Proceedings of the National Conference
On Undergraduate Research (NCUR) 2017
University of Memphis, Memphis, TN
Memphis, Tennessee
April 6-8, 2017

Gender Inequality and Economic Growth

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Abstract

Using cross-sectional data from 96 countries between the time period of 1980 to 2015 this empirical model examines the relationship between increases in gender inequality and the growth rate of per capita Gross Domestic Product. The interest variable, the Gender Inequality Index of the United Nations 2014 Human Development Report, is modeled with four control variables to infer the quantitative impact of gender inequality on economic growth rate. The index is assessed for its quality and value to both this study and to policy development strategies. The GII is found to be consistent and suitable to providing a broad understanding of the various avenues through which gender biased inequality acts, however, it is considered lacking in the specificity necessary for acute political assessment and action for addressing gender inequality globally. Consistent with previous literature, increases in gender inequality are found to negatively impact GDP per capita growth rate. The importance of curtailing gender discrimination globally and choice methods for progress have proven contrariant and discrepant in recent research and political discussion.[1] A portion of fault is placed on the misunderstanding surrounding the varied approaches to discerning the direction of the relationship between gender inequality and economic magnitude or growth.[2] The direction of this relationship is recognized as highly important to precisely deducing which policy decisions can be pursued for inclusive and efficacious growth and this process is contemplated in light of the study's findings.

Keywords: Gender Inequality, Economic Growth Rate, Policy Development

1. Introduction

A highly-controversial and significant issue worldwide, the task of addressing gender inequality and its lasting effects pose detrimental barricades to global human advancement and growth.[3] Unequal treatment of people based on sex occurs in political, social, and economic realms with repercussions that are reflected in quantifiable ways.[4] Pay discrimination, minimized labor force participation, gendercide and infanticide, under-representation in legal systems, educational attainment and limited autonomy in healthcare decisions provide examples of such instances.

Recognizing gender inequality as both unconscionable and globally pervasive is indeed the first step to addressing its many injustices, but the semantics of these viewpoints are not the topic of this study. Rather, this research accepts the findings of prior research on the prevalence of gender discrimination and seeks to further discern and define the national economic disadvantage due to gender discrimination, on average, through an Ordinary Least Squares regression. Resulting insights of the relationship's qualities are utilized to ascertain how to best approach and address the varied consequences of gender inequality on a global scale. This is no simple task, principally due to differences in directional discoveries of prior research in identifying the variables of gender inequality versus gender equality and what parameters of these pertain to the economic status of a nation. In hope of accurately discerning any relationality, this study gives special care to clearly communicating the composition of the interest variable and the translation of any impacts made by the variable to national economic context.

2. Data Description

The majority of the data utilized in this analysis is sourced from the World Bank Statistical Annex provided by the United Nations. The data is cross-sectional and includes 96 countries with data from 1980 to 2015.

The variable of interest, the Gender Inequality Index (GII)[5], is sourced from the United Nations Human Development Report for 2014. To capture impacts of gender-based disadvantage in human development three main categories are considered: reproductive health, empowerment, and labor market status. Maternal mortality ratio and adolescent birth rate measures comprise the female reproductive health component of the index. Empowerment is proxied using the ratios of female and male population that possess at least secondary education, as well as, the ratios of female and male shares of parliamentary seats. Together these measures create corresponding male and female empowerment indices. Additionally, the ratios of female and male labor force participation rates inform the labor market indices for each sex. The Gender Inequality Index is then computed using the association-sensitive inequality measure suggested by Seth[1,6]. The index is then scored on a scale from zero to one, with zero indicating fairly equal treatment for female and male citizens and one indicating extreme disadvantage for one sex.

