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Mercenaries and Poverty: A Panel Data Study on Defense/Military and Education Spending and Their Effects on Poverty Related Metrics

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Abstract

This research paper explores the possible relationship between a nation's defense/military and education spending and its effect on the nation's income inequality. Several prior studies have found that there seems to be a direct relationship between defense/military spending and income inequality. However, there is lack of papers that have examined adding the additional variable of education or included multiple countries in its analysis. The purpose of this paper is to fill the hole in the research of the topic by including fourteen nations and the additional variable. Specifically, the paper includes data from 2004 to 2014, including the percentage of GDP spent on education, the percentage of GDP spent on defense/military, and the Gini Coefficient (a measure of income inequality). The study was unable to find a statistically significant relationship between the three variables for the countries analyzed. This suggests that while the association has been shown previously for single nations, it is not necessarily a wide spread connection.

I. Introduction

Whether or not North Korea decides to fire a nuclear missile, defense/military spending will always be a hotbed of discontent and debate. However, it was not until recently, within the last decade or so, that the idea of income inequality and its associated issues came to the forefront of public concern. The concept of income inequality is still relatively new, with it first being truly measured in the early nineteenth century with the introduction of the Gini Coefficient. However, it did not take long for it to spike, and the disquiet along with it. According to The New York Times and Oxfam, the World's eight richest men have as much wealth as the bottom half of the population; a figure that is almost $430 billion.[1]Headlines like these spark conversations that tend to shape the future of modern society.

The purpose of this paper is to see if there is any statistical connection between the percentage of GDP a country spends on mainly on defense/military but also education and the level of income inequality. The data is collected in three different metrics, percentage of GDP for Education spending, percentage of GDP for Defense/Military spending, and the Gini coefficient.

[1] (MULLANY 2017)

Previous papers have been done analyzing the relationship between two of the three variables in many different combinations, however none where discovered that assessed all three. Given a positive statistical relationship, the affects could push world leaders to reevaluate national spending priorities.

II. Literature Review

Much research has been conducted on topics of a very similar nature to the topic of this paper, however, most of the research questions revolve around the significance of defense/military spending in the economy. Or on the other hand, how other economic metrics have influence on income inequality, like employment and tax rates. Only a few researchers have turned their attention to the direct connection between defense/military spending and income inequality. A particularly interesting piece was done by a Professor of Economics out of Randolph-Macon Woman's College, John D. Abell. His times series study focuses on the United States post-Vietnam War and controls for most macro-economic factors beyond defense/military spending and income inequality. While his paper did, in fact, conclude that there was a statistically significant relationship between the two variables, the most interesting aspect of his research was a partial explanation he offered for the association.[2] Mr. Abell suggests that part of the association can be attributed to the pay differences found in civilian vs. military related work, as well as military related contracts vs. commercial contracts. Mr. Abell found that jobs and contracts related to the military had a higher value when compared to their counterparts in the civilian world. While I am not as keen to associate this with income inequality, it is an interesting point to be considered.

Another paper that I reviewed prior to conducting my research was a similar study to Mr. Abell's, barring the fact that it was based in China and assessed different metrics of income

[2] (Abell 1994)

inequality. Binbin Meng, William Lucyshyn and Xiangqian Li published a report in the *Defense and Peace Economics* Journal detailing their research on China's defense expenditure and their nation's indicator for income inequality. Instead of Gini, Meng, Lucyshyn and Li analyzed China's transfer payments, which are another way of describing a subsidy. They found that indeed there was a negative impact on China's defense expenditure on its transfer payments.[3] The significance of this is that the authors argue that these transfer payments represent a form of fixing the inequality in China, and by reducing these payments, they are furthering the income gap.

III. Theoretical Model

Due to the structure and availability of data, the model used in this research is panel data. The empirical model takes the form: Ineq=f(Defense,Educ)

Where *Ineq* is the Gini Coefficient, the measure of income inequality performed by the Organization for Economic Co-operation and Development. Where *Defense* is the percentage of GDP that is defense/military expenditure, and *Educ* is the percentage of GDP that is education expenditure. Before I began my analysis, I expected that my *Defense* variable would have a positive coefficient, as it would raise income inequality, while my *Educ* variable would have a negative coefficient, because it would lower income inequality.

IV. Data Description

The entirety of the data was drawn from two sources, the Organization for Economic Co-operation and Development and the World Bank's DataBank. DataBank is a collection of economic world data which allows users to view and download collections of data. Before I started, I had decided to use the most recent data available for a period of ten years. I began my data collection by

[3] (Meng, Lucyshyn and Li 2015)

downloading all 70+ years of defense/military spending data available. I then removed all of the countries that did not have data as recently as 2000's, and then again widdled down my list of countries to those who had complete data sets from 2004-2014, the range I had previously set. Once I had my list of countries to start with, I then assembled the data for the other two variables, removing any countries that did not have a full set of Gini coefficients for the ten-year period. At the end of my data collection, I was left with 14 nations with ten years of data for the three variables. The summary statistics of this data is in section VIII of this paper in *Table 1*.

The dependent variable in this study is the income inequality metric, Gini coefficients. Simply put, the metric is cumulative portions of the population compared to cumulative portions of income. "The Gini coefficient is based on the comparison of cumulative proportions of the population against cumulative proportions of income they receive, and it ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality."[4] The mean Gini coefficient for the fourteen nations that I assessed is .310. This means that the average income inequality measured is about 1/3 unequal.

