The Effect of Poor Working Conditions and Income Inequality on GDP Growth

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Abstract:

This paper looks to see if there is a relationship between poor working conditions and growth in GDP annually. Many nations have historically treated their workers very poorly, and offered little in support or protection to them. Consequently, many of these same nations have seen large boosts in annual GDP growth. This paper aims to see if there is a correlation between this treatment of workers, and these subsequent boosts of GDP growth, and if there is, is it possible to predict the expected level of growth based on these factors.

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1.0 INTRODUCTION

Since the time of the industrial revolution, many nations have struggled with the balance of workers rights and treatment, with the development of their nation and producing goods. European nations, as well as the US, were the first to jump this hurtle. Many pieces of legislation have been passed by these nations since then, to offer much more in the way of employee protection. During time of industrialization, huge increases in wealth of these nations also ensued. Much of this growth was due to the rapid increase in technology as well as the increasing ease to produce it. However, was there another element that could be adding to this growth? Since the time of industrialization in the West, many other nations have begun to follow suit. Some of these countries include Indonesia, China, Vietnam, etc.

The goal of this paper is to see if there is a correlation between poor treatment of employees as well as harsh working conditions, and the prosperity of a developing nation. There are recent examples of places that have seen rapid economic growth while simultaneously having very poor working conditions. These places seem to be located in Asia, so what does the rest of the world look like? That question will too be answered by this paper.

This model could be used by nations to help predict their economic growth each year, and may in fact help maximize it. It is often assumed in business classes that by being more environmentally friendly and more caring towards employees, it will result in better economic growth for a company, and as an extent a country as a whole. There is a possibility that this is only a case by case basis. There are a lot of factors that go into a country's economic growth, so it is very possible that the wellbeing of workers may not be enough to make a significant difference.

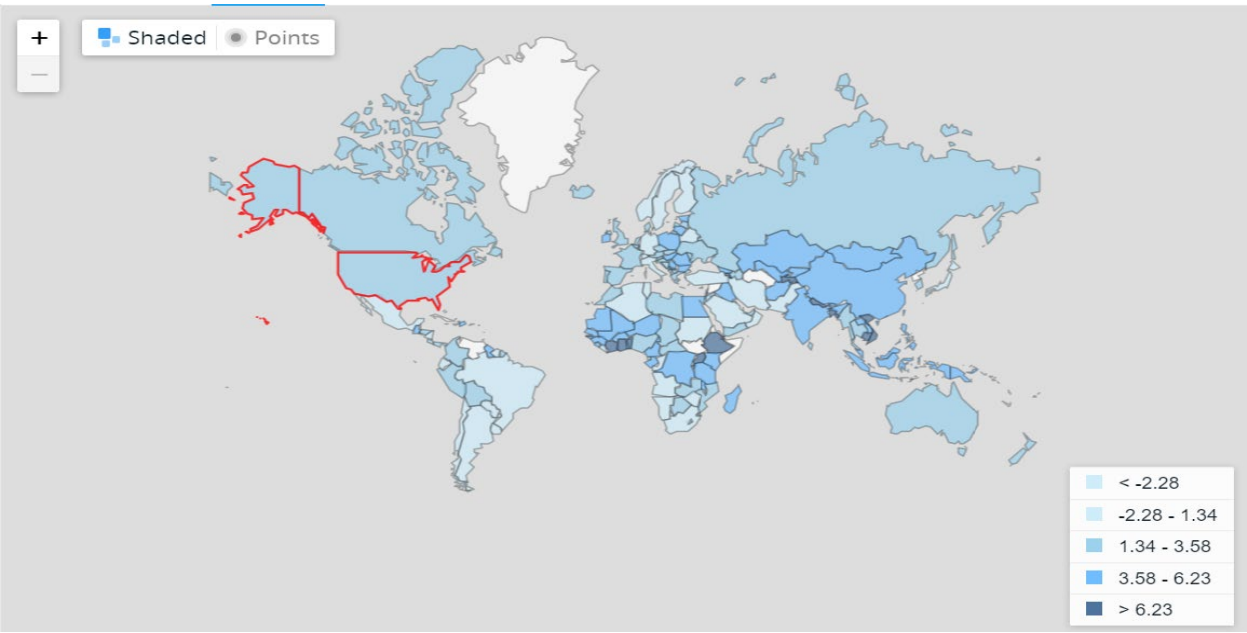
The remainder of this paper will be broken down into five subsections. These subsections are Historical Trends, Literature Review, Data and Methodology, Empirical Results, and Conclusion with Appendix. The Historical Trends category will discuss the trends of GDP in different regions of the world, and industrial growth as well as some more background information on the topic. The Literature Review portion will go into looking at the studies used to influence this model. Data and Methodology will be used to describe how the data was acquired and how it was used to generate the model. Empirical results will go over the results of the aforementioned model, and the Conclusion and Appendix will have all the final information needed.

