Abstract

This seminar paper has studied what the effect of educational gender gap has on economic growth and fertility rate. The paper uses the world bank as their data source, from there collected the panel data. The method of the paper has been to perform a panel data regression with pooled OLS, Fixed and random effect. However in order to take endogenous effect into consideration a one and two step system and difference GMM estimation with lag 1, 2 and 1+2 has been performed. The results of this paper has been that he Random effect perform better in comparison to the fixed effect for only model 1 and vice versa for model 2. The findings in comparison to pooled OLS and random effect is that pooled OLS is a better fit for both models. Further has the gender gap has been positive correlated with economic growth and negative correlated with Fertility rate, however all effect are insignificant. For the GMM estimation, has the finding been that the system GMM perform better however the Hansen test make it not possible to choose between the lags. In spite of that and in regards to the one-way system GMM estimation, two-third of the result of lags estimation has been that educational gender gap is negatively correlated with economic growth. This is vice versa for two-way system GMM estimation. For difference GMM estimation, the educational gender gap is positively correlated with economic growth for difference, in all cases. Further founding of this paper has been that educational gender gap is negatively correlated with fertility in all lag cases in regards to both system and difference GMM estimation.

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1 Introduction

The subject of this seminar paper is topics surrounding Development Economics. Economic growth and how to improve it, is one of many interest that each country has worldwide. In spite of that, each country differ from one another when it comes to their level of economics growth. Specially the developing countries struggles more with improvement of their economy. There are many aspect behind the reasons and many theories on how to improve a country's economy and create growth. Further from this, any theory and reasoning can differ from country to country. One tool to improving economic growth, that all counties has in common, is by means of education. It is well know that education has a positive impact on economic growth. This paper will use data, regarding education, as a tool, to examine in which ways education affects economic growth. However, to make it more specific, this paper will look into what significance the educational gender gap has on economic growth in developing countries. The paper will examine the consequences of the gender gap in education by using a simple overview. Furthermore, only include fertility rate as a second dependent variable beside economic growth.The Empirical approach used to answer the research question is:

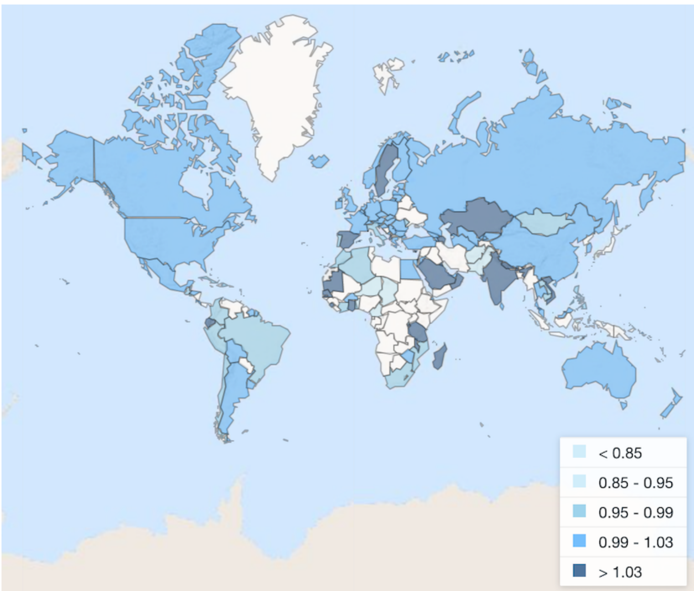
Research question

"In development countries, will a reduction in the gender education gap increase economic growth, and does this have any effects on fertility rate?"

By panel data regression on cross country panel data. In addition, a system and difference GMM-model estimation are made to cover for endogeneity problems in the model. The finding of most Related literature, is that a decrease in the gender gap has a significant and positive effect on economic growth. Moreover, most articles have found that education has a negative and significant effect on fertility. The primary result of the paper has been random effect performed better than the Pooled OLS and fixed effect. The second result of this paper system GMM has performed better than the difference GMM. However None of the result are sufficient and thereby not valid or can be used as scientific evidence. Roapmap: 1. Descriptive statistic of the gender educational gaps, the fertility rate in developing counties. 2. Past studies in regards to the effect of gender educational gaps on economics growth are included. 3. The description of the data and empirical method 4. Result and limitation of the paper. 5. Conclusion of the paper in regards to the research question.

