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Vir Vohra
Skidmore College

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An Analysis of Income Inequality and How It Is Affected
by Different Factors in the United States of America with
Respect to the Kuznets Hypothesis over the Time Period of
1983 and 2016

*This thesis is submitted in partial fulfillment of the requirements for the course
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Name: _____

Signature: _____

Abstract

Economic well being has increased considerably in the last three decades that has caused an income gap in the United States has increased in the same time frame. Various distinguished economists have argued since 1955 about the various factors that cause this trend. Income Inequality occurs because a number of factors impact it such as the productivity of a country.

Technological change has been a major factor contributing to the income gap. It has favored high skilled workers and various industries in the United States. In addition, there is an analysis of the effects of globalization and how it causes an upsurge of income inequality in developed countries, such as the United States. It uses globalization as a proxy for openness to trade in the analysis and considers the rising overall impact of trade. The results show certain trends and expectations for and against the literature, some of which that dates back to Kuznets' hypothesis from 1955. The paper also analyses Kuznets' relationship with respect to economic productivity of the United States. Finally it looks at and analyses the positive effects of how labor unions decrease income inequality and ultimately proposes potential reforms to reduce the snowballing income gap in the United States in the last 36 years.

Introduction

Equality is an important value to the human race. Regardless of ones' ideologies, culture, religion and race, people care about equality. A decrease in equality has significant negative impacts on economic growth. Broadening income inequality is one of the most crucial challenges of our time. In advanced countries, the gap between the rich and the poor is at the highest level in decades. However, Inequality trends are not the same in every country. Developing countries have had mixed trends in different countries. Various countries even have declining inequality, but have further imbalances in different areas such as health care, economic well-being and even finance. One such country where Income inequality has grown incrementally is the United States. In comparison to other industrialized countries such as the UK, France and Germany, the United States has had a more rapid increase of this income gap. After World War 1, all of the developing countries mentioned above had reduced inequality all the way until the 1960's. However, after the mid-1970's, the United States rapidly diverged and increased income inequality. We see an increase in the GINI coefficient for household income for the United States after the mid-1970's until before the most recent recession.

Recent Literature has proved that the income gap has increased over the past three decades in the United States and most developed countries around the world (Burkhauser et al, 2010). The measure for income inequality (GINI) rose from 0.47 in 1979 to 0.59 by 2007 in the United States. This increase of 23% of the GINI coefficient shows discouraging results towards equality. We see the same trend in

the OECD countries around these years, however, not to the same extent. The GINI coefficient increased from 0.28 to 0.31 between 1979 and 2007 in the United States. According to Kuznets', income inequality increases until it's at its highest income level, after which it gradually starts to decrease. The graphical representation of his proposition is an inverted U-shaped curve (Dobson & Ramlogan, 2009). Kuznets' hypothesis was important because it focuses on an important relationship between development and long-term growth. Various economists in the past have argued that income inequality increased because Americans have become older and more educated. Although income inequality has increased over the last 3 decades, inequality of work hours had also amplified with it. Hence, the top earners were making money from not just the ideal yearly salaries but from performance pays and different bonuses. Low-medium income based workers shop at discounted stores such as target and Wal-Mart, which have seen a substantial price drops over the last 20 years.

This paper analyses certain factors that Kuznets' did not simply due to the time period in which he made his hypothesis. Changes in technology have also contributed towards the concentration of the income in the top percentile, causing the income inequality in the United States to increase. This technological progress has resulted in the increase of skill premiums, which has had positive and negative effects. Skill premiums have caused widening income disparities in advanced countries such as the United States. Education plays an important role in these skill premiums. Different people will have various different skill sets which are based on

a number of factors such as education, type of education, location and experience of various different industries. Education gains are important here because they enlarge disproportionality at the higher end of the distribution. Education is the main reason in the difference of driving income shares of the poor and middle class. The difference in education is crucial not only to the jobs people acquire, but to health care and many different social policies. The lower class, middle class and upper class are different in every country irrespective of the level of development of the country as a whole. The process of globalization has in turn, moved jobs out of the United States, which has helped lower costs of production and has resulted in profits skyrocketing for American companies. This has given high-income workers, who have equity in these companies, the opportunity to pay lower capital gains tax. This leads to the wealthiest Americans having tax rates that are lower than those of the average American. Globalization and how it has impacted various industries in the United States is hence, a big source for inequality. Financial globalization and a higher skill premium has played a greater role in the increase of income inequality between the poor and middle class as compared to the top 10% in advanced countries such as the United States when compared to developing countries. Unionization has had a progressive effect on Income Inequality especially in the United States. Trade Unions are imperative to the decrease in Income Inequality. According to the Bloomberg Market report of 2015, the weekly pay was increased by over \$200 in 2014. The salary of a unionized member was 21 cents to the dollar, which results from the bargaining power of unions in the United States. This decreases wages of non-union workers as well. The effects of the decline of unions

in the United states is also different based on the sex of the person working.

This study is important because it essentially aims to find the main factors that affect income and study these factors over a long time period to see and analyze the extent of these effects in the United States over a period of 36 years. The analysis also mentions some reforms towards fixing the Income gap. The extent of inequality, and its drivers, and what to do about it are some of the most fiercely argued topics in economics today, and this paper aims to evaluate them.

Literature Review

Over the past four decades, technology has reduced the cost of production and purchasing in many distinctive ways. These costs include automation, trade, transportation and communication. Poverty has decreased in this time period due to the markets that have been integrated around the world due to the rapid upsurge in globalization we have faced in the last few decades. This globalization has brought about many different growth opportunities in developed and developing nations around the world. However, with these growth opportunities comes a rise in inequality in the United States. This process of growth has been complemented with many different factors such as globalization or trade openness, unionization and technological advancements that have caused high inequality. We break down the main factors below into 4 categories; Technology, Trade Globalization, Gross Domestic Product and Unionization.