2.0 Trends of Working Conditions and Income Inequality

Throughout history there has always been some level of economic inequality. There have always been people who are very poor, those that are very rich and some people who are in between. As society's begin to develop, the issue of inequality becomes more and more noteworthy. In more developed countries, like the US and many European countries, income inequality has become a hot button political issue. However, in some of the industrializing nations like China, Vietnam, etc. this isn't much of an issue for the people, while it trends ever upward. Similarly, working conditions have been increasing in many of these developed countries, while in the developing countries the working conditions have remained the same, or been decreasing since their industrialization.

GDP growth, as seen below, has been on the increase on the developing nations around the world. Places like Vietnam with a growth of around 6.23% each year, and China with around 6% are examples of industrializing nations with high GDP growth each year. For the more developed nations, the average growth rate is around 2.5% - 3.5% each year. Some of the smaller countries, like Greenland and Somalia, have no data available on their growth. For the rest of the nations of the world, the growth fluctuates each year, with the developing nations, and consequently the countries with the worse treatment of workers, seeing the highest amount of growth.

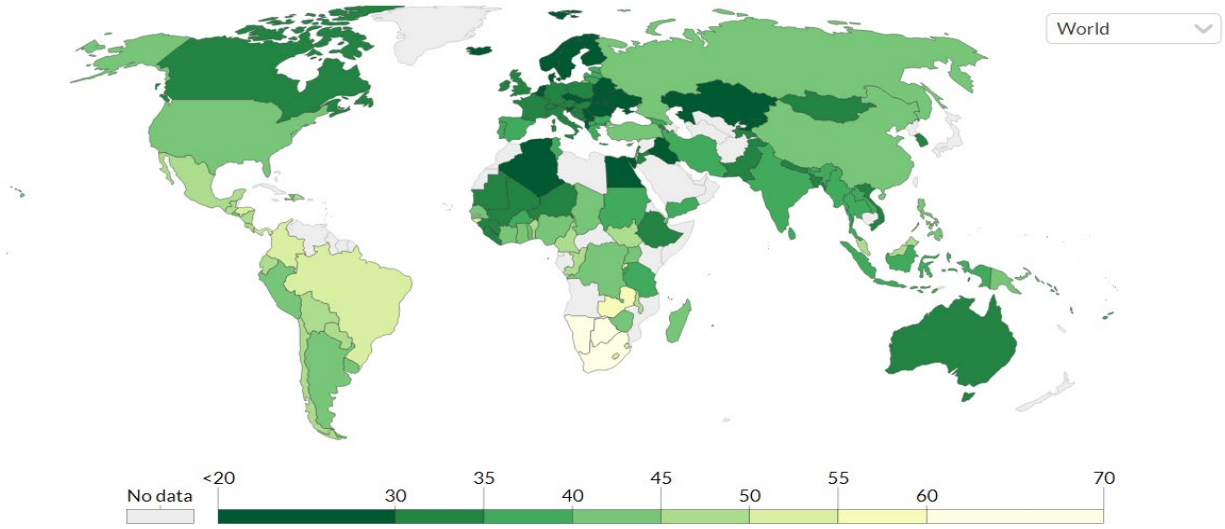
Figure 1: Worldwide GDP Growth



Source: World Bank

In the US specifically, income inequality has been on the rise year over year. We can see that it has been trending upward since the late 60s. Meanwhile the GDP growth per year has been trending downward. In other countries, they have been seeing a similar increase in economic inequality but interestingly enough, it is still less than the US. Meanwhile their economic growth has been on the incline as shown in the chart below. Places