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Gender Inequality and Growth: The Case of Rich vs. Poor Countries

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Using cross-section data for over 120 countries, we explore the relationship between gender inequality and economic growth. We contribute to the existing literature in two important ways. First, we use a broad measure of gender inequality that goes well beyond gender inequality in education, the focus of most existing studies. Second, we allow for heterogeneity in the growth and gender inequality relationship across low and high-income countries. Our results confirm that greater gender inequality is associated with lower growth. However, this negative relationship holds among the low-income countries but not among high-income countries. Our findings have important implications for the design and targeting of gender related policies.

Keywords: Gender, Growth, Gender Inequality Index, Income
JEL: J16, O11, O40

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1. Introduction

Promoting gender equality is fast becoming an important aspect of the global agenda. For example, the 2010 Millennium Development Summit lists gender equality as one of its main goals. Gender equality has a direct beneficial effect on the economic status of women, a sufficient reason by itself for pursuing policies aimed at gender parity. In addition, gender equality is widely believed to contribute to the overall development or growth rate of the economy (World Bank 2012). Precisely how strong is the relationship between gender equality and economic growth? Is this relationship uniform across all countries or is it restricted to only a group of countries? The present paper contributes to the literature on gender equality and economic growth by attempting to answer these questions.

Formal empirical evidence on the nexus between gender inequality and overall economic growth is limited. Evens so, the evidence that does exist is largely focused on the gender gap in education and its impact on growth. One argument for why gender inequality matters for growth is that if one believes that boys and girls have a similar distribution of innate abilities, gender inequality in education must mean less able boys than girls get the chance to be educated, and more importantly, that the average innate ability of those who get educated is lower than it would be the case if boys and girls received equal educational opportunities. With lower overall innate ability, growth rate could decline. This argument can be easily extended to beyond inequality in education such as inequality in business opportunities and access to jobs (Klasen 1999). Another possibility is that there could be complementarity between male and female education and well being. For example, if there are positive externalities in education between siblings then holding the overall level of education fixed, a more balanced distribution of education between males and females is likely to boost overall human capital and hence economic growth. It is conceivable

that a similar argument may hold for other drivers of economic growth. Further, in many cases, greater gender equality may imply moving resources away from males to females. Such redistribution could have a positive effect on growth if women contribute more to growth than males through for example, investing more in children's education and health. Last, more often than not, greater gender equality is likely to be associated with better opportunities for women on an absolute scale and irrespective of the level of opportunities available for men. An absolute improvement in economic opportunities available to women is likely to improve overall growth as more people are now actively contributing to the economy.

In an early empirical attempt, Barro and Lee (1994) and Barro and Sala-i-Martin (1995) estimate the impact on growth (GDP per capita growth rate) of female years of schooling controlling for male years of schooling. They report a 'puzzling' a finding that higher female primary and secondary years schooling (i.e., lower gender inequality in education[1]) is negatively associated with growth. Dollar and Gatti (1999) also estimate the impact of female secondary enrollment rates on growth. Controlling for male secondary enrollment rates, they find that higher female secondary enrollment rate (i.e., lower gender inequality in education) is associated with higher growth rate, but only in countries with relatively high levels of female education to begin with. In another study, Klasen (1999) uses the ratio of female to male total years of schooling as well as the growth rate of this ratio over time as their two measures of gender equality in education. Controlling for the overall (male plus female) level of total years of schooling across countries and its growth rate over time, the study finds a sharp positive effect of both their gender equality measures on growth rate.

[1] Female years of schooling capture gender inequality in education since the study controls for the male years of schooling.

We depart from the literature mentioned above in two important ways. First, we use a broad measure of gender inequality, the United Nation's Gender Inequality Index. The index measures gender inequality not just in education but also in other areas including health, employment and political empowerment. Second, we explore heterogeneity in the growth-gender inequality relationship in that we allow the strength of the relationship to vary between rich vs. poor countries. Our results confirm that grater gender inequality is associated with lower per capita income growth in over 120 countries. However, this result is entirely driven by the sample of relatively low-income countries. At sufficiently high levels of income, there is no significant relationship between gender inequality and growth. Figure 1 and 2 provide a graphical illustration of this result.