Technological changes, as explained above has led to groundbreaking improvements in productivity and general wellbeing around the world. This is simply because these advancements in technology have raised the demand for capital and highly skilled labor instead of low-skilled labor. They do this by eliminating jobs through upgrading the skill level required to keep the specific low skilled job (Card and Dinardo 2002). Technological advancements have been found to contribute to the rising of income inequality in advanced economies such as the United States. This rise of income inequality in complimented with the growing of the earnings gap between high and low-skilled workers despite the large rise in the supply of highly educated labor.

Trade Globalization is one of the alternative factors studied in this analysis that is a variable which causes an increase in the income gap in the United States. High trade between countries with and without free trade agreements has been deemed as a main driver of increasing income inequality. The inflows and outflows of trade have been a mechanism for an increase in growth for many different countries all around the world. This trade promotes competition and efficiency in countries around the world. In advanced countries, technology has replaced many jobs, as we already know. However, it could potentially have mixed effects on the job market in the United States. There is a mixed effect in the wages received by people from both ends of this spectrum. The demand for less skilled workers may increase with technological advancements or visa versa. These automation technologies have been explained as labor saving. Which in turn leads to the income gap to widen and hence decline job opportunities in many labor-intensive industries that rely on low-

skilled workers. This can be seen in the manufacturing industry (Feenstra and Hanson 1996, 1999, 2003).

In the United States, there was a rapidly growing income gap between supply and demand. Economic Growth and employment diverged in 2001 during the economic recovery. The demand could not keep up to the production supply in the United States. Productivity was growing; however, it was not growing fast enough to keep up with the tastes and preferences of the United States' consumers. Between 1989 and 2000, the United States economy finally saw a stoppage in the rapid growth of inequality. This trend had finally slowed down. Wages had increased by almost 14% for those in the bottom decile of the wage spectrum. Between the second half of this time period mentioned above, there was a massive rise in wages. This was the first time where the lower decile saw a larger increase of wages as compared to the top decile (Mishel, Bernstein and Boushey, 2003). Globally, the middle class and the top decile of workers in the United States have experienced the largest gains in the last few decades. Examining changes in real income between 1988 and 2008 at various percentiles of the global income distribution there are the largest visible gains of the earners from the top decile. This refers to the top 1 per cent. Emerging economies have shown an increase in the middle class rapidly.

The impact of globalization in the not so recent past has been nothing short of spectacular. Globalization is the progression that causes worldwide markets to integrate with one another. We cannot assume one factor being the sole cause of this, howsoever; there are many different reasons for this. New technologies and

management expertise over the years have reduced costs of various products in the United States over the last 50 years. Transportation and transaction costs have reduced as a result of this integration of the world market. These costs have reduced the barriers to international trade.

Until about the mid 1990's, the globalization on the distribution of jobs and income in the country had positive impacts. Advanced economies were growing at a steady rate of about 2.5 per cent, and the different types of job opportunities seemed to have been increasing. Due to the integration of markets, imported goods around the world become cheaper. This had positive impacts on consumers in not only developed countries like the United States but on many other developing countries around the world. As Developing countries become wealthier, the economic structures of these countries change due to the change of allocation of using various comparative advantages. These countries now produce certain things that were exclusively produced by developed economies a few decades ago. Most of these countries produce these things at a faster pace and at a considerably lower cost. Hence, globalization affects the price of goods, job patterns and wages almost everywhere in the world. It changes the structure of individual economies; however, it changes different economies in different ways. There is a growing increase in growth rates for developing countries. For example, China has grown at more than 7 per cent per year for the last 25 years or more. Developing countries' income levels have accelerated to the point where they have congregated towards those income levels in the developed economies of the global economy. There has been

accelerated growth on the emerging developing economies, which has had a definitive impact on the global economy.

This change has redistributed employment opportunities and incomes in developed countries, such as the United States. We see this in the United States very clearly. After the 1950's, in the United States, economists assumed that growth and employment went hand in hand. The United States' economy's performance confirmed this assumption. This change in the United States meant that for the first time, growth and employment in the United States were starting to conflict. The highly accelerating developing countries are becoming more competitive and productive in industries that the United States has been dominant in the recent past. For example, the manufacture of semiconductors, pharmaceuticals, electronics and IT services has been adopted by developing countries such as China and India. This has caused employment opportunities in the United States to move away from the sectors that have the highest growth. In turn, the industries with the least growth are the ones where these job opportunities have been moving. These growing inequalities are negatively impact income and employment in the United States. The highly educated workers have been enjoying increasing wages and many more benefits. However, the less educated workers have been facing stagnant wages and fewer opportunities in the inactive industries in the United States.

All the changes of income inequality in the United States economy cannot be the sole cause of Globalization or market integration of the world economy. An

important variation in the recent past, which is the cause of the increase in inequality, is the result of automation of technology. For example, the labor saving informational technology and the automation of transactions in the United States has cut jobs in a vital part of the value chain. The manufacturing industry has had a larger decline in job opportunities than other industries in the United States.

However, we cannot conclude that technology or automation has had a bigger impact on manufacturing than other sectors of the economy. This is because information processing technology has reduced jobs not only in manufacturing, but also throughout the United States economy. Jobs in finance, consulting, government and retail have increased. However, this does not mean that jobs have not been eliminated due to technological advancements. Hence, the income inequality in the United States cannot be explained by changes in technology alone. To think that technology was the sole cause of the United States employment challenge would be wrong and an uneducated assumption. This does not mean that technology is not an irrelevant factor. It does, however prove that technology affects some industries in the economy more than it does others.