that are still developing, have relatively low amounts of income inequality but the more developed a nation becomes the higher the income inequality. Using data from the US, it can be seen that they are right around the 40-45 whereas somewhere like Vietnam has a gini in closer to the 30 mark. The Gini index being the economic indicator for inequality, is used to get a gage of a country's estimated level of income inequality.

Figure 2: Gini Index

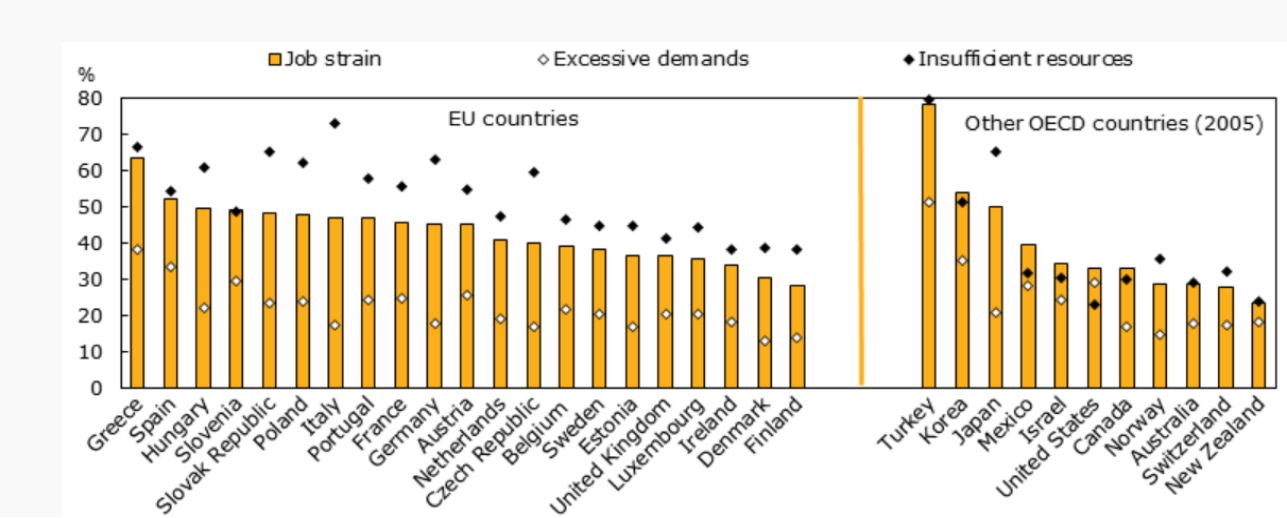


Source: World Bank

Lastly the trend of workplace conditions is a harder topic to find much information on. There are many measures of different elements of workplace quality, but there are few in the way of quality of workplace. The chart below shows the incidents of job strain. It can be seen that the job strain levels are increased in more developing nations, whereas the countries that have been industrialized for a while have much less levels of job strain. This data also looks at things like the resources available to the company at the time, as well as if the demands are seen as excessive for the employees working. This trend doesn't have a complete worldwide look at

every country but it does provide some interesting insight as to how each country's workforce views their employment. While there isn't a great list of countries that are developing, one country that still is, is Turkey. It can be seen that job strain is very high there, as well as a lack of resources and excessive demands. This is in stark contrast to places like the US where job strain rates are far lower, around 45% as opposed to 78%.

Figure 3: Incidence of Job Strain



Source: OECD.org

It is clear to see that the trend, at least for low-income nations, is rising GDP growth, rising income inequality, with poor working conditions. Interestingly, even in the high-income nations the Gini Index is increasing. Meanwhile the same areas are stagnating in GDP growth. These findings will be reflected in the final model.