2. Data and Main variables

The data we use is a cross-section of 122 countries. The estimation method used is Ordinary Least Squares (OLS) with Huber-White robust standard errors. Significant level is denoted by *** (1 percent or less), ** (5 percent or less) and * (10 percent or less). Descriptive statistics of all the variables used in the regressions are provided in Table 1. Our dependent variable is the average value for 2005-2009 of the annual growth rate of GDP per capita (*Growth*). Data source for the variable is World Development Indicators, World Bank. In our sample, the mean value of *Growth* equals 2.6 and the standard deviation is 1.98.

Our main explanatory variables are a measure of the level of gender inequality (*GII*) across countries, GDP per capita (*Income*), and the interaction term between gender inequality and income (*GII*Income*). The interaction term allows us to check if the proposed relationship

between gender inequality and growth is uniform across all countries or does it vary with the level of income across countries.

For *GII*, we use the United Nation's Gender Inequality Index, averaged over 2005, 2008 and 2011, the most recent years for which data are available. The index quantifies gender inequality in three dimensions – reproductive health, empowerment, and the labor market. The reproductive health dimension is measured by a country's maternal mortality ratio and adolescent fertility rate, while the empowerment dimension combines the share of parliamentary seats held by each sex with female/male attainment levels in secondary and tertiary education. Finally, the labor dimension is calculated from female/male labor market participation rates. The index varies between 0 and 1, with 0 implying no gender inequality and higher values implying greater gender inequality or increasingly less favorable treatment of women vis-à-vis men.[2] In our sample, *GII* varies between .06 and .78, with a mean value of .39 and the standard deviation of .19. For *Income*, we use lagged (year 2005) values of the (log of) GDP per capita (PPP adjusted and at constant 2005 International $). Data source for the variable is World Development Indicators, World Bank. *Income* controls for convergence related effects on growth from spuriously affecting the estimation of our main variable, *GII***Income*.

It is well-known that regression results based on cross-section data tend to suffer from the omitted variable bias problem. However, this problem is likely to be less severe in our case since our focus is not on how gender inequality is associated with growth but on how this association between gender inequality and growth differs between rich vs. poor countries. For example, once could plausibly argue that gender inequality could spuriously pick up the effect of various dimensions of overall development like the quality of institutions, infrastructure, etc. However,

[2] We note that gender inequality as measure by *GII* never implies that women perform better than men; that is, gender inequality or *GII*>0 implies less favorable treatment of women relative to men.

even if this were the case, there is no reason to believe that this spurious correlation between gender inequality and other dimensions of overall development should be stronger in the poor countries and weaker in the richer countries.

Nevertheless, to further bolster our confidence against the omitted variable bias problem we control for a number of variables that are known to be correlated with gender inequality and/or growth. We also control for the interaction term between these variables and income to rule out the possibility that the differential impact of *GII* across low vs. high income countries is not spuriously driven by the differential impact of the covariates of *GII* across low vs. high income countries. The controls are as follows.

First, we control for dummy variables indicating the main religious group in the country taken from La Porta et. al. (1999). The main religious groups include *Buddhist*, *Catholic*, *Muslim* and *Protestant* and residual omitted category of a*ll other religions*. As mentioned above, we also control for the interaction term between these main religious group dummy variables and *Income*.

Next, we control for country size measured by the (log of) total population of a country averaged over 2005-2009 (*Population*) and its interaction term with *Income*. Country-size could impact growth via its known covariates such as economies of scale in production and provision of public goods and the degree of integration with the rest of the world. Data source for *Population* is World Development Indicators, World Bank.