Technological change or advancements have played an important role in inequality, especially in a developed country such as the United States. An important opinion to note is that technology is directly related to globalization. Jorgensen and Vu (2005) provide a series on IT investment using national expenditure data for computer hardware, software and telecommunications equipment in the United

States. This method takes into account the life of every certain type of software. Technological development was measured by the IMF working paper by a share of information and communications technology (ICT) capital in the total capital stock. This share has risen in the last two decades across every income level (Jaumotte, et.al, 2013). It is an important variable in the IMF working paper analysis as it plays a key role in being interconnected with globalization. This paper uses ICT capital produced domestically in the United States as a percentage as a proxy of technology to distinguish between globalization and technology.

Looking at the output is a relevant measure of the size of a company, industry or economy. However, a better way to determine its added value; which is the goods and services it produces and it's cost of inputs. The costs of inputs could be the price of raw materials, energy used, and energy consumed. Even the transportation costs between the phases of the production cycle can be relevant. Goods and services are often purchased as immediate inputs from other companies or industries. The value added produced by all the industries of a particular economy add up to the countries' GDP.

Employment opportunities and incomes have been rising for highly educated people in the United States. However, these opportunities are fading away for people who are less educated. These trends have been stagnant, and we see no reason to believe that they will change any time soon. Here, we see the distinct effects of globalization on income inequality and how it affects different industries

in different ways. Opportunities are increasing for the highly educated labor throughout the economy. While, the opportunities for the less well educated are diminishing. The job market of tradable and non-tradable sectors must increase and stay competitive with one another to form a balance in the economy. If goods become cheaper, the rise in real incomes brought by lower prices does not affect people in the short term. However, the declining employment that comes hand in hand with it has an immediate negative effect in the short term.

In our case, we use a parametric specification for our regressions of inequality indicators on Gross Domestic Product per capita and we also use its squared term. This shows the non-linear or curved relationship in our studies. The American Economic Review (Ahluwalia, 1976) finds a positive coefficient for the Gross Domestic Product per capita variable, and a negative GDP per capita squared variable. This is consistent with Kuznets hypothesis of the inverted U-shaped relationship. Kuznets' hypothesis claims that, in the initial stages of development, when per capita income is still low, so is the inequality variable when it is the dependent variable. However, as time progresses, inequality rises to make capital accumulation, which act as investments, through savings. Kuznets uses the Keynesians hypothesis of marginal propensity to save for the consumers who are apart of the higher income levels. This rise of inequality is justified by a transition from the primary sector to the secondary sector. This time series hypothesis by Kuznets, is the reason why most economists believe that economic growth helps inequality decrease in developed countries such as the United States.

Most of these studies confirm Kuznets hypothesis, although there is some counter-evidence that is against this theory. However, almost every study has differences that are the reason for these varied results. In a study done on Kuznets' hypothesis in a Panel of States, we can see this counter-evidence (Kim, Huang, & Lin, 2011). In this study, empirical results reveal a long run and U-shaped relationship between inequality and development. We can clearly see inequality initially declining and then rising making a U shape and hence, rejecting Kuznets theory since the U-shape is not inverted. Studies involving panel data between 1947-1988 by Ram was also unable to support the inverted U-shaped curve or Kuznets hypothesis. His study was initially restricted to developing countries that caused him to reinvestigate his study for the United States to try and support the hypothesis. However, he could not prove Kuznets hypothesis. He also found a U shaped curve, which was not inverted (Ram, 1991).

There is a large body of literature on Kuznets hypothesis. Due to the mixed results, there is no definite conclusion on the relationship between inequality and development, although the majority of the papers studied have shown the un-inverted U-shaped relationship. There is a failure in finding a conclusion due to the low quality and various comparative studies of data across different countries and over time. This paper looks and addresses these issues and focuses only on one country and other important factors that lead to income inequality in the United

States that have not been studied in coalition in the past and are adapted for the 21st century.

Using Gross Domestic Product per capita and its squared variable alone cannot account for our analysis of inequality. Hence, we use some other explanatory variables mentioned below. This analysis uses Gross Domestic Product in two different ways. First, GDP (as a total \$ value) to use as a measure for globalization using Exports and Imports and adding them together and later dividing them by GDP (as a total \$ value) to measure the change on Income inequality by the Openness to Trade. Second, Gross Domestic Product is used as an explanatory variable using the measure of Gross Domestic Product per capita. Third, I use Gross Domestic Product as a squared variable to account for Kuznets hypothesis as another explanatory variable.

Income Inequality Consequences

Too much income inequality, in the long run, in a country is sure to have a significant negative impact on the wellbeing of a society. Growing inequality in a country is simply a problem in the allocation of resources. This means that the country is not using its most valuable assets or workers in the most productive way. Preferential tax treatments can furthermore undermine economic efficiency. Inequality distorts our society in every possible way. The role of the government plays a crucial role here in infrastructure, education, health and technology. For example, the rich do not need the government for healthcare or education from their

children. The rich also seem to become distant from ordinary people who rely on government aid. "With the wealthy class having a significant influence in the political process it could influence the implementation of foreign policy and, therefore, the notion of balance and restraint between domestic and foreign needs can become distorted" (Stiglitz 2011).

This excessive inequality can also adversely affect the people's quality of life. The rich benefit from the availability of superior education and health from the private sector. Economic growth slows down due to this social instability due to the influence of the rich on the political process in favor of less investment in human capital or other forms of social infrastructure. High-income inequality can cause political instability due to the large part of the population that is not satisfied with its economic status. This political instability leads to a lot of risky investments that undermines the country's economic growth in the long run (Soubbotina and Sheram 2000).