2 Descriptive statistic

This sections of the paper, show a short descriptive statistic overview on how the gender gap in primary education and fertility rate trend have been through out the past years and present years. This paper uses ratio of female to male (Gender partial index (GPI)) to measure for the the gender gap in primary education. A GPI measurement between 0.97 and 1.03 indicates parity among the genders. Countries are in this paper classified as development counties when they have a low to low middle income, see appendix.

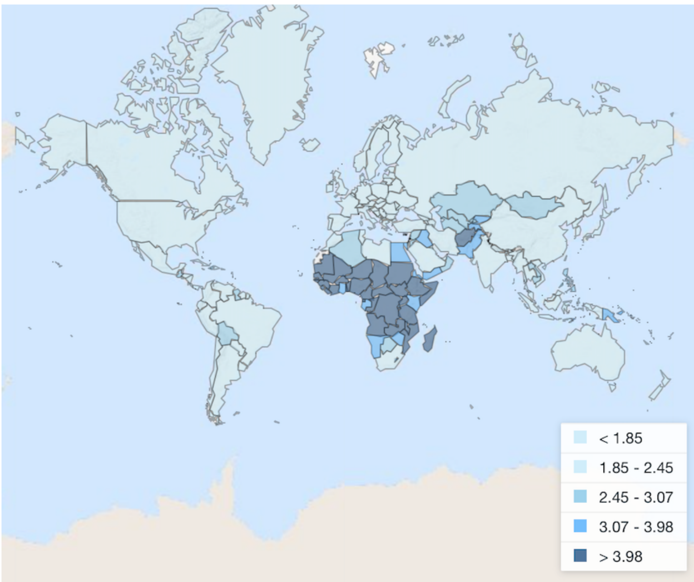


Figur. 1: Level of GPI world wide for year 2019, The world bank (2021b).

2.1 Gender gap in education

The gender gap in primary education has been improved world wide throughout the years and many of the countries has achieved to reduce the gap. However, there is still some countries that still has a gender gap in regards to the primary enrollment. These countries are mostly developing countries who has a low to low middle income. This can be observed in the map below in figure 1 that shows the level of GPI for primary enrollment world wide for year 2019 are closely to 1, UNICEFF DATA (UNICEFF DATA), but still low for some development countries.

2.2 The fertility rate world wide and in development countries



Figur. 2: Level of fertility rate world wide for year 2019, The world bank (2021a).

The fertility rate has been declining in the past 20 years. Going from 2.7 birth per woman in 2000 to 2.4 birth per woman in 2020, The world bank (2021a).This is also the case for developing countries. However, developing countries still have high fertility rate even though we see a decrease in fertility rate for these countries. This can be observed in the map below in figure 2 that shows the world wide level of fertility rate for year 2019.

3 Past Literature

This next section contains a couple of brief overviews on past literature that has examined and studied the same subject as this paper.

3.1 Educational gender gap and economic growth

The paper Klasen and Lamanna (2008) examines the impact of gender gap in education and labor force on economic growth. This paper uses panel data regression with cross country to investigate the matter of their papers interest. The author of this paper has chosen data from developing counties. The papers findings, in regards to the effect of educations gap on economics growth, is that gender gap significantly reduce the economic growth, and thereby has negative effect on economic growth. Another paper with an almost identical goal of reach search is Ali (2015) that studies the effect of gender inequality on economic growth in regards to education rate and labor force rate. The Author uses a time series secondary data with a time period of 1980 to 2009 for Pakistan which is a developing country. The result of this paper in regards to educational gender gap has been that gender gap in education has negative effect on economic growth.

The two past papers also studies the relationship of gender gap in labour force in addition to educational gender gap. Although gender gap in labour force and education might have a correlation, it can be interesting, in relationship to this paper, to also get an overview of past studies where only the gender gap education is considered. Firstly, as this paper Thevenon et al. (2012) that examines the impact of the increased educational attainment for women, and the relation to economic growth. Here the study used cross country data from 30 developing countries with a period time span going from 1960 to 2008. Secondly, as this paper Baloch et al. (2016) that studies the effect of gender gap on economics growth. The study contains panel data from 110 developing countries with a time index from 2006-2012. The study uses panel data analyse with fixed, random and OLS regression. The finding of both of these paper has been that counties that has a decrease in there educational gender gap will have a positive effect on economics growth.