Countries' colonization history is often cited as one of the reasons for its lack of development and poor economic growth. If gender inequality also varies systematically with countries' colonization history then our estimation results for gender inequality could suffer from omitted variable bias problem. To check for this possibility, we control for a dummy variable

equal to 1 if a country was colonized and 0 otherwise (*Colony*) as well as the interaction term between *Colony* and *Income*. The data source for *Colony* is Acemoglu et al. (2001).

We also eliminate region specific differences in growth that may be spuriously correlated with gender inequality. We do so by controlling for dummy variables for Asia, Africa, Europe, Latin America and the residual omitted category of all other countries (*Africa*, *Asia*, *Europe*, *Latin America*, *Other regions*).

For additional robustness, we follow Dollar and Gatti (1999) and control for differences in civil liberty and economic freedom across countries and their interaction terms with *Income*. Civil liberty is measured by the 2004 to 2008 average values of Freedom House' civil liberty index (*Civil Liberty*). The civil liberty index runs from 1 (most free) to 7 (least free). Economic freedom is measured by the 2005-2009 average value of Heritage Foundation's Index of Economic Freedom (*EFI*). The index scores countries on 10 broad factors of economic freedom and ranges from 0 (least free) to 100 (most free).

Last, we control for the square of *GII*. The motivation here is that *GII* and *Income* are likely to be inversely correlated and therefore our main interaction term (*GII***Income*) could spuriously pick up the effect of *GII*-squared on growth.

3. Estimation

Regression results are provided in Table 2. We would like to caution that these results are in the nature of associations or correlations, suggestive of a possible causal link from gender inequality to growth. However, more rigorous work is required to truly establish causality.

Without any other controls, there is a positive relationship between GII and Growth and this relationship is significant at less than the 5 percent level (column 1). Note that this result

contradicts our maintained hypothesis that greater gender inequality affects growth adversely. One possible explanation here is that countries with higher income levels have lower growth rates (convergence) and also lower gender inequality. Hence, failure to control for differences in income level across countries could result in a spurious positive relationship between gender inequality and growth. Our results do not reject this explanation. That is, in column 2, we control for *Income* and find that the estimated coefficient value of *GII* now becomes negative and significant at the 5 percent level. The coefficient value is also large in absolute terms equaling -2.52. The estimate implies that moving from a country with least gender inequality in our sample (Netherlands) to country with the highest gender inequality (Yemen) reduces the growth rate by 1.8 percentage points. This is a large effect given that the mean level of growth rate in our sample is 2.61 percent.[3]

Next, we add our main interaction term (*GII*Income*) to the specification. Regression results provided in column 3 show that interaction term is positive, economically large and statistically significant at the 1 percent level. In other words, the negative relationship we found above between *GII* and *Growth* is much stronger (more negative) in countries at low income levels than at high income levels. Specifically, the *GII-Growth* relationship is negative and significant at less than the 5 percent level below the 66th percentile value of *Income*. For income levels between the 66th and the 92nd percentile value, the *GII-Growth* relationship is statistically insignificant at the 5 percent level. For income levels above the 92nd percentile value, *GII-Growth* relationship is actually positive and significant at the 5 percent level. We note that this

[3] Adding the remaining level controls (i.e., all the controls discussed above except for the interaction terms) to the specification does not change the negative relationship between *GII* and *Income* mentioned above. For example, adding all the controls together to the specification, the estimated coefficient value of *GII* further increases (in absolute value) from -2.52 above to -3.87 (not shown) and it remains significant at less than the 5 percent level (p-value of .044).

significant positive relationship at high income levels is not robust to the various controls (discussed in detail below). Quantitatively, a unit increase in *GII* is associated with a decrease in growth rate of 16.9 percentage points at the lowest value of *Income* (significant at the 1 percent level), but an increase of 3.9 percentage points at the highest income level (significant at the 1 percent level).