Another consequence of income inequality in the United States is that there is a limitation upward mobility amongst top executives of a lot of the more valuable firms in the United States. Corporate CEO's in the United States enjoy record levels of compensation, and in turn, the middle class is affected negatively. The middle class experiences stagnant and low wages. The reduction of a lot of the benefits of the middle class is also threatened. This is where the study focuses on unionization in the United States. A decline in union membership, which is measured by the unionization rate, can reduce the bargaining power that unions have. This would in turn

cause worsening of wage inequality (Wilkinson and Pickett, 2010). According to a recent study of the 350 largest companies in the United States, the average CEO compensation was over \$9 million in 2004. This was a 14.5 per cent increase as compared to the year before. The wall street journal claimed that payments towards CEO's of large companies in the United States increased by 480 percent between 1970 and 2003. Certain types of CEO's are in a position where they work very hard around various procedures to avoid taxes. One such way is by having low salaries and by using other methods to avoid paying high taxes. This is not a method of payment available to the average American. The ratio of compensation between a CEO and an average American is much wider than it is in any other industrialized country. "Taking a wider definition of compensation into account, instead of simply "pay," in 2005 a typical CEO's compensation was \$11.6 million which was 279 times the average pay of a non- supervisory worker" (Boushey and Weller, 2006).

The American democratic system has always been a promoter of equal rights, and how everyone in the country should be deemed as equal. This is irrespective of income, gender, race or ethnicity. However, due to the vast income inequality in the United States, this has not been as true. Due to the centralization of wealth in the hands of a few, and the concentration of power towards the rich, the political power has tipped in the favor of the wealthy. The politicians should pay more attention to the needs and concerns of the middle and lower income portion of the country. Nevertheless, in reality this is not the case. The politicians pay more apprehension to the business centered and the higher income groups in the country.

Analytical Framework

The model shown in Figure 1 represents the Kuznets' model for GDP and Income Inequality. We hypothesize that the regression will result in the United States being on the left hand side of the Kuznets' Turning Point, which states that in theory, a positive relationship will exist between the GINI-coefficient and GDP growth. We hypothesize, as Kuznets did, that GDP per capita has a diminishing effect as income inequality increases, hence the inverted U-shaped curve. However, we are aware that our results could be different because Kuznets only studied this in the 1950's and not over a long time series. We hypothesize a positive correlation for income inequality with Globalization (which includes GDP, imports and exports) and Technology. Another hypothesis is that there will be a negative correlation between income inequality and unionization. Kuznets accounted for neither unionization nor technology, which is increasingly important in the 21st century.

As inequality is a very complex and multi-dimensional phenomenon, there are many different approaches that specify a possible source of inequality. The theory of Internationalization of production is a theory that brings technology to light in this argument. There is a wide range of literature that relates income inequality and the effects of globalization of markets (Mills, 2008). Outsourcing and Offshoring deeply effects labor and hence we study Unionization in the United States to justify this. This theory is in line with international trade and a rapid spread of ICT in various industries. Firms in advanced countries, such as the United States,

keep highly skilled activities for a limited number of highly paid employees. At the same time, they cut the number of jobs and wages for medium and low skilled workers. This process is replicated as the skill-biased technological change gives demand to highly skilled workers over the others. The outcome of this phenomenon leads to wage inequality in developed countries. The effects of this globalization can favor the process of industrialization and job creation in developing countries. However, this is not the case for the United States.

There have been many empirical studies that support the Kuznets curve. The Kuznets curve, the GINI index measures the extent to which the distribution of income within an economy shows the deviations from a perfectly equal distribution. The Lorenz curve plots the cumulative percentage of total income received against the cumulative number of recipients. The GINI in this case measures the area between the Lorenz curve and a hypothetical line of absolute equality, which is represented on the GINI index at 0; an index of 100 or 1 shows perfect inequality. As stated above, there are many studies supporting this theory by Kuznets. This refers to the U-shaped inverted relation between inequality and development. There are many studies supporting this for cross sectional and time series data.

Most studies focus on growth rates, we use Gross Domestic Product per capita, but our focus is on real development (Ahluwalia, 1976). The reason for this is because we use a time series that goes hand in hand with Kuznet's long run feature of economic development. Ahluwalia also finds that there is no evidence of an independent short-term relationship between inequality and the rate of growth

of GDP over the time period he looks at. The coefficient of GDP was insignificant in all the equations shown in his paper with different combinations of various explanatory variables in the short term. Hence, Kuznets hypothesis requires the long run that I interpret in my analysis

Data and Initial Conditions

Income Inequality (GINI): Income Inequality is measured by the GINI coefficient. This is a *dependent* variable for the purpose of this paper. An Italian statistician named Corrado Gini developed the coefficient measure in 1912. This variable is how I plan to measure Income Inequality. This measure can apply to both small and large population or developing and developed countries. One can measure a GINI within a household itself, a state in a country or a whole country. It is measured between scales of 0 to 1 on a percentage basis. Where, 0 indicates that everyone in the group has the exact same income or share income equally. While, a measure of 1 indicates that there is complete inequality within the country, which essentially means that one person or worker earns all the income and everyone else earns nothing. Having either of these extreme numbers is not necessarily a good thing. If we measure the income of a household with latter, and the GINI coefficient is 1, this could mean that one person earns all the income of the household. However, a GINI of 1 in a whole country would not make economic sense.

There is currently no satisfying measure of the GINI coefficient (Spilimbergo, 1997).

There are however, multiple ways to calculate personal income distribution. The

GINI coefficient is the most widely used of these and hence it is used in this paper. The major problem with the GINI coefficient is that it only provides a general image of the level of income inequality. There is another problem, which involves comparing GINI measurements, however, this is not the aim of the analysis in this case and hence, we use the GINI coefficient.

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 (World Bank, 2017). The United States had a GINI coefficient of 0.41 in 2013, which shows that it is somewhere in the middle of the spectrum. There is a direct connection between literature and data because this is essentially what I am testing.