Countries in this study's sample are then split into four classification levels of gender bias in human development. This stratification follows according to the distribution of GII scores and mean values of the dataset. Beginning with countries that classify as having very high human development and low gender bias, the first category contains countries with scores that range from 0 to 0.175. Those with high human development and moderate gender bias follow with a score range from 0.176 to 0.375. Next, countries which classify as medium human development countries, possessing medium level gender bias range from 0.376 to 0.475. Lastly, low human development countries with high gender bias to have a score of 0.476 or greater.

The study results indicate that the sticky nature of the variables comprising the Gender Inequality Index allow for stable results that are found steady and consistent for multiple years, including those prior to and after the 2014 draw date. The index is assessed utilizing hypothetical unit "increases" in the GII score by a one hundredth of a point. This allows for economic interpretation of the impacts that changes to gender bias may have on economic growth rate, on average. It should be noted that the average GII score of 0.38 for the 96 countries in the sample indicates moderate human development levels with persistent gender bias for the dataset as a whole.

Control variables in the model include single-measure and averaged continuous variables for each country. The two single-measure variables included are the gross domestic product of 1980 and the proportion of population with at least secondary education in 1980. The average level of initial GDP per capita for the data set is $10,253.42 in 2010 dollars. The dataset's mean secondary education enrollment rate of 91.5% reveals less than optimal educational attainment for countries in the data set. The continuous control variables utilized in the model are computed by averaging all observations from 1980-2015 with an allowance for up to six missing observations for each variable per country. These variables include gross capital formation as a percent of GDP and the annual percent of population growth. The average rate of 23.06% gross capital formation reveals a fairly moderate rate of investment for the countries included in the dataset and he average population growth rate for the data set is 1.726%.

Examining the average values for control variables in the dataset provides an interesting view of the collection of countries overall, but it must be noted that countries in the dataset vary greatly in terms of economic standing, human development levels, and in severity of gender discrimination. Three notable countries differ severely from the rest of the dataset and are treated as outliers with the use of dummy variables. These three countries are China, Iraq and the United Arab Emirates. All are outliers in terms of economic growth rate due to severely high or extremely low growth rates, respectively. China and the United Arab Emirates are both classified as countries of high human development and moderate gender bias in terms of their respective GII scores of 0.19 and 0.23, while Iraq resides solidly in the classification of high gender discrimination and low human development with a score of 0.54. These countries' gender inequality index scores are noted in light of their separation from the dataset based on economic growth rate variation. The study found treatment of these outlying countries, using categorical variables, necessary and beneficial to preserving important information regarding the impact of gender inequality on economic growth in its allowance for proper recognition to the outliers' unique behavior with regard to the dependent variable.

Table 1. List of Countries

Albania	Bhutan	Dominican Republic	India	Luxembourg	Oman	Thailand
United Arab Emirates	Botswana	Algeria	Ireland	Morocco	Pakistan	Trinidad and Tobago
Argentina	Central African Republic	Ecuador	Iran	Mexico	Panama	United States
Australia	Canada	Egypt	Iraq	Mali	Peru	Venezuela
Austria	Switzerland	Spain	Marshall Islands	Malta	Philippines	Democratic Republic of the Congo
Burundi	Chile	Finland	Israel	Mauritania	Portugal	Zambia
Belgium	China	Fiji	Italy	Mauritius	Paraguay	
Benin	Ivory Coast	France	Jamaica	Malawi	Rwanda	
Burkina Faso	Cameroon	United Kingdom	Jordan	Malaysia	Senegal	
Bangladesh	Republic of the Congo	Ghana	Japan	Niger	Sierra Leone	
Bulgaria	Colombia	Gambia	Kenya	Nicaragua	El Salvador	
Bahrain	Costa Rica	Greece	South Korea	Netherlands	Suriname	
Belize	Cuba	Guatemala	Liberia	Norway	Sweden	
Bolivia	Cyprus	Guyana	Sri Lanka	Nepal	Swaziland	
Barbados	Denmark	Honduras	Lesotho	New Zealand	Togo	