Columns 2-9 in Table 2 provide results when the various controls are added to the specification. These results show that irrespective of the set of controls: (i) the main interaction term is always positive, large and significant at the 5 percent level, (ii) at sufficiently low level of income in our sample, the impact of *GII* on growth is negative and significant at the 5 percent level, (iii) at sufficiently high level of income in our sample, the impact of *GII* on growth is positive, although this is not significant (at the 10 percent level or less) except for the specifications in columns 2 and 3 of Table 2.

Since most of the literature on gender inequality and growth is focused on education, we checked if our results for *GII* discussed above survive controls for gender inequality in education or not. We did so by adding to the list of controls above (i.e., to the specification in column 9, table 2) the average of the ratio of female to male primary, secondary and tertiary education enrollment rates (average values over 2005-2009 taken from World Development Indicators, World bank) and the average of the level of female primary, secondary and tertiary enrollment rate (average values over 2005-2009 taken from World Development Indicators, World bank). As above, we also included the interaction terms between each of the two education variables and *Income*. However, these education controls did not change our main results much. For example, with all the controls discussed above included, adding the education related controls to the specification caused the estimated coefficient value of the main interaction term

(*GII*Income*) to actually increase from 2.9 (column 9, Table 2) to 3.3 (significant at close to the 1 percent level, not shown).

4. Conclusion

Existing studies that gender inequality in education has an adverse impact on growth. We use a broader measure of gender inequality and find two results. First, the negative relationship between gender inequality and growth goes beyond education as it holds for the broader measure of gender inequality. Second, the strong negative relationship between gender inequality and growth holds among the relatively low-income countries, but not among high-income countries. These findings are important from the policy point of view and also for properly sequencing gender specific reforms and the broader overall development efforts. We hope that the present paper inspires more work along similar lines.