GDP per capita (GDPpc): GDP per capita is an independent variable for the purpose of this paper. GDP per capita is the Gross domestic product divided by the mid year population of the specific country, in our case, the United States. Gross Domestic Product is the sum of gross value added by everyone who produces something in the economy of a country, in addition any product tax and subtracting any subsidies depending on the product. Subsidies are not included in the GDP. It is measured in U.S. Dollars and calculated without accounting for depreciation of assets or natural resources (World Bank). There is a apparent gradual linear

increase over the last 30 years or so of GDP per capita in the United States. For example, in 1980 the GDP per capita was 12597.7 US\$ and in 2015 it increased to 56,115.6 US\$. This shows an increase of more than 4 times as it was in 1980. There was a slight decrease in 2008 due to the economic recession, however, the number went right back up in 2009 causing this gradual escalation to keep increasing.

Openness To Trade acting (TRADE): Openness to trade acts as a proxy for globalization. This is an *independent* variable for the purpose of this paper. World trade or Openness to trade is measured as the ratio between imports adding exports that are in turn, divided by GDP. For the purpose of Globalization or Openness to Trade, we look toward GDP, Exports and Imports. When we look at GDP, we are looking at a Dollar value of the GDP of the United States. Exports consist of Exports of goods, services and primary income (BoP, current US\$). Import data is found the same way as Imports of goods, services and primary income (BoP, current US\$). I am using all 3 of these variables, where I use the sum of exports and imports and divide the sum of these flows by GDP in dollar values.

Zhou Chen supported Kuznets theory by using an alternate estimation strategy of endogenous regression. He stated that turning point on the inverted U-shaped curve depends on population and openness to trade (Chen, 2011). The ratio has grown almost by 5 times since the 1980's. Hence, I am using trade openness as a measure for globalization in the world today and it's effects on income inequality. Advanced economies are known to have trade systems that allow more open trading

regimes as compared to developing countries. High trade between countries with and without free trade agreements has been deemed as main drivers of increasing income inequality. The inflows and outflows of trade have been a mechanism for an increase in growth for many different countries all around the world. This trade promotes competition and efficiency in countries around the world. In advanced countries, technology has replaced many jobs, as we already know. However, it could potentially have mixed effects on the job market in the United States. There is a mixed effect in the wages received by people from both ends of this spectrum. The demand for less skilled workers may increase with technological advancements or visa versa. These automation technologies have been explained as labor saving. Which in turn leads to the income gap to widen and hence decline job opportunities in many labor-intensive industries that rely on low-skilled workers. This can be seen in the manufacturing industry (Feenstra, 2001).

Technological Advancements (ICT): Information and Communications

Technology is a measure of technology or the increase in technology in the United States used in this analysis. This is a percentage of investments in the United States. This is an *independent* variable for the purpose of this paper. I will be measuring technological development as a measure for technology to compare with Income inequality. I will be using the share of information and communications technology (ICT) investments to measure this. ICT investment is defined as the acquisition of equipment and computer software that is used in production for more than one year (OECD Database, 2017). It has 3 components it can be divided into, information technology equipment (computers and related hardware), communications

equipment; and software (which includes pre-packaged and customized software). This number has also increased rapidly over the past 20 years across all income levels. ICT investments are important for federal agencies to assess future productivity and economic growth prospects, and reconcile important differences between reported production and consumption of technology. I will be using ICT capital produced domestically as a proxy of technology to show the difference between globalization and ICT.

New information technology has led to improvements in productivity, utility and well being in the United States (and the rest of the world) incrementally. However, it has played a crucial part in increasing income inequality in the United States. This is simply because technological advancements can raise demand for capital and skilled labor over low skilled or unskilled labor by eliminating many jobs in the United States and other countries due to the automation of work and the ease of profits in many industries (such as manufacturing) without having an excess of labor. The fight to keep jobs versus the incremental technological advancements is an unfair one. This has very evidently increased the income gap in the United States for not only unskilled labor, but also for skilled labor. This is true, even despite the large rise in supply of educated or skilled labor. We would assume would reduce the gap, however, this is not the case.

Unionization (UNION): Unionization Rate as a percentage of employed people of all unions in the United States will measure unionization. This is an *independent* variable for the purpose of this paper. I will be testing the percent of employed

members of unions across all industries and occupations in the United States. This includes people from all sexes, all races and any ethnic origin. The data includes workers who are 16 years of age or above. This is an essentially wage and salary worker, excluding incorporated self-employed workers. In my data the highest rate of unionization is in 1983, which is at 20.1% after which unionization rates have decreased incrementally in the United States. Low-wage jobs have their wages increased in many country unions as a national minimum wage. Wage dispersion within unionized labor is smaller than a group of non-unionized workers (Freeman, 1982). I believe that there is a negative relationship between Income inequality and Unionization, and hence, the more unionization increases, the more the income gap decreases.

After WWII labor unions came into the United States. They have the ability to raise wages and working standards for members of these unions and for people who are not members. Labor unions have simple limits in power, which were concentrated in certain industries in the economy. However, unions have maintained prosperity in the United States since WWII. There is a clear wage premium for union workers. In addition, this wage premium is more evident for low skilled workers, which causes a spill over effect to non-union members who are also low skilled workers. Unionization hence has a negative impact on income inequality, which makes it different than the other independent variables. This proves that unions can not only raise the floor price of wages, but also lower the price ceiling.

Union bargaining power has hence been crucial towards reducing income inequality.

Methodology

The empirical analysis is based on the following model,

$$GINI_t = \beta_0 + \beta_1 UNION_t + \beta_2 TRADE_t + \beta_3 ICT_t + \beta_4 GDPpc_t + \beta_5 GDPpc_t^2 + \varepsilon_t$$

Where, $GINI_t$ is the income inequality coefficient, over a time period of 35 years.