2.1 Definition of Variables

GII Gender Inequality Index – U.N. Gender Inequality Index (2014)
GDP1980ln Initial GDP – Natural log of GDP per capita at 1980, (constant 2010 US$)
SECEDU80 Initial Human Capital – Total enrolment in secondary education as percent of population of official secondary education age (% in 1980)
INVEST Gross Capital Formation – Net increase in physical assets (% of GDP)
POPRATE Population Growth Rate – Population growth (annual %)
IRQ.D Iraq – Categorical variable of Iraq
UAE.D United Arab Emirates – Categorical variable of United Arab Emirates
CHN.D China – Categorical variable of China

2.2 General Statistics

Statistics	N	Mean	St. Dev.	Min	Max
GDPrate_mean	96	1.623	1.620	-2.368	8.693
INVEST_mean	96	23.060	5.779	11.179	45.015
POPrate_mean	96	1.728	1.108	-0.533	6.361
SECEDU80	96	91.500	24.806	17.292	131.177
GII	96	0.376	0.197	0.028	0.713
GDP80	96	10,253.420	16,229.450	279.299	115,003.400

3. Methodology

The model is grounded in the Neoclassical macroeconomic growth model of Robert M. Solow[7] with inspiration from Robert J. Barro's[8] cross sectional global study of economic growth. Inclusion of initial human capital, initial gross domestic product and the rates of population and investment in the model as control variables are in light of this methodological foundation.

Ordinary Least Squares regression is utilized to discern the impact of variations in countries' gender discrimination levels on economic growth rate. Gross domestic product per capita and GII scores serve as proxies for economic growth and gender bias discrimination level within countries, respectively.

Increases in gender inequality are expected to negatively impact economic growth rates based on the underutilization and limitation of females in the population. This constraint of females in an economy is assessed through several key measures in the Gender Inequality Index. Education attainment, health care access, economic participation and representation in society collectively capture the economic impact of discrimination on female citizens. This occurs primarily through the ease or ability with which females can contribute to society. It includes labor production both immediately and in the future, as lasting impacts of limitations ripple through following years. This realization indicates the possibility of a persistent gender-biased impact on economic growth and societal achievement within a country for generations, barring changes to political and cultural gender biased treatment.

Assessing the necessary assumptions of Ordinary Least Squares methodology, the Residuals vs. Fitted, Normal Q-Q, Scale-Location, and Residuals vs. Leverage plots of the model are examined. The Residuals vs. Fitted and Scale-Location plots indicate the data points are homoscedastic with a fairly constant variance across all observations. The Normal Q-Q plot and the Residuals vs. Leverage further support the accuracy of model specification, revealing appropriately normal error terms and no points of leverage or influence in the data.