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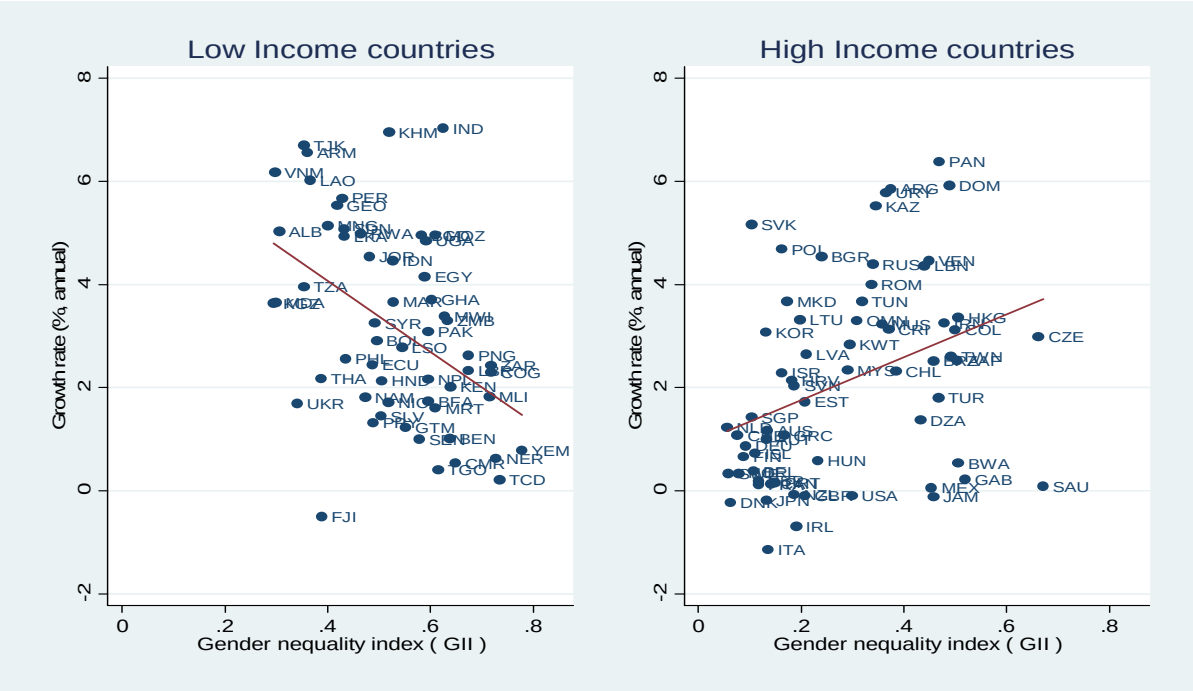
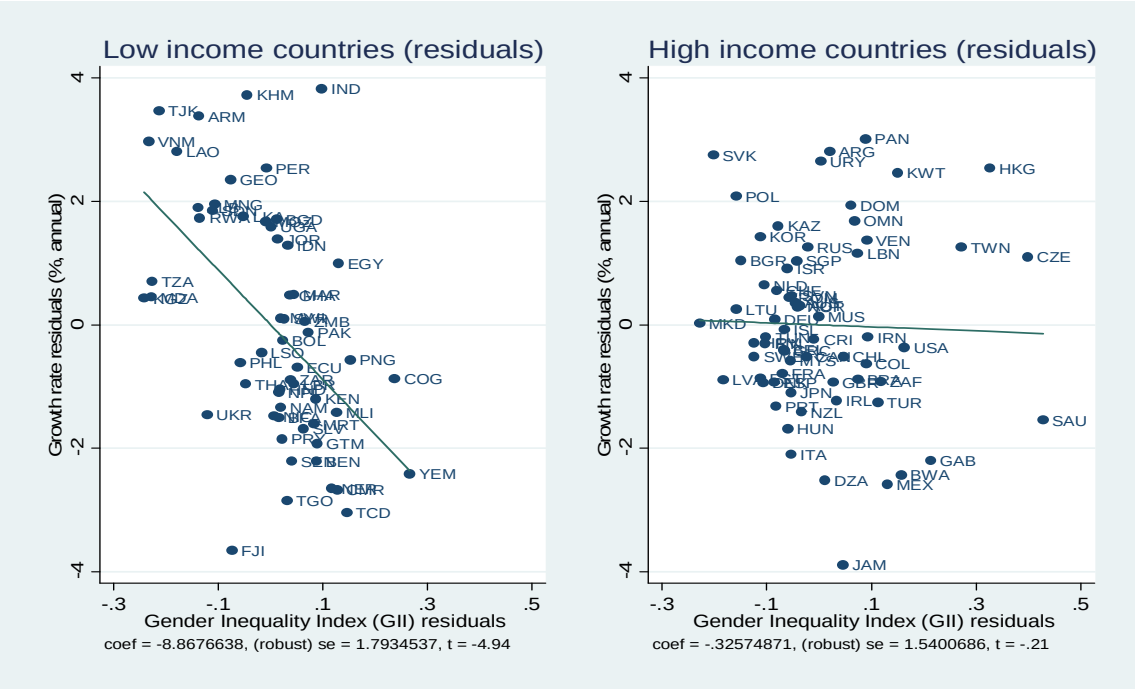
Figure 1: GDP per capita growth rate and GII index



Source: World Development Indicators, World Bank and United Nations.
Note: Low income countries are all countries that are below the median level of GDP per capita (PPP, constant 2005 USD) and high income countries include the rest that are above the median level of income.

Figure 2: GDP per capita growth rate and GII index after controlling for convergence



Source: World Development Indicators, World Bank and United Nations.
Note: 1) Low income countries are all countries that are below the median level of GDP per capita (PPP, constant 2005 USD) and high income countries include the rest that are above the median level of income.
2) Figure 2 is a partial scatter plot of GDP per capita growth rate against *GII* after controlling for the initial level of GDP per capita (*Income*) level of the countries.