Two other interesting papers in the same subject has also shown that educational gender gap is not good for economic growth. The paper Altuzarra et al. (2021) that studies the effect of gender gap on economics growth. The study uses panel data contain from 105 developing countries with a time index from 1990–2017. And the paper Licumba et al. (2015) that studies the effect of gender gap on economics growth. The study Licumba et al. (2015) uses panel data contain from 105 developing countries with a time index from 1990–2017. The finding of these papers in regards to gender gap i education has been that gender equality has a positive effect on economics growth. The finding are based of an cross-region and panel data analysis.

3.2 Educational gender gap and fertility rate

In additional to economic growth, this paper also studies the effect of educational gender gap on fertility. Past studies on these subject has been a bit harder to find however papers such as Adamchak and Ntseane (1992) studies the effect of education on fertility rates for men and women in 37 sub-Saharan nations. The study uses panel data contained from 110 developing countries with a time index from 2006-2012. the study uses panel data analyse with fixed, random and OLS regression. The finding of this paper, in regards to primary enrollment, has been that primary enrollment in 1960 and 1980 had a negative, thought insignificant, effect towards fertility rate.

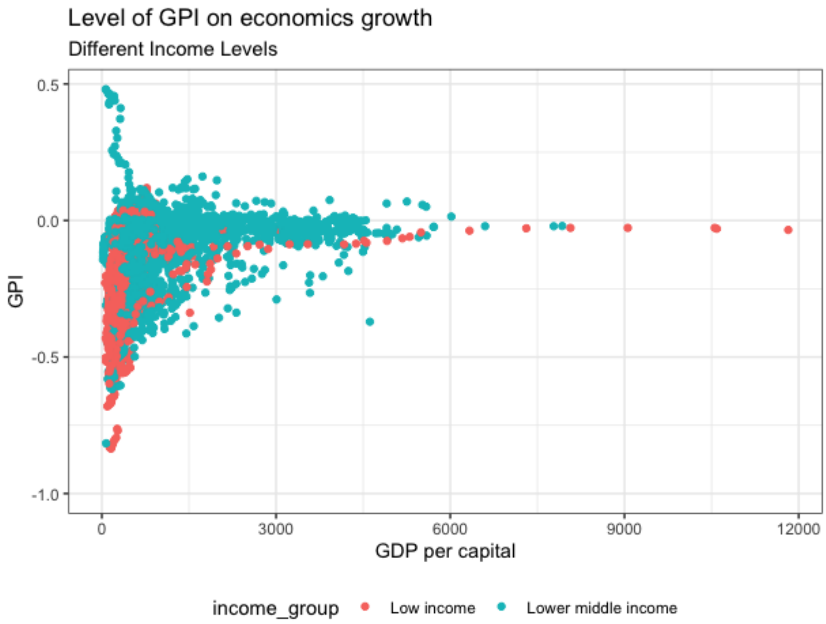
Other papers such as, Akin (2005) studies among other things the effect of education on fertility for 14 Middle Eastern countries. A time series going from 1980 to 1998. The result in regards to fertility and education has been that enrollment of primary and secondary educational for woman has a negative and significant effect on fertility. Regarding the men, the study has shown a positive and significant effect on fertility.

And lastly we have that a paper of Chisadza et al. (2015) that studies the effect of different level of education on fertility for 48 sub-Saharan African countries. A time series going from 1970 to 2010. the method behind the study is a panel data analysis using fixed effect and instrumental variables. The finding in interest of this paper and primary enrollment has been that a lower level of education has a non-significant effect on fertility decision. The article shows, that a higher level of educations has no significant effect on fertility.

For all the above past studies, that are included in this paper, we have that reduction educational gender gap reduces fertility rate and improves economic growth. However most of these papers result are based panel data regression only, which is not the case of this paper. This paper uses GMM estimation method as a addition to the panel regression method to cover for any endogeneity in the model.

4 Materials and methods

4.1 Description of data



Figur. 3: Level of gpi of GDP per capital for development countries

The data is a panel data set containing 13,603 observations with 7 variables and a time span index from 1960 to 2020. The data has 223 countries included, The world bank (The world bank). Four additional variables are made One, the gender parity index takes the value 1 for when there is equal among of girls and boys enrolled in primary school. To neutralise this variable, an additional variable gpi has been made by subtraction the original variable GPI with one. The variable gpi will take the value 0 for when there is an equal amount of girls and boys enrolled in primary school. Two, log variables for GDP per capital and population. Three, A dummy variable (development) has been created to indicate development countries and takes the value 1 if a countries income group is either a "low income" or "Lower middle income" and otherwise 0. This dummy variable generates 4941 observations from the time span of 1960-2020. Figure 3, show how the gpi is distributed across the development countries when including the GDP per capital. The tendency in figure shows that gpi is mostly around 0 or below 0 for development countries included in the data set. Develop equal to 1 if income group equal to "Low income" or "Lower middle income". See appendix for all the development countries.