$\beta_1 UNION_t$ represents the Unionization rate of workers employed in unions across

the United States. $\beta_3 ICT_t$ expresses the Information and Communication

Technology Investment variable described above. $\beta_2 TRADE_t$ denotes Openness to

trade that is measured by the equation $\beta_4 \left(\frac{EX + IM}{GDP} \right)$, where EX is total exports, IM,

which is total imports, and GDP that is Gross Domestic Product. For Gross Domestic

Product we consider $\beta_4 GDPpc_t$ and $\beta_5 GDPpc_t^2$ as different explanatory variables

due to the assumption that GDP is not a linear variable, but has a diminishing effect

based on the Kuznets hypothesis. In this case, it is accounted for by squaring it as

another variable in itself, which uses the same hypothesis as Kuznets. The first

assumption is that the first GDP variable is expected to have a negative relationship

and the squared variable to respectively have a positive relationship with Income

Inequality that together makes an inverted U-shaped curve.

For the GINI coefficient, this evaluation expects to find different results based on the various independent variables in my study: such as Gross Domestic Product per capita, Openness to Trade, Unionization and Technology. As Openness to trade or Globalization increases, including GDP, exports and imports, we expect the income gap to increase with it. Hence income inequality and has a positive relationship with the independent openness to trade variable. Technology has led to groundbreaking improvements in productivity and general well being, which has led to a raised demand for capital and highly skilled labor instead of low skilled labor in comparison. In the relevant literature, technological advancements have been found to contribute to the rising of income inequality in advanced economies such as the United States. This rise of income inequality in complimented with the growing of the earnings gap between high and low-skilled workers despite the large rise in the supply of highly educated labor. Hence, this paper hypothesizes technology will have a positive effect on Income Inequality and as Technology increases so will the Inequality. Based on the Kuznets Hypothesis, I expect that GDP per capita will have a positive effect on income inequality, which will eventually diminish and cause the squared GDP per capita variable to decrease in agreement to The American Economic Review and in line with Kuznets theory (Ahluwalia, 1976). Finally, Unionization has had a negative effect on income inequality, unlike the other two variables. Unions sustain economic choices in a country, such as minimum wages, health benefits, social security and high marginal taxes. Hence, I believe that an increase in Unionization rate will have a negative impact and reduce income inequality of the United States.

Table 1: Models of OLS

	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)
VARIABLES	GINI	GINI	GINI	GINI	GINI
UNION	-0.317 (0.342)	-	-	-	-0.812*** (0.0605)
TRADE	0.0542 (0.0754)	-	0.159*** (0.0341)	-	-
ICT	0.181** (0.0776)	-	0.276*** (0.0445)	0.172*** (0.0627)	-
GDPpc	-8.28e-07 (1.41e-06)	1.46e-06** (7.05e-07)	-	1.07e-06*** (2.26e-07)	-
GDPpc ²	0 (0)	2.29e-12 (1.00e-11)	-	-	-
Constant	0.413*** (0.0937)	0.372*** (0.0111)	0.302*** (0.00809)	0.340*** (0.0112)	0.542*** (0.00893)
Observations	37	37	37	37	37
R-squared	0.891	0.856	0.881	0.882	0.837

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

*** represents 1% of significance
 ** represents 5% of significance
 • represents 10% of significance

When looking at the results of Model 1 as shown in **Table 1** above, there is a high R^2 and adjusted R^2 , however, there is no significance in any of the variables except for the ICT variable that has 5% significance. The models in case all denote 36 degrees of freedom. The Unionization rate variable has a negative coefficient as we expected. Hence, as the unionization rate increases there is a decrease in Income Inequality. The Openness to Trade variable and ICT investment variable for technology both have a positive coefficient as expected in the hypothesis. The analytical framework in this paper relates GDP per capita and its squared variable to the Kuznet's hypothesis, which hypothesizes that GDP per capita will be positive and its squared value will show a negative effect. However, the results are the opposite to those expected, expressing a U-shaped curve. This shows us that the results in The American Economic Journal by Ahluwalia (Ahluwalia, 1976) hold true.

This analysis searched for multicollinearity by doing a VIF test. The results as shown in **Table 2** exhibited that the data indeed had multicollinearity. Hence, the study divided up the variables with respect to the GINI coefficient in 4 different models. These models are shown on **Table 2**, **Table 3**, **Table 4** and **Table 5** in the appendix.

This paper breaks up Model 1 into 4 different models. First, Model 2 consists of only GDPpc and GDPpc² and how they affect the GINI coefficient. This is consistent with the Kuznets hypothesis. Where, GDPpc is at the 5% level of significance and since GDPpc² is the squared variable, the paper hypothesizes there

to be multicollinearity, which does exist in the model due to a VIF of 38.35 (As shown in **Table 3**). This is due to the fact that there is a squared variable. The coefficients for both GDPpc and GDPpc² are positive (As shown in **Table 1**). Model 3 shows Income Inequality and how it is affected by ICT investment (ICT) and Openness to Trade (TRADE). The expectation earlier in the paper for both of these coefficients to be positive holds true (As shown in **Table 1**). The VIF Test in **table 4** shows a VIF of 2.41, which prevents multicollinearity in this case. Model 4 studies the effects of GDPpc and ICT on Income Inequality. The expectations fall in line with the results for the signs of the coefficients (As shown on **Table 1**). Both ICT and GDPpc have positive coefficients (As shown in **Table 5**). Finally, Model 5 studies the effects that Unionization has on Income Inequality. As expected in the hypothesis, Unionization has a negative effect on Income Inequality (As shown on **Table 1**). This means that as the Unionization rate increases, Income Inequality decreases in the United States. There is no multicollinearity because there is only one explanatory variable in this model (As shown in **Table 6**).

Data Set & Data Sources

The data for this paper have been accumulated and compiled from standard sources. For the purpose of measuring the GINI coefficient to use for the regressions in this analysis, data has been used from the census government website.