Table 1: Summary Statistics

Variable	Mean	Std. deviation	Minimum	Maximum	Number of observations
Growth (dependent variable)	2.61	1.98	-1.15	7.0	122
GII	0.39	0.19	0.06	0.78	122
Income	8.64	1.28	5.53	10.7	122
Buddhist	0.06	0.23	0	1	121
Catholic	0.37	0.49	0	1	121
Muslim	0.24	0.43	0	1	121
Protestant	0.16	0.37	0	1	121
All other religions	0.17	0.38	0	1	121
Population	16.38	1.38	12.6	20.9	122
Colony	0.42	0.50	0	1	122
Civil Liberty	2.94	1.61	1	6.8	118
Africa	0.26	0.44	0	1	122
Asia	0.28	0.45	0	1	122
Europe	0.25	0.44	0	1	122
Latin America	0.15	0.36	0	1	122
Other regions	0.06	0.23	0	1	122
EFI	61.47	10.85	0	89.5	121

Table 2: Regression results

Dependent variable: *Growth*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GII	2.07**	-2.52**	-39.13***	-34.85***	-31.47***	-31.22***	-27.58***	-28.14***	-30.39*
	[0.019]	[0.041]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.074]
Income		-0.91***	-2.74***	-2.48***	-2.44***	-2.34***	-2.32***	2.86	2.81
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.132]	[0.156]
*GII*Income*			4.02***	3.58***	3.10***	3.08***	2.61***	2.73***	2.87**
			[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.019]
Buddhist				0.77	0.25	0.27	3.08	4.26	4.26
				[0.184]	[0.725]	[0.707]	[0.472]	[0.266]	[0.270]
Catholic				-0.21	0.11	0.09	0.56	1.44	1.43
				[0.635]	[0.821]	[0.865]	[0.872]	[0.673]	[0.676]
Muslim				-0.17	-0.02	-0.02	-5.91*	-6.40*	-6.55*
				[0.723]	[0.967]	[0.968]	[0.094]	[0.060]	[0.063]
Protestant				-0.97*	-0.31	-0.28	1.39	2.71	2.68
				[0.062]	[0.532]	[0.576]	[0.662]	[0.432]	[0.435]
Population					0.07	0.03	0.06	2.62**	2.62**
					[0.560]	[0.805]	[0.663]	[0.011]	[0.011]
Colony					0.13	0.16	0.33	-5.81**	-5.82**
					[0.768]	[0.718]	[0.427]	[0.027]	[0.028]
Civil Liberty					-0.11	-0.21	-0.36**	0.94	0.94
					[0.397]	[0.171]	[0.032]	[0.365]	[0.368]
Region fixed effects					Yes	Yes	Yes	Yes	Yes
EFI						-0.02	-0.03	0.002	0.002
						[0.174]	[0.139]	[0.989]	[0.987]
*Buddhist*Income*							-0.3	-0.44	-0.44
							[0.535]	[0.328]	[0.333]
*Catholic*Income*							-0.07	-0.22	-0.22
							[0.854]	[0.574]	[0.576]
*Muslim*Income*							0.76*	0.85**	0.86*
							[0.074]	[0.045]	[0.051]
*Protestant*Income*							-0.21	-0.39	-0.39
							[0.564]	[0.312]	[0.315]
*Population*Income*								-0.28***	-0.28***
								[0.008]	[0.008]
*Colony*Income*								0.70**	0.70**
								[0.032]	[0.033]
*Civil Liberty*Income*								-0.16	-0.16
								[0.191]	[0.195]
*EFI*Income*								-0.004	-0.004
								[0.782]	[0.778]
GII-squared									1.22
									[0.886]
Obs.	122	122	122	121	117	116	116	116	116
R^2	0.041	0.19	0.415	0.454	0.525	0.531	0.559	0.614	0.614

p-values in brackets. All regressions use a constant term (not shown) and Huber-White robust standard errors. Significance level is denoted by *** (1% or less), ** (5% or less) and * (10% or less). Sample size varies due to missing data.