators is predicted to result in merely 0.73 percentage point decrease in Gini index.

The respective numbers of variance inflation factors shown in the table describing “diagnosis of multi-collinearity” shows that multi-collinearity is not a problem in my model. Heteroscedasticity test shows that the null hypothesis that heteroscedasticity is not present can be rejected at 10% level. Therefore, heteroscedasticity has been controlled in the regression and the standard errors shown are heteroscedasticity-robust standard errors.

Policy Recommendations

There are “direct” and “indirect” approaches to reduce income inequality. An example of “direct” approaches is to spend more money on means-tested transfer payments—those targeted toward people report low incomes, according to Reynolds. Many researchers have shown concerns that a direct approach may cause undesirable consequences including reduced incentives to work hard or be frugal. I coined indirect methods as a more sustainable long-term approach to alleviating poverty and inequality while there is the disadvantage of a time lag to achieve the desired results. Indirect approaches are those aimed “at affecting the labor market in ways intended to increase the lowest wage rates. Such proposals include protecting manufacturing industries from foreign competition, restricting immigration, promoting unionization, and raising the minimum wage. A large part of the indirect approach also encompasses education (which has been predicted by my model to be a very important determinant of inequality and will be the main focus of my policy recommendation), since advocates of additional subsidies to certain types of schooling often claim their proposals would reduce measured inequality” (Reynolds 185, 2006). In addition, creating a level playing field through better primary education imposes fewer concerns that the redistribution may create a decrease in incentive to work hard.

The policy recommendation to increase public expenditure on primary education to reduce income inequality is under the assumption that the funds to spend are available. How best to raise the funds needed to increase the expenditure is a whole new different story. Progressive taxation of income and wealth in various ways are some of the most

commonly proposed ways of raising funds. Since tax system is not the focus of this paper, there is not a discussion in this paper about specific ways of progressive taxes on wealth and income or any other way of raising the revenue needed for education and unemployment reforms.

The results of my theoretical and empirical research showed that it is very important to give necessary quality education at the very start. Thus, I focus more on the reform of primary education assuming that the funds have been raised because the regression results show that effects of public spending on primary education on lessening inequality is most astounding. By creating a level playing field, those at the bottom will be able to rise in the age in which there is more and more “growing premium on education in the ‘knowledge economy’” (Irvin 2008, 208).

There are certain areas that can be given more attention in order to give a more direct effect. Jencks points out that “class differences seem to be greatest for verbal ability and general information” rather than “tests of reading comprehension, mathematical skills, nonverbal ability, and many other talents” (1972, 78). He reasoned that this might be because these skills are largely taught in school so that differences between homes affect them less. From this, we can see that creating a level playing field requires schools to focus on providing students with classes and activities to improve verbal ability and general information.

In addition, providing resources for play and extra-curriculum activities are an important part because “these activities have been correlated with higher levels of academic achievement and lower rates of truancy” (Gorski 2013, 81). Gorski also discusses

that poor and working class families often cannot afford to participate in out-of-school academic training or tutoring, music lessons, athletics, or other extra-curricular activities, whether because the activities themselves are too expensive or because they do not have access to adequate amounts of time or to dependable sources of transportation.

Therefore, for instance, while building a playground does not necessarily have direct effects on the poor students' performance and earning abilities, it does help them in indirect ways such as having an effect on students' chances of having a good time during recess, according to Jencks (Jencks 1972, 29). Having a good time is in fact very important for students from poor families to want to stay at school. Giving poor children a good time can be achieved by many means such as creating resources and facilities they do not have at home such as providing playgrounds and attention from teachers that they do not necessarily receive at home from busy parents who are juggling two or more part-time jobs. Again, these resources are not only for students from poor families but also for every student. However, these resources are likely to be more beneficial for students from poor families who have not had access to these resources outside of school, according to the theory of diminishing marginal utility.

Some promising guidelines to best educate the economically and socially disadvantaged children according to Gordan and Wilkerson (1966) include effective teaching, child-parent-teacher motivation, new materials and technology, peer teaching and learning, psycho-educational diagnosis and remediation, learning task specific grouping (homogeneous versus heterogeneous grouping), extensions of the school, staffing, financial assistance, and improved opportunity (Gordan Wilkerson 1966, 178).

In addition, strategies for making classroom more equitable and engaging, and validating for low-income students and families, as advocated by Gorski (2013), include:

1. Incorporating music, art, and theater across the curriculum;
2. Having and communicating high expectations for all students;
3. Adopting higher-order, student-centered, rigorous pedagogies;
4. Incorporating movement and exercise into teaching and learning;
5. Making curricula relevant to the lives of low-income students;
6. Teaching about poverty and class bias;
7. Analyzing learning materials for class (and other) bias; and
8. Promoting literacy enjoyment

The guidelines and strategies discussed above are most commonly discussed strategies by scholars and professionals from the education field. When increasing expenditure on primary education, it is important to consult these scholars and professionals in order to make sure the resources go to the right places that will be most effective to create a level playing field for the children from different classes.

In addition to the activities and guidelines discussed above, I would like to add that the differences in knowledge and interest of business, entrepreneurship, and personal finance should be also taught at school in order to create a level playing field in students' knowledge in these areas too. While children from wealthy families may be familiar with hearing and understanding the concepts of money management, saving, investing, occupational choice and wealth, children from low income or welfare families are unlikely to have grown up hearing those discussions. Therefore, financial literacy courses, personal

finance, investing techniques, business, occupational choice and wealth should be incorporated into school curriculums at various stages of students' education when creating a level playing field.

Limitations

Many of the data from the World Bank does not have data for every country for every year. Therefore, some of the data used in the model for different countries are from different years. If there were more complete data, this limitation will be eliminated while it would allow the increase in number of observations over many years span. Availability of complete data for different years will also allow me to eliminate another limitation which is the need to include a lag variable in order to take into account the time taken for children to grow up and affect income inequality negatively or positively. However, this lag variable is not included due to the limitation of data availability.

In addition, since the data are country level data, there is the assumption that spending is more or less equal in various parts of the country. In the case that this assumption does not hold, it would not be a problem if a more or less equal percentages of poor children and rich children are going to schools in different districts and states, meaning that rich children are not all concentrated in rich schools and poor children are not all concentrated in poor schools. It is important for schools to have similar social, economic, racial, and academic composition.

Conclusions

This paper started with identifying important determinants of income inequality through theoretical research. Among the various theories of causes of inequality, I hypothesized creating a level playing field for children at the very start of their student career as an important determinant. I then created a regression model using the variable public expenditure on primary education as the variable to be tested while controlling for other important determinants of inequality including public expenditure per student on all stages of education, unemployment rate, GDP per capita, GDP growth, and governance indicator. The empirical model confirms theory that quality of primary education is highly beneficial for students. I then did more theoretical research concerning ways to improve the quality of primary education and included them in policy recommendation.

While this paper focuses mainly on the effects of the quality of primary education on reduction of inequality and poverty, there are various evidences suggesting that there are positive relationships between increases in income and increases in years of education. Contribution to the inequality by the whole system of education starting from access to education to quality of education at every stage will be the next steps in larger studies in the future.

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