3.0 LITERATURE REVIEW

There's a large interest in trying to estimate a nation's economic growth. A lot of time and research is spent on trying to maximize growth. In addition, there are a lot of factors that go into figuring out GDP growth. In Bartak and Jablonski (2020) they discuss the impact of what comes from income inequality. They were primarily concerned with whether or not income inequality has a negative impact on a countries growth. This study focused on OECD countries

mainly. In this study they found that various measures of inequality have consequences on economic growth in a nation. This study indicates that there is a negative impact of income inequality on a nation's GDP growth. Another study, Kim (2016), looks to see if access to financial capital can affect income inequality and economic growth. Kim (2016) also discusses how income inequality does have a negative impact on GDP, and in addition, income inequality plays a huge role in the GDP growth in low-income countries, as well as high-fragility nations. Lastly the study found that there is a correlation between financial inclusion and economic growth. Not exactly along the same lines of this study but a useful baseline nonetheless. There is a similar situation to the study Zietz and Zhao (2009) where it looks at how the change of household income affects that GDP of a nation. It also looks at how overtime the impact of household income on economic inequality. This was found by breaking up each household income level into quantiles. Like the previous study, it helps give a better understanding of GDP and the many factors that go into it.

One study, Iyigun and Owen (2004), looks at the impact of income inequality on many different macroeconomic variables, but most importantly for the confines of this study, it's effect on Real GDP growth. The findings were in high-income countries with greater levels of income inequality there is more volatility in consumption growth. Conversely in low-income countries, higher income inequality leads to more stability in terms of consumption growth. This study helps set the scene into how different levels of wealth in a country can impact a nation's GDP. Chang, Gupta, and Miller (2018), also looks at this topic, but focuses just on the US from the years 1917, to 2012. Using a wavelet analysis, this study ended up finding that there is a correlation between income inequality and GDP growth. This study also looks at the real GDP and inequality overtime to see what role policy implications of politics can play. Tridico and Pariboni (2018) looks at the reverse, trying to see how a weak GDP and decline in the wage share can impact economic productivity. They achieve this by using Sylo Labini's equation where productivity growth depends on GDP rate of growth and wage share, but inversely on changes of financialization and income inequality. While a big focus of Tridico and Pariboni (2018) is labor productivity, there is still much to gather from it's look at income inequality.

Hoeller, Joumard and Koske (2014), takes a different look, looking at the policies of the workforce and education as well as tax policy in a nation and seeing how that impacts income inequality, and then applies that to the overall GDP. This study only looks at the OECD

countries, but it did find that changes of policy can reduce income inequality while still maintaining a positive level of economic growth in a nation. Tuelings and van Rens (2008) also takes a look at education as it relates to income inequality and economic growth. It also looks at the impact of endogenous skill-biased technological progress as well as change in GDP. This particular study is more useful for background research than as a basis for constructing a model, but it still aids by giving further insight. In addition, it also provides further insight on how best to break down the variables of the model used in this study, by looking at things like employment in industry and technological exports. Lastly, Ezcurra (2007) looks at whether or not income inequality is harmful for regional growth in the EU. This study also focuses on things like sectoral composition of economic activity and human capital stock. The findings of this study were that there is a negative correlation between income inequality and economic performance. All together, these studies give a solid understanding of the idea that will be looked at in this paper. While there are still some gaps to be filled in, specifically pertaining to the idea of job quality and how to measure it, the aforementioned studies give enough of a comprehensive look to begin the process.

4.0 DATA AND METHODOLOGY

4.1 Data

The data collection portion of this research posed a bit of a problem. For starters all of the data was taken from the Worldbank. The data collected was on the following variables: GDP, Annual GDP Growth, Gini Index, Working Hours, Children in Employment, Children in Employment (Unpaid family workers), Mortality Due to Air Pollution, Poverty Rate, Employment in Industry, Employment in Services, and High-Tech Exports. The data for these variables were collected for every country worldwide from the years of 2009 to 2019. The reasoning for not using 2020 is because at the time of data collection, 2020 values weren't available. The data was all annualized time series data. Once all of the data was collected, a random sample was taken of 10 countries in each of the following subcategories: high-income, medium-income, low-income. These nations were divided into these groups based off of their GDP.