Description of variables

Variabel label	Variable descriptions
year	Year
country	Country
$countrycode$	Country Code
$timecode$	Time Code
gdp_{growth}	GDP growth (annual %)
$gdp_{prcapitalcurrentUS}$	GDP per capita (current US$)
population	Population, total
fertility	Fertility rate, total (births per woman)
$Primary_{GPI}$	School enrollment, primary (gross), gender parity index (GPI)
gpi	$Primary_{GPI} - 1$
$incomegroup$	Income group for each country
$log(gdp_{prcapital})$	Log of GDP per capita (current US$)
$log(pop)$	Log of population, total
develop	1 if income group equal to "Low income" or "Lower middle income"

Table 1: An description overview of all variables used in this paper, see appendix for data source

4.2 Description of method

This study has use a panel data regression to examine the problem of interest. However in order to be able to make a regression a model has be made. In this study we have two variables for our dependent variable. The first interest of this paper is, as stated before, to find out how the gender gap in education effects economics growth. However the two other main explanatory variables, in regards to economic growth, is population and GDP per capital. Keeping the model very simple we get the following panel data equation model:

$$gdp_{growth_t} = \beta_0 + \beta_1 * gpi_{t-1} + \beta_2 * log(pop)_t + \beta_2 * log(gdp_{prcapital})_t + \epsilon \tag{1}$$

The second interest of the paper is, how the gender gap in education effects fertility rate. this make the second panel data equation model to be as follows:

$$fertility_t = \beta_0 + \beta_1 * gpi_{t-1} + \epsilon \tag{2}$$

After setting up the model the panel data regression can take place. First, Pooled OLS, fixed effect and Random model regression for both models are made. Diagnostic test for normally distributed, multicollinearity and Heteroskedasticity is made for each Pooled OLS model. For the paper it has been found that model 1 and 2 are normally distributed and do not suffer from multicollinearity but suffers from Heteroskedasticity. In the end of the regression analysis a Hausman test and Breusch and pagan lagrangian multipier test for both models. The model will suffer from endogeneity in the regression analysis and one way of dealing with this kind of problem is by using instrumental variables (IV) techniques. However this method has not been used, since it can be quite difficult to find instrumental variables that we can use instead of gender gap in regards to economic growth. Here the GMM model estimation can be used instead. The GMM model estimation is a common way to deal with endogeneity in a panel data regression. The GMM model is made both throughout a two-step and one-step model for both models. Second, is the GMM model made throughout the difference and system GMM model for both models. For each model there is be used a lag for 1 and lag 2 and one for lag 1 + 2. Dummy variables for country and year is included in all the models too. The last process of the GMM-estimation is to find out which model is the best fitted model. The method behind the data clearing is that any missing values have been left as missing. There has not been made any imputation of any variables that has a missing value. Firstly, the missing value are mostly in the begging of the timespan, this can be due to countries has collected data later than others and this is expected since we dealing with poor country. The second kind of missing value, is that some observations are missing in between. Here, in both cases, we have that the missing value is randomly missing and can therefore be removed from the data set completely. However, STATA handles the missing value for the panel data analysis and gmm-estimation by qoute "any observation which is missing on the outcome variable". This means we can keep the missing value and avoid getting an unbalanced panel data.

5 Result

In the next section, a more detail interpretation of the results for the methods is made.

5.1 Panel data analysis

	(Model 1) OLS	(Model 2) OLS	(Model 1) FE	(Model 2) FE	(Model 1) RE	(Model 2) RE
GPI	0.645	-5.312	0.469	-0.105	0.469	-0.105
	(0.342)	(0.000)	(0.715)	(0.359)	(0.715)	(0.359)
loggdp_prcap	0.0634		0.571		0.571	
	(0.588)		(0.571)		(0.076)	
logpop	0.237		0.719		0.719	
	(0.000)		(0.568)		(0.567)	
Constant	-0.290	4.365	-6.595	6.808	-4.543	8.376
	(0.817)	(0.000)	(0.741)	(0.000)	(0.830)	(0.000)
Year dummies	NO	NO	YES	YES	YES	YES
Observations	2801	3042	2801	3042	2801	3042
r2	0.00655	0.346	0.0739	0.764		
F	6.144	1610.7				
p	0.000368	5.36e-283				

p-values in parentheses

Table 2: Simple Pooled OLS, Fixed effect and Random effect estimation result for model 1 and 2