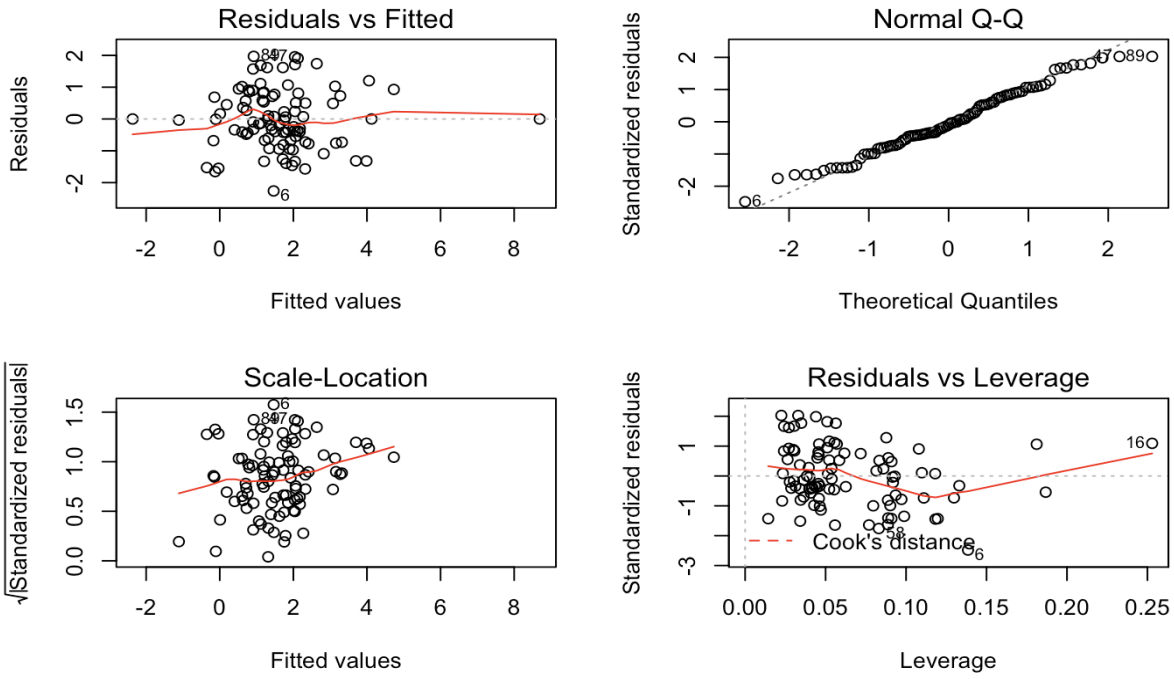
3.1 Model Specification

$$\text{Economic Growth} = \alpha + \beta_1 GII + \beta_2 GDP1980ln + \beta_3 SECEDU80 + \beta_4 INVEST + \beta_5 POPRATE + \beta_7 IRQ.D + \beta_8 UAE.D + \beta_9 CHN.D$$

3.2 Correlation Matrix

	GDPrate_mean	GII	logGDP80	INVEST_mean	POPrate_mean	SECEDU80
GDPrate_mean	1.00000000	-0.2763225	-0.09689123	0.5500772	-0.3778380	0.1826459
GII	-0.27632254	1.0000000	-0.82093184	-0.1940647	0.5959708	-0.4452188
logGDP80	-0.09689123	-0.8209318	1.00000000	0.0262090	-0.3931143	0.5092167
INVEST_mean	0.55007717	-0.1940647	0.02620900	1.0000000	-0.1421727	0.1583791
POPrate_mean	-0.37783798	0.5959708	-0.39311426	-0.1421727	1.0000000	-0.3969533
SECEDU80	0.18264586	-0.4452188	0.50921673	0.1583791	-0.3969533	1.0000000

3.3 Plots for Assessment of Ordinary Least Squares Assumptions Validation



4. Results

Initial assessment of the relationship solely between countries' Gender Inequality Index score and GDP per capita growth rate reveals a highly significant negative correlation. The introduction of initial human capital, initial gross domestic product, investment rate, and population growth rate variables in model two reveals the GII variable to be consistent in this behavior. In consideration of outliers with potential to heavily influence regression results in previous research, outlying countries are controlled for using categorical variables in models three and four and the direction and statistical significance of the interest variable endures.[9]

A change in the significance of the population growth variable is detected and explored in the penultimate and final models. These models reveal collinearity between the GII and population growth variable as is discerned from the increased magnitude of the gender inequality coefficient at the removal of the population variable in model three. This behavior is likely due to overlapping information in the maternal mortality rate and adolescent birth rate components of the GII with the population growth variable. The potential for omitted variable bias lead to retaining the population growth variable in the final model.

A strong negative relationship between gender discrimination and economic growth rate is discerned in the final model. The highly significant coefficient of -5.87 indicates that a one hundredths of a percentage point increase in a country's Gender Inequality Index score is, on average, associated with a 5.87% decrease in GDP per capita growth rate. Putting this into perspective, a country with a GDP per capita growth rate of 1.62% would experience a decrease of approximately 0.095 percentage points for each associated one hundredths percentage point increase in its Gender Inequality Index score. The resulting GDP per capita growth rate of 1.525% would be expected, on average.