Table 1: Descriptive Statistics

	GDP growth	Gini index	Working hours (Children)	Children in employment	Mortality Air pollution	Poverty rate	Employment industry	High-tech exports
Mean	3.528	15.628	1.244	1.662	7.760	6.196	18.246	12.563
Standard Error	0.208	1.075	0.345	0.551	2.055	0.607	0.492	0.853
Median	3.079	0.000	0.000	0.000	0.000	0.000	20.180	8.308
Mode	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Standard Deviation	3.608	18.615	5.981	9.540	35.602	10.516	8.526	14.770
Sample Variance	13.021	346.531	35.766	91.003	1267.491	110.578	72.690	218.151
Kurtosis	8.200	-1.541	23.145	52.399	35.817	4.005	-0.192	2.578
Skewness	-0.196	0.463	4.912	7.042	5.691	1.917	-0.875	1.584
Range	41.315	53.900	38.500	87.446	324.100	56.800	30.300	78.477
Minimum	-20.599	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	20.716	53.900	38.500	87.446	324.100	56.800	30.300	78.477
Sum	1058.325	4688.300	373.176	498.675	2327.900	1858.900	5473.800	3768.852
Count	300.000	300.000	300.000	300.000	300.000	300.000	300.000	300.000
Confidence Level(95.0%)	0.410	2.115	0.679	1.084	4.045	1.195	0.969	1.678

When all the data was collected, the next step was to trim some of the more unnecessary variables, meaning variables that were highly correlated. A correlation coefficient matrix was constructed to see what variables would best suit the model, and strengthen the results rather than negatively impact it. As seen below, some of the variables like Children in Employment and Children in Employment (Unpaid Family workers), would be too correlated to each other, so for the confines of this study, the unpaid family workers variable was removed from the study. In addition, employment in services was removed as many of the countries in the low-income bracket had a low amount of the total population working in services.

Table 2: Correlation Matrix

	GDP growth
GDP growth	1
Annual % growth	0.655301449
Gini index	0.012521768
Working hours	-0.41519973
Children in employment	0.091880221
Unpaid family workers	0.089078729
Mortality Air Pollution	0.522685667
Poverty rate	0.027367274
Employment industry	-0.13151309
Employment services	-0.48189876
High-tech exports	0.111676472

4.2 Empirical Model

GDP Growth = $\beta_0 + \beta_1(Gini\ Index) + \beta_3(Average\ working\ hours\ of\ children) + \beta_4(Children\ in\ employment) + \beta_5(Mortality\ Rate\ From\ Air\ Pollution) + \beta_6(Poverty\ Rate) + \beta_7(Employment\ in\ Industry) + \beta_8(High-tech\ Exports) + v_{i,t}$

The dependent variable, as the rest of this paper would imply, is GDP growth. The independent variables are the Gini index, Average Work Hours of Children, Children in Employment, Mortality Rate From Air Pollution, Poverty Rate, Employment in Industry, and lastly High-tech Exports. The Gini Index is a representation of the economic inequality around the world and encompases the first criteria for this study. Average working hours of children is a weekly measure that finds the average supposing the nation has children that do work. Children in employment represents the percentage of the population of children that are involved in employment. Mortality rate due to air pollution is deaths caused by pollution, and this will help paint a better picture of the quality of the working environment in a nation. Poverty rate looks at the percentage of the population (looking at the total population) that falls under the poverty line. Employment in industry looks at the percentage of people working in industry out of the total working population. Lastly, high-tech exports looks at what portion of a nation's exports are

sophisticated technology. The reason that there aren't any variables that reflect just plan job quality, is because there isn't one. Instead for the confines of this study, variables that seemed to best represent the quality of work in a nation were selected.