5.1.1 Pooled OLS model

For our panel data analysis, we first regress a simple OLS model for both model 1 and 2, and thereby analyse its result. In table 2 each estimations result for each model can been seen. In table 2, Model 1, has F statistic shows 6.144 and the probability value is less than 5 percent tells us that our model is fit for analyse. R-square is 0.0065 meaning that our independent variable are explaining 0,65 percent variance in out dependent variable, which is very low. All coefficient are all positive relate with GDP growth which is as expected but all coefficient are insignificant. For model 2 we have that F statistic that shows 1610.71 and the probability value is less than 5 percent which tells us that our model is fit for analyse. R-square is 0.3463 meaning that our independent variable are explaining 34,62 percent variance in our dependent variable. GPI coefficient is negative correlated with fertility also as expected and is significant.

5.1.2 Fixed effect model

For our fixed effect model we do not make use of country id since it will be omitted in our fixed effect estimator. The result of the fixed effect has been shown in table 2. Here we see that GPI is positively correlated with growth but negatively correlated with fertility which is as expected. However GPI for both models are insignificant, which is not good news. For model 1 we have significance in the following years: 1979,1980,1982, 1984, 1986-1987, 1989-1994, 1998, 2009, 2012 and 2020. These significant years can be due to several things. Year 2020, might be due to covid-19. Year 2009 might be due to the financial crisis in 2008. Furthermore, since the data is globally collected, it is difficult to exactly point out what special event has created the significant level in the dummy variable for the remaining years. For model 2 we have all dummy variables for year being significant beside year 1971-1976. The reason behind the significant can be due to the years explain in model 1, or due to other factors but again difficult to point out the exact reason since there are many countries included.

5.1.3 Random effect model

Table 2 also shows our Random model estimations result. We have in model 1 GPI, log of gdp pr capital and log og population being positive correlated with GDP growth. However all three coefficient are insignificant, in model 1 estimation.

Year dummy variable are similar to Fixed effect model, and most ID(country) dummy are insignificant. For model 2, we have negative correlation of GPI on fertility, which is expected however still insignificant. In both models Year dummy variable are similar to Fixed effect model, and most ID(country) dummy are insignificant. Due to page-space the dummy variables has been excluded from the table 3.

5.1.4 Comparince of the models

Three models has been made, however a Hausman specifikations test has been completed to find out which of the three models perform best.

Firstly we compare the Fixed effect with Random effect for both model 1 and 2. The result of Hausman specifikations test in comparison for model 1, has been carried out to be insignificant and which means that the RE is better to use for model 1. In comparison for model 2, we have the opposite significant result which means a FE is a better fit for model 2.

Secondly we compare the Random effect with the pooled OLS for both model 1 and 2 with Breusch-Pagan Lagrange multiplier TEST. There have been here insignificant result for both cases which means that the pooled OLS is a better fit than the random effect.

5.2 GMM Estimations result

5.2.1 System GMM

	lag 1 GDP_growth	lag 1 +2 GDP_growth	lag 2 GDP_growth	lag 1 GDP_growth	lag 1+2 GDP_growth	lag 2 GDP_growth
L.GDP_growth	0.337***	0.336***	0.547***	0.425***	0.233***	0.518***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
GPI	-0.138	-0.0950	1.368	-36.87***	120.9***	1.681
	(0.972)	(0.980)	(0.147)	(0.000)	(0.000)	(0.269)
loggdp_prcap	14.21***	13.88***	-2.098	25.20***	-8.794	-1.344
	(0.000)	(0.000)	(0.271)	(0.000)	(0.209)	(0.492)
logpop	17.39***	16.97***	-2.418	1.635***	23.32***	0.564*
	(0.000)	(0.000)	(0.326)	(0.000)	(0.000)	(0.095)
Constant	-384.3***	-374.9***	57.24	-208.8***	-329.1***	2.842
	(0.000)	(0.000)	(0.282)	(0.000)	(0.000)	(0.879)
Year dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
Observations	2780	2780	2780	2780	2780	2780
No. of instruments	137	139	137	137	139	137
AR1 (p-value)	2.87e-09	1.98e-09	0.000130	6.23e-09	2.99e-09	0.000196
AR2 (p-value)	0.737	0.736	0.380	0.740	0.0860	0.444
Hansen-J (p-value)	1.000	1.000	1.000	1.000	1.000	1.000

p-values in parentheses

* $p<0.10$, ** $p<0.05$, *** $p<0.010$

Table 3: GMM System estimation result for model 1, first 3 estimation result are for one-way estimation and the last 3 estimations result are for two-way estimation. Here with each one having estimation result for lag 1, lag 1+2 and lag 3.