Unionization rates have been obtained from data found in the Union affiliation data from the Current Population Survey from the Bureau of Labor Statistics. This is the

most reliable data in the United States for data regarding unions. The technology variable which is known as the Information and Communication technology investment as a total number. This data has been retrieved from the OECD Databank. However, there were 6 years of data that were missing from this variable. They were accounted for by averaging the number and comparing them by making trend lines and relating the numbers to previous literature.

When compiling data for the Openness to Trade or globalization variable, there was a process used. The process included compiling export, import and GDP data from the World Bank national accounts data and OECD National accounts data files. After which there is a formula mentioned in the paper where Exports and Imports have been added together and further divided by the GDP variable. This formula has formed the Openness to Trade variable. The data was retrieved from the data bank on the Online World Bank Data source and compiled together to make the relevant formula create new numbers. The data for GDP per capita was retrieved from World development indicators which was sources from the World Bank nations; accounts data and OECD National accounts data files

Results

The results of the estimation of the model for the United States (As Shown in Table 1) shows that unionization is the only variable in this study that has a significant impact on inequality when referring to model 1 (As shown in Table 1). As expected, it has a negative effect to the GINI. This means that as the Unionization

rate increases in the United States, the income inequality decreases, being concurrent with the initial hypothesis. Unionization is significant at the 5 percent level, proving to be the most significant value (As shown in Table 6). Intriguingly, openness to trade and technological investments in capital appear to be statistically insignificant in Model 1 having p-values higher than 0.05 and not linking with any of the confidence levels as shown in the Appendix. This could be due to the fact that the GINI coefficient data was averaged for the last 3 years based on trend lines made over a scatterplot. Technological advancements, as expected, show a positive relation with income inequality and are significant at a 5% level. This means that as the ICT investments increase in the United States or technology develops, the income gap in the country widens. This variable is the only significant variable in model 1. The OECD has not released any more data on ICT since 2010 and initially the paper regressed data on the years between 1980 and 2010, however, the last 6 years data were averaged based on trend lines created by the data to account for having more significance.

The results of the coefficients had positive and negative relations to income inequality as anticipated. For example, this means that openness to trade, initially increases income inequality, and after a certain point it starts to decrease. However, in Model 1 neither the squared or normal variable was statistically significant in any respects. When we consider the squared variable, we expected it to decrease. The variable for openness to trade had been squared to account for the fact that it wasn't linear in relation to income inequality. This is based on the neoclassical economic

theory. Initially, import competing industries in the United States release labor that causes unemployment and hence increases inequality. This is due to unemployment causing income drops during the time of when the labor is released from the industry. Over time, the same labor gets absorbed to export industries, and hence inequality starts decreasing. This is the reason we considered an inverse U-shaped model for openness to trade. The results clearly show that the competitive capital and technology intensive trade patterns leads to less labor absorption due to the shift. However, both of the openness to trade variables is insignificant and hence were not used in the models. This could be due to the missing data from 2016, however, this is unlikely.

Even though the variables go in the right direction, 3 out of 4 of them are not significant in Model 1. For example, openness to trade could be insignificant due to multicollinearity with the other 4 variables. It may depend on what kind of country (developing or developed) the United States exports or imports to. If accounted for, maybe we would see a different result. There is an adjustment in this case by changing the variables and checking for autocorrelation and other tests.

Due to the high insignificance in Model 1, the paper analyses 4 alternative situations using the same variables with different permutations and combinations. Model 2 shows that GDP per capita is significant, however, the squared variable is not. Model 2 has a high R^2 at 0.856 (As shown in Table 1). Model 3 shows the affects that ICT and Openness to Trade has on Income Inequality. Both of the variables are

significant and represent 1% significance levels. Model 4 shows significance in both ICT and GDP per capita with respect to Income Inequality. Both variables are significant and represent 1% significance levels. However, GDP per capita is significant, it has a minute effect on the GINI coefficient. Model 5 shows the relationship between Income Inequality and unionization rate. As expected, it shows a negative relationship and represents 1% of significance.

This analysis uses the Durban Watson test to detect for autocorrelation in this analysis. (As shown in table 7). Autocorrelation shows the relationship between values separated from each other by a given time lag in time series models such as all the models in this paper. The paper analyses each of the 5 models separately (As shown in Table 7). Model 1 has a value of 1.012 which shows evidence of positive serial correlation. Model 2, Model 4 and Model 5 show D-values under 1, which shows that successive error terms are close in value to one another, which can be accounted for in future studies. Model 3 shows positive correlation at 1.054 (As shown in Table 7).

The degrees of freedom in each of these tests are all 36. Each of the models have very high R^2 and adjusted R^2 values all above 80, which show that the relationships are logical, although the variables could be independently expanded with other variables. Knowing this, and the way the models are divided up in this study proves that this analysis could be very useful for future studies and topics about income inequality in the United States.

Reforms to Reduce Income Inequality

There are many different factors that negatively impact income inequality; this depends on the situation, country and time frame to do it in. The paper discusses potential modifications to fix this problem of the increasing income inequality in the United States. Globalization is inevitable; trade is a more fierce industry than ever. Economies of countries are based on trade and produce things they have a competitive advantage in. It would be counterproductive to suggest reducing trade, even though it causes inequality. When looking at development and how it's increase causes the income gap to widen, we must think about the labor and labor allocation to fix this problem.

Since we have mentioned high and low-skilled labor time and time again, let's focus on that. Education is the difference between a high and low-skilled worker. We live in a world in which technology is automating several jobs, especially the jobs on low-skilled workers. Hence, it is significant to increase skill levels around advanced countries to maintain a low unemployment rate. Improving education quality and eliminating expensive higher education are the two major keys in adapting low skilled workers to high skilled workers. This education hence helps improve the income of people from all around the United States for the future. Having people educated helps manage technological changes or advancements and adapting to them in the future. The key to minimizing globalization and ever changing technology in advanced countries is a policy agenda that encourages innovation and

moving products up the value chain instead of spiraling down the value chain. Having an economy where there is a higher supply of highly skilled workers can bolster productivity in the nation. Having equal education opportunities available to everyone at a higher level could help reduce inequalities. Restructuring the process of raising average living standards will be able to influence the allocation of income in the United States. Without a doubt the process of tackling inequality will have more than one method or approach to actually completely diminish inequality. This process of tackling inequality would go beyond the remit of labor, social welfare and tax policies.