5.0 EMPIRICAL RESULTS

As stated previously, this study was broken down into three main categories, low-income, medium-income, and high-income nations, and then finally an overall result. To begin looking at the results for the low-income countries, for the overall results the R-squared value is rather weak as seen below with a value of 0.3624. This is overall not a very high score, and shows that this model isn't the most accurate in terms of low-income countries. The P-value for each variable isn't very strong either. The only variables that showed significance at .05 were children in employment and employment in industry. The results for low income countries were a bit lackluster, but that is due to one major issue; lack of data for low-income countries. Much of the data that was collected had gaps in it for the low-income countries due mainly to the lack of collection of data, and lack of an organizational structure in some of these low income countries.

Table 3: Low-Income Results

Regression Statistics	
Multiple R	0.60205369
R Square	0.36246865
Adjusted R Square	0.31058491
Standard Error	5.00441196
Observations	100

	Coefficients	*Standard Error*	*P-value*
Intercept	0	#N/A	#N/A
Gini index	0.08858706	0.062885114	0.16225475
Working Hours (Children)	0.13045358	0.099584517	0.19342964
Children in employment	0.21478798	0.083387355	0.0116***
Mortality Air Pollution	0.00714241	0.010592823	0.50181283
Poverty rate	-0.0073994	0.061548738	0.90456745
Employment industry	0.16738247	0.051405118	0.00158***
High-tech exports	0.02348888	0.037031767	0.52744876

*** = signifcance at .05

When looking at the results of the middle-income countries, there is a bit better of a result. The overall R-Squared is a far better score of 0.7498. This means that the model was overall far more accurate at predicting the GDP growth of the nations in this income range using the aforementioned variables. Unfortunately, the P-values still didn't show many significant variables. At a .05 significance level, the only two variables that were significant were employment in industry and high-tech exports. The middle-income countries had the most complete data, benefiting from the complete income inequality data, while still having data available on children in the labor force.

Table 4: Middle-Income Results

Regression Statistics	
Multiple R	0.86596229
R Square	0.74989069
Adjusted R Square	0.72300192
Standard Error	2.59121059
Observations	100

	Coefficients	*Standard Error*	*P-value*
Intercept	0	#N/A	#N/A
Gini index	-0.00947758	0.02210776	0.66913349
Working Hours (Children)	0.05338173	0.075186964	0.47948894
Children in employment	-0.00622172	0.044854421	0.8899798
Mortality Air Pollution	0.01465706	0.008221055	0.0778706
Poverty rate	-0.02988611	0.037945344	0.43292807
Employment industry	0.17877076	0.02040794	8.58E-14***
High-tech exports	0.03332388	0.014338103	0.0223***

*** = signficance at .05

The high-income nations results fell in between that of the low-income countries and the middle income countries. The R-Squared was 0.5950 as seen below.. This isn't nearly as good as the middle-income nations in terms of the strength of the model, however it is far stronger than

the model for low-income nations. In terms of P-value, like in low-income countries, the only two significant P-value are children in employment and employment in industry at a .05 significance. The issue for high-income countries is that while they have solid reporting on things like poverty rate and the Gini Index, there are no data points for things like children in employment. The lack of these data points stems from the fact that most high-income countries have laws making child labor illegal.

Table 5: High-Income Results

Regression Statistics	
Multiple R	0.77137734
R Square	0.59502301
Adjusted R Square	0.55814277
Standard Error	2.53599324
Observations	100

	Coefficients	*Standard Error*	*P-value*
Intercept	0	#N/A	#N/A
Gini index	-0.020496	0.015356209	0.1852311
Working Hours (Children)	-0.0296922	0.048918725	0.5453497
Children in employment	0.05329601	0.024803968	0.03426***
Mortality Air Pollution	0.0199598	0.011573189	0.087911
Poverty rate	-0.0501806	0.038456785	0.1951614
Employment industry	0.09754724	0.030264835	0.00175***
High-tech exports	0.06413596	0.033542774	0.058946

*** = significant at .05

Lastly, the overall results were interesting. These results were found by taking all of the countries used in this analysis and combining them all, then evaluating them using the same model as the previous. The overall R-squared value was 0.4493. This isn't that strong of a result for the model results. Where the findings of the overall results get interesting is the P-values. At a significance level of .05, the significant variables were the Gini Index, children in employment, mortality from air pollution, employment in industry and high-tech exports. This had far more

significant variables than the other models, which was surprising given the fact that it uses the same nations as the previous results. An interesting outcome nonetheless.