Table 3, shows our GMM system estimations for model 1 for both one-step (first three eqations) and two-step estimation (last three equations), with the respective lags. Number of groups in our model is 81, the rest of the groups have some sufficient observations and has left out. Model 1 suffer from autocorrelations in the first order AR1 since its p-value is insignificant. To correct this we need to find more instrumental variable to solve this problem. To see whether our instrumental variable are the best fitted for our model, we observe the Hansen test. Here according to Roodman (2009), if the hansen test is above or below 0.10-0.30 then there is a problem in the model, which is case for all the lags in table 3. Log of population is significant and positive correlated with GDP GROWTH in all cases in table 3, beside in one-step system GMM with lag 2, where it is insignificant and negatively correlated with GDP growth. Log of GDP per capital is positive correlated with GDP growth and significant in one-step system GMM with lag 1 plus lag 1+2. In addition to this GDP per capital is positive correlated with GDP growth and significant in two-step system GMM with lag 1. GPI is significant only in the two-step system GMM, one with lag 1 where it is negatively correlated with GDP GROWTH and one in lag 1 + 2 where it has a positive correlation to GDP GROWTH. Number of instrument need to be lower than the number of groups. This is important since it a rule of thumb by Roodman (2009). This is not the case in any of the estimations results in table 3. This means that the model suffers a problem with to many instruments. Notice that in two-step system GMM with lag 1 is the only case where we find all variable significant at the same time, however here the GPI and log of GDP per capital is very unusually high in the coefficient result. The system GMM estimation for model 2, can been seen in table 4 which is constructed in the same way as table 3. GPI is negatively correlated with Fertility in all cases however is not significant in one-step model of lag 1 and lag 1+2. The model suffer from autocorrelation in the first order since the p value is significant. Again to correct this, more IV variables must be found. This is true in one hand, and in other hand we once again have a case where there is 81 groups and around 133 to 134 no. of instruments use in each GMM Estimation in table 4. So again as before we have a case of too many instruments compared to the number of groups. The Hansen test shows that the model is fitted but the result of the Hansen test is too high to be believable or valid. This means there is a problem in the model in all cases in table 4. Further notice, that in the case where all variable are significant are when the model take into the account of only lag 2 both in the one-step and two-step models. Here is the coefficient of the GPI very close to each other and negatively correlated with fertility, also.

5.2.2 Difference GMM

From Table 5 we have Significant value in first order autocorrelation, this means that in all case the model suffer from autocorrelation. As mentioned before a solution can

	lag 1	lag 1 +2	lag 2	lag 1	lag 1+2	lag 2
	Fertility	Fertility	Fertility	Fertility	Fertility	Fertility
L.Fertility	0.00658	0.237***	1.044***	-0.0446	-0.166	1.003***
	(0.826)	(0.000)	(0.000)	(0.114)	(0.121)	(0.000)
GPI	-0.108	-0.165	-0.320*	-2.193***	-0.923***	-0.306***
	(0.837)	(0.688)	(0.059)	(0.000)	(0.001)	(0.001)
Constant	6.087***	4.672***	-0.266	4.246***	5.134***	0
	(0.000)	(0.000)	(0.857)	(0.000)	(0.000)	(.)
Year dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
Observations	3042	3042	3042	3042	3042	3042
No. of instruments	133	134	133	133	134	133
AR1 (p-value)	1.95e-08	0.0000129	0.00882	0.000000492	0.000000113	6.51e-73
AR2 (p-value)	2.27e-08	0.00000219	0.927	4.45e-08	0.0000151	0.946
Hansen-J (p-value)	1.000	1.000	0.998	1.000	1.000	0.998

p-values in parentheses

* p<0.10, ** p<0.05, *** p<0.010

Table 4: GMM System estimation result for model 2, first 3 estimation result are for one-way estimation and the last 3 estimations result are for two-way estimation. Here with each one having estimation result for lag 1, lag 1+2 and lag 3.