An alternative impending reform could be revolved around restructuring the tax system in a conscious effort to reduce inequality. There is a positive relation between growth and redistribution of tax systems for most countries. This shows us that if the government offers lower income groups more opportunities with regards to tax incentives, there may be a minor decrease in the income gap. Lowering income inequality does not need to go hand in hand with having low efficiency in a specific country. Redistribution through the tax system is found to have positively related growth towards most countries. As seen in previous IMF work, there has only been negative growth when the tax system has been completely redistributed to an extent where there cannot be positive aspects towards the extent of the change and redistribution. There shouldn't be a stark efficiency-equity trade off (Ostry, Berg and Tsangarides, 2014). This proves that the effect of redistribution towards lower income households could have optimistic incentives to consider.

Although there would be negative effects because of the simple act of redistribution, however, the positive effects of this would outweigh them.

Conclusion

This paper documents the role of income inequality in the United States and provides evidence towards the trends of inequality with various factors over the last 36 years in the United States using various different variables and factors that affect inequality.

The paper considered Kuznets' curve as a basis to consider inequality, however, it initially created a model with all of the variables that had been considered important which were left out by Kuznets. The reason for this is because Kuznets hypothesis was only created in 1955 and was not based on a time series analysis. Although the model included various factors that are relevant to the 21st century, most of the variables were insignificant and had multicollinearity. The insignificance in Model 1 was created as a foundation for creating the rest of the models in the paper. There was only one variable that was significant in Model 1, which led to the creation of 4 new models. The models that were created after Model 1 had the same variables as the initial model, although they had different permutations and combinations of the variables in each model.

The models had results as anticipated by the expectations in the paper. The technology variable was found to increase income inequality as it increased itself. Similarly, as openness to trade increased in the United States, the income gap tended to widen. As projected, the increase in the unionization rate in the United States causes inequality to decrease considerably. One of the most interesting results the paper found was based on GDP per capita and the Kuznets' theory. As indicated by Ram (1991) and Kim, Huang & Lin (2011), the Kuznets inverted U-shaped hypothesis was not supported by their results. Even though they both had different studies based in different time periods and countries, they also found a U shaped curve that was not inverted.

Finally, we can conclude by stating that inequality has been a major concern in the United States for a long time. There are many factors that cause inequality in various different ways. This paper has divided up the models in different ways to show significance of the effects that these variables have on Income inequality. The main finding of this empirical analysis is that developed countries, such as the United States, is affected by technology, productivity, unionization and openness to trade in diverse ways. There are many reforms such as redistributing the tax system and education in the United States that can fix this impeding problem of Inequality. With the new variables added to the Kuznets' theory, this paper proves that there are always going to be new factors based on the time period that effect income inequality in new and relevant ways. There will always be an argument regarding this theory, however, the answer will always remain in the techniques and time

frame that the study lies in. Equality will always be an important value to the human race. If the income gap keeps on decreasing we will face significant negative impacts on economic growth in the United States.

Tables & Appendix

Table 2:

VIF Test for Income Inequality with model 1

Mean VIF : 67.41

VARIABLE	VIF	1/VIF
GDPpc	184.40	0.005
GDPpc ²	91.48	0.010
Unionization	42.25	0.023
Trade	11.68	0.085
ICT	7.26	0.137

Table 3:

VIF Test for Income Inequality with model 2

Mean VIF: 38.35

VARIABLE	VIF	1/VIF
GDPpc	38.35	0.026
GDPpc ²	38.35	0.026

Table 4:

VIF Test for income Inequality with model 3

Mean VIF: 2.41

VARIABLE	VIF	1/VIF
Trade	2.41	0.414
ICT	2.41	0.414

Table 5:

VIF Test for Income Inequality with model 4

Mean VIF: 4.82

VARIABLE	VIF	1/VIF
GDPpc	4.82	0.207
ICT	4.82	0.207

Table 6:

VIF Test for Income Inequality with model 5

Mean VIF: 1.00

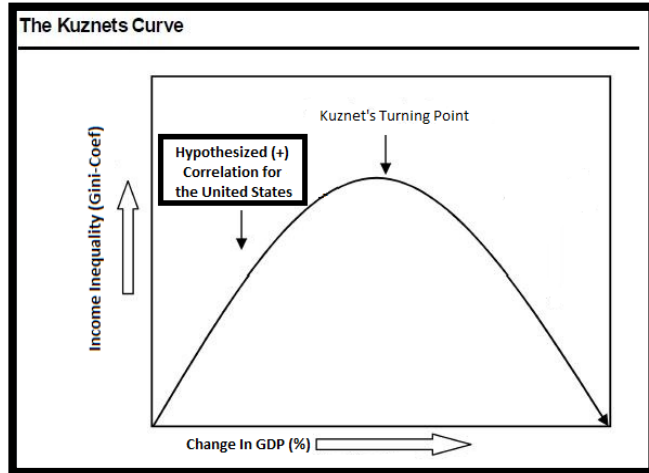
VARIABLE	VIF	1/VIF
Unionization	1.00	1.000

Table 7:

Name of Model	Model 1	Model 2	Model 3	Model 4	Model 5
D-Watson Test Statistic (D-Value)	1.012	0.744	1.054	0.886	0.744

Figure 1:

Hypothesized Relation; The United States and the Kuznet Model (Reeves *et. Vohra*, 2016)



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