Table 6: Overall Results

Regression Statistics	
Multiple R	0.670365461
R Square	0.449389851
Adjusted R Square	0.434701589
Standard Error	3.785831968
Observations	300

	Coefficients	*Standard Error*	*P-value*
Intercept	0	#N/A	#N/A
Gini index	-0.032145604	0.015332125	0.036884717
Working Hours (Children)	0.063714637	0.041824585	0.128742814
Children in employment	0.054261143	0.026082121	0.03835***
Mortality Air Pollution	0.014071399	0.006146586	0.0228***
Poverty rate	0.028346202	0.025583883	0.268783011
Employment industry	0.141149767	0.018859236	8.4582E-13***
High-tech exports	0.037029414	0.015393088	0.01677***

*** = significance at .05

These findings have some implications. Despite some of the models not being the strongest,this model isn't without its benefits. When used looking at nations in the middle-income bracket it performed rather well. In some of the other nations that had lower data completion, it made the model perform worse. It isn't quite the expected result, but it did show that there is definitely an impact on GDP as a result of income inequality and poor working conditions. With increased access to data, this model could be refined to a stronger level, and could even be used to help predict GDP growth in nations around the world. Interesting how some of the variables weren't significant in some nation economic groups, but were found to be significant in the overall model. When refined, this model could be used by policymakers to try to influence levels of annual GDP growth by trying to change inequality levels, or by putting increased restrictions on businesses to improve working conditions. Based on the results of this

study, it would be beneficial overall to adjust the levels of air pollution, income inequality, children in employment,employment in industry and tech exports, in order to change GDP growth. While it is known that these variables do impact growth on GDP, without increased access to data, it is hard to say to what extent. Therefore, the overall policy recommendation would be to use these variables as a baseline tool to predict GDP growth, but ensure there is sufficient data to do so.

6.0 CONCLUSION

Overall, the outcome of this analysis was surprising. While some of the results for each of these outcomes wasn't the best, the overall results had significant P-values. Based on the results given it can be concluded that there is some level of impact of these variables on the growth of GDP each year. As some of the studies listed in the beginning of this paper discuss, there are many variables that can impact the growth of a country's GDP. While the model used in this doesn't encompass every single one of these variables, it does take into account the major variables that are representative of the issue trying to be determined by this paper. While the trends of the last ten years indicate that there may be at least some correlation between GDP growth, income inequality, and working conditions, the analysis portion of this research did still have some issues.

There were many challenges facing the research of this topic. One of the largest challenges was regarding data collection and the methodology. For starters, there wasn't much in the way papers that look at the same exact topic as this paper. Much of the research was done either looking at the impact of income inequality on GDP growth or in looking at the impact of working conditions on GDP growth, not combining them both. This made it a bit more difficult as trailblazing is always harder than walking a preset path. In addition, there was a challenge with data collection. For example, there is no real set variable that reflects workplace quality or job quality. Because of this the variables used had to be pulled together from variables used in other papers, or things that seemed to be indicative of job quality. In addition with data collection came the challenge of trying to have a complete data set. Much of the information one some of the low income countries was incomplete, resulting in what may be a poor model. There isn't much that can be done to alleviate this problem, other than having more data be made available.

These challenges impacted the results, and perhaps even made for a weaker model. That being said, the results of the model, depending on the category of the countries focused on, weren't too bad. The middle income countries had the best performance of the model mainly due to the most complete data. Interestingly however, the overall model had far more significant variables than the other models. This came as a surprise, but it is something that is noteworthy. For the time being, it is a bit inconclusive whether or not income inequality and working conditions impact GDP heavily. More data collection and research will need to be done on this topic in the future.

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