be to include more variables as IV-instruments.Number of groups is below number of instruments which is a good thing compared to system GMM, where it was the opposite result. So in this case, the model holds the rule of thumb by Roodman (2009). The hansen test is insufficient since according to Roodman (2009), a Hansen-J test that is above or below 0.10-0.30 means there is a problem in the model. This means that all the GMM models in table 5 is not fit to show any result, however it can bee important to keep in mind that these Hansen-J test performs better in difference GMM in comparison to System GMM since it is a bit lower. GPI has a positive but insignificant coefficient result in all cases in table 5. The positive coefficient is not as expected since educational gender gap should not have a positive effect on economic growth. Log of GDP per capital and log of population is positively correlated with GDP growth and only significant in the case of lag 1 and lag 1+2 in both one-step model and two-step model estimation. For table 6, we have the difference GMM Estimation result both

	lag 1	lag 1+ 2	lag 2	lag 1	lag 1+2	lag 3
	GDP_growth	GDP_growth	GDP_growth	GDP_growth	GDP_growth	GDP_growth
L.GDP_growth	0.304***	0.271***	0.718***	0.304***	0.281***	0.718***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
GPI	0.223	0.389	1.205	0.223	1.864	1.205
	(0.939)	(0.867)	(0.295)	(0.939)	(0.567)	(0.295)
loggdp_prcap	9.224**	5.905**	3.070	9.224**	7.334**	3.070
	(0.023)	(0.038)	(0.187)	(0.023)	(0.038)	(0.187)
logpop	11.32**	7.299**	3.884	11.32**	8.877**	3.884
	(0.013)	(0.024)	(0.119)	(0.013)	(0.035)	(0.119)
Year dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
Observations	2699	2699	2699	2699	2699	2699
No. of instruments	54	56	54	54	56	54
AR1 (p-value)	0.000000449	3.08e-08	0.000598	0.000000449	0.00000242	0.000598
AR2 (p-value)	0.783	0.852	0.357	0.783	0.911	0.357
Hansen-J (p-value)	.	5.82e-09	.	.	5.82e-09	.

p-values in parentheses

* p<0.10, ** p<0.05, *** p<0.010

Table 5: GMM difference estimation result for model 1, first 3 estimation result are for one-way estimation and the last 3 estimations result are for two-way estimation. Here with each one having estimation result for lag 1, lag 1+2 and lag 3.

for one-step and two-step estimations. The rule of thumb is kept since the number of groups is higher than the number of instrument.Depending on the model and whether the p-value is below 0.05 then most of the models suffer from autocorrelation in either AR1 or AR2 or both. So therefore the models might be in need of more IV-instrument. The Hansen test is again not sufficient in some cases and only in the case of lag 1+2 we get a Hansen test within a reasonable value and significant index which is a good thing. This indicates that the models in those cases are fitted. In these case the GPI coefficient is insignificant but negatively correlated with fertility rate which is as expected.

	lag 1	lag 1+ 2	lag 2	lag 1	lag 1+2	lag 2
	Fertility	Fertility	Fertility	Fertility	Fertility	Fertility
L.Fertility	0.382*	-0.0664	1.122***	0.382*	-0.137***	1.122***
	(0.087)	(0.329)	(0.000)	(0.087)	(0.004)	(0.000)
GPI	-0.184	-0.0916	-0.336*	-0.184	-0.236	-0.336*
	(0.577)	(0.868)	(0.061)	(0.577)	(0.663)	(0.061)
Year dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
Observations	2961	2961	2961	2961	2961	2961
No. of instruments	51	52	51	51	52	51
AR1 (p-value)	0.287	4.18e-08	0.00767	0.287	6.50e-08	0.00767
AR2 (p-value)	0.0140	0.000000259	0.913	0.0140	0.000000458	0.913
Hansen-J (p-value)	.	0.136	.	.	0.136	.

p-values in parentheses

* p<0.10, ** p<0.05, *** p<0.010

Table 6: GMM difference estimation result for model 2, first 3 estimation result are for one-way estimation and the last 3 estimations result are for two-way estimation. Here with each one having estimation result for lag 1, lag 1+2 and lag 3.

5.2.3 System VS difference GMM

It can be difficult task to choose between the system and the difference GMM model, since in our case we have not been able to get any desirable result. However if we still want to choose between these two, then we can follow the the rule of thumb by Blundell et al. (2001). This which says that if the difference GMM result for the coefficient are closer to the fixed effect coefficient result then the system GMM should be more preferred over Difference GMM. In this case our preferred model is indeed the system GMM, since most, and if not all, of coefficient of the difference GMM estimation results in both model 1 and 2 are closer to the fixed effect estimation result.