4.1 Regression Results

Gender Inequality and Economic Growth

	Dependent variable:			
	Growth Rate of GDP per Capita			
	(1)	(2)	(3)	(4)
Gender Inequality Index	-2.27***	-6.17***	-6.62***	-5.87***
	(0.81)	(1.19)	(1.05)	(1.18)
Natural log Initial GDP 1980		-0.92***	-0.83***	-0.81***
		(0.14)	(0.15)	(0.15)
Initial Human Capital 1980		0.01**	0.01**	0.01
		(0.01)	(0.005)	(0.01)
Gross Capital Formation (%of GDP)		0.11***	0.10***	0.10***
		(0.02)	(0.02)	(0.02)
Population Growth Rate		-0.22*		-0.20
		(0.13)		(0.15)
Iraq			3.65***	3.78***
			(1.01)	(1.01)
United Arab Emirates			-2.21**	-1.24
			(1.06)	(1.28)
China			2.04*	2.13*
			(1.14)	(1.14)
Constant	2.48***	8.34***	7.64***	7.66***
	(0.35)	(1.59)	(1.60)	(1.59)
Observations	96	96	96	96
R^2	0.08	0.59	0.66	0.66
Adjusted R^2	0.07	0.57	0.63	0.63
Residual Std. Error	1.57 (df = 94)	1.07 (df = 90)	0.99 (df = 88)	0.98 (df = 87)
F Statistic	7.77*** (df = 1; 94)	25.70*** (df = 5; 90)	24.02*** (df = 7; 88)	21.43*** (df = 8; 87)
Note:	*p<0.1; **p<0.05; ***p<0.01			
	Cross-sectional Data for Ninety-six countries from 1980-2015; Human Development Report, United Nations Development Program (UNDP); World Development Indicators, World Bank			

5. Conclusion

Controlling for four main contributors to macroeconomic growth and examining the relationship between gender inequality and economic growth rate, it is shown that increases to the gender inequality score negatively impact GDP per capita growth rate on average. The snapshot perspective of the impact of the combined economic, legal, health and civil realities of gender disadvantage provided by the GII is informative in its encompassing and personable nature. It aptly includes recognized channels of globally prevalent gender disadvantage and provides a quantifiable measure of disadvantage. By regressing this score against fluctuations in national economic achievement over a 35 year span we can deduce the relative impact of gender disadvantage on economic growth for the nations in the sample.

Limitations are present in the use of an index, however, as the value to policy development rests on the clarity and specificity of the relationships between the individual index components and economic growth are muddled in its mathematical construction. There exists a clear indication that gender inequality and economic growth are inversely

related, but our ability to attribute weights to areas of the greatest influence on national economic wellbeing is restrained. As a result, the opportune focuses of policy change and assessment remain hazy.

From a philosophical or humanitarian perspective it may be tempting to disesteem questions of specificity or directional causality in the context of human rights, but this risks inefficiency at best and economic and civil upheaval at worst. Altering legal, political or social infrastructures without thoughtful study of their direct and interconnected relationships risks harm to those it seeks to benefit. This is not to overlook the value of multidisciplinary study to the development of a holistic knowledge of gender inequality's origins and intricacies. In fact, we suspect the value of such work is likely to grow as globalization continues to expand economically, politically and ideologically. The scope and concentration of global policy development, as such, is pertinent to future research given the variety of economic, social and political features. Global studies provide an economic based guiding relationship in support of gender equality, but efficaciously achieving equality at present appears inevitably nationally and regionally intimate.

6. References

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7. Endnote

1 GII methodology per Seth (2009) states "This method implies that the index is based on the general mean of general means of different orders—the first aggregation is by a geometric mean across dimensions; these means, calculated separately for women and men, are then aggregated using a harmonic mean across genders."