There are two independent variables in the study. The first being the defense/military spending data. This metric is measured in percentage of GDP of host nation, and was obtained from the World Bank's Databank. The World Bank defines defense/military spending as "Military expenditures data from SIPRI are derived from the NATO definition, which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities."[5] The mean

[4] (OECD n.d.)
[5] (The World Bank n.d.)

percent of GDP that is spent on defense/military is 1.43%. One note about this mean is that it is particularly low. The countries in the sample are not known for their large standing militaries or to be particularly provocative. Also, within the data set, there are several European Union countries that are spending additional resources on defense that is not included in this percentage as it is counted as EU dues.

The second independent variable is the education spending as a percentage of GDP. Like the defense/military spending data, this was also obtained from the World Bank's Databank. The World Bank defines education expenditure as simply "General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP."[6] The mean percentage of GDP that is spent on education is 5.18%. The model also is fixed for cross section and period effects.

V. Results

Table 2 reports the effect of each variable, including defense/military and education spending. In my empirical analysis, the Durbin Watson Test revealed that there was no significant serial correlation in the model which allowed me to proceed to the hypothesis analysis. Across the model the results are not what was expected. Neither independent variables showed statistically significance. Also, my expected signs for the coefficients were both wrong.

The results, in the end, did not confirm my hypothesis that defense/military spending and education spending have a direct statistical relationship with income inequality. The only conclusion that my model can perform is that for the Model I, 92.8% of the variations can be explained by the model, while for Model II it was 93.6%.

[6] (The World Bank n.d.)

VI. Conclusion

The study did not confirm my hypothesis that an increase in defense spending would also increase the income inequality of the country, on average, when utilizing cross-country data. The model including observations from 14 countries yields results that there is no statistically significant evidence that suggests there is an effect on income inequality when it comes to GDP spending of defense/military and education. Before the study, I was expecting a high positive correlation between the increasing of defense spending with an increase of income inequality while a decrease in education spending.

The purpose of this study was to understand the associations between income inequality and government spending, specifically in defense and education, on a global scale. However, there are several limitations to consider. First, there may have been control variables that I did not account for that would have allowed for different results. A second consideration is the small sample size of countries and data points that I used in my model. For example, it may have been better to add more countries with less years of data, and to account for more variables, rather than my very narrow focus.

Future research should consider the possible link between the two variables, defense/military spending and income inequality, on a global scale, in order to make accurate policy decisions.

VII. References

VIII.

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IX. Table and Graphs

Table 1

Variable Name	Observations	Mean	Std. Dev.	Max	Min
Defense Spending	154	1.43%	.6096	3.22	.418
Education Spending	123	5.18%	.7831	7.19	3.66
Income Inequality	154	.310	.0401	.392	.234

Table 2

Variables	Fixed Models	
Y (Income Inequality)	Model I	Model II
X1 (Defense Spending)	-.004 (-.526)	-.003 (-0.379)
X2 (Education Spending)		.0004 (.139)
Obs	154	123
Adj R^2	.928	.936
F-stat (p-value)	83.04 (0.000)	72.90 (0.000)
Serial Correlation Test (DW Stat)	1.81	2.00

*Notes: t-stat in parenthesis. *** indicates significant at 1% level, ** indicates significant at 5% level, * indicates significant at 10% level*

X. Appendix

Dependent Variable: INEQ
Method: Panel Least Squares
Date: 12/14/17 Time: 18:10
Sample: 1 154
Periods included: 14
Cross-sections included: 11
Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.314584	0.009604	32.75487	0.0000
DEFENSE	-0.003527	0.006703	-0.526126	0.5997

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.939209	Mean dependent var	0.309552
Adjusted R-squared	0.927898	S.D. dependent var	0.040136
S.E. of regression	0.010777	Akaike info criterion	-6.075245
Sum squared resid	0.014983	Schwarz criterion	-5.582233
Log likelihood	492.7939	Hannan-Quinn criter.	-5.874985
F-statistic	83.04201	Durbin-Watson stat	1.805978
Prob(F-statistic)	0.000000		

Dependent Variable: INEQ
Method: Panel Least Squares
Date: 12/14/17 Time: 18:09
Sample: 1 154
Periods included: 14
Cross-sections included: 11
Total panel (unbalanced) observations: 123

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.311342	0.018016	17.28114	0.0000
DEFENSE	-0.002860	0.007553	-0.378610	0.7058
EDUC	0.000408	0.002934	0.139066	0.8897

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.949468	Mean dependent var	0.309366
Adjusted R-squared	0.936444	S.D. dependent var	0.041293
S.E. of regression	0.010410	Akaike info criterion	-6.106784
Sum squared resid	0.010512	Schwarz criterion	-5.512339
Log likelihood	401.5672	Hannan-Quinn criter.	-5.865322
F-statistic	72.90253	Durbin-Watson stat	2.001171
Prob(F-statistic)	0.000000		

	DEFENSE	EDUC	INEQ
Mean	1.430842	5.184269	0.309366
Median	1.402591	5.080980	0.315000
Maximum	2.836596	7.185100	0.384000
Minimum	0.419040	3.661820	0.234000
Std. Dev.	0.509710	0.783098	0.041293
Skewness	0.077478	0.439767	-0.116063
Kurtosis	2.635508	2.842708	1.781742
Jarque-Bera	0.803936	4.091399	7.882431
Probability	0.669002	0.129290	0.019425
Sum	175.9935	637.6650	38.05200
Sum Sq. Dev.	31.69610	74.81567	0.208025