5.3 Limitation of the model

This paper will fall short on several points, since this paper is a simple overview of what effect the gender educational gap can have on economic growth. The points are as followed: The data is not supported enough due to many missing observations. Furthermore, the selected dependent variables included are not enough to explain and more variables should be included to have a better overview of what effect the gender educational gap can have on economic growth. This can be important upon improving the model.This paper, also fall short on the social and cultural aspect behind educational gender gap. Examples of such social and cultural aspects in developing countries are the stereotypes gender roles, where men are the breadwinner and women are to housewives. This kind of aspect can have a long term economics effect of improving the educational gender gap if women do not or cannot use their education and chooses to stay at home. Another example of social and cultural aspect that might have an effect, is the demand of child labour. Develop countries that are in need of child labour can have an effect on participation of education. The paper does not look into how many of the enrollment children that complete school. A country that has a high enrollment but a low rate in how many that complete school might have different results in the economic growth aspect. The quality of the education can also have a impact economic growth. This paper fell short on these findings. Health and the quality of the environment are also some highly variables that can have impact the amount of enrolled students and therefore on the economic growth. The paper also only looks into the enrollment of the primary schooling. The enrollment of higher levels can differ, specially for when the young people hits puperty, here the social aspect might have an effect and some girls might be married off or more durable to do labour work instead of attending school.

6 Conclusion

The aim of this paper was to examine what effect the educational gender gap in primary school has on economic growth and fertility in developing country.The panel data for this paper was collected from the world bank. All the missing data has been cleared out all the models in order to keep the data balance.The method of the data was done correctly by firstly a panel data regression with pooled OLS, fixed and random effect. Secondly a one-way and two-way system and difference GMM estimation with lag 1, 2 and 1+2 was conducted The findings of the pooled OLS, fixed and random effect, is that the Random effect perform better in comparison to the fixed effect for only model 1 and vice versa for model 2. The findings in comparison to pooled OLS and random effect is that pooled ols is a better fit for both models. Further finding is that the gender gap is positively correlated with economic growth and negative correlated with fertility, however insignificant in all cases.

For the GMM estimation, has the finding been that the system GMM perform better however the Hansen test make it not possible to choose between the lags. In spite of that and in regards to the one-way system GMM estimation, two-third of the result of lags estimation has been that educational gender gap is negatively correlated with economic growth. This is vice versa for two-way system GMM estimation. For difference GMM estimation, the educational gender gap is positively correlated with economic growth for difference, in all cases. Further founding of this paper has been that educational gender gap is negatively correlated with fertility in all lag cases in regards to both system and difference GMM estimation.

One reason behind the insignificant result of this paper, is probably the simplicity of the model and missing data values, which was stated in the section for limitation of this paper. To better the model it can be a good idea to perform all the step again, just with more explanatory variables for both models and reduce the missing values. Another idea, could be to compare the model with missing values and the model without missing value and the one with created values, and then interpret the outcome. Further one can test difference lags, to see any difference in the result.In the end one can choose a different method, if the lags and the GMM estimation is tricky to produce any significant result. Here instead of GMM Estimation, you could have found a IV instrument variables and even more better compared them to these GMM estimation found in this paper.

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Appendix

Country Code	Region	IncomeGroup	Country Name
AGO	Sub-Saharan Africa	Lower middle income	Angola
BDI	Sub-Saharan Africa	Low income	Burundi
BEN	Sub-Saharan Africa	Lower middle income	Benin
BFA	Sub-Saharan Africa	Low income	Burkina Faso
BLZ	Latin America & Caribbean	Lower middle income	Belize
BOL	Latin America & Caribbean	Lower middle income	Bolivia
BTN	South Asia	Lower middle income	Bhutan
CAF	Sub-Saharan Africa	Low income	Central African Republic
CIV	Sub-Saharan Africa	Lower middle income	Côte d'Ivoire
CMR	Sub-Saharan Africa	Lower middle income	Cameroon
COD	Sub-Saharan Africa	Low income	Congo, Dem. Rep.
COG	Sub-Saharan Africa	Lower middle income	Congo, Rep.
COM	Sub-Saharan Africa	Lower middle income	Comoros
CPV	Sub-Saharan Africa	Lower middle income	Cabo Verde
DJI	Middle East & North Africa	Lower middle income	Djibouti
DZA	Middle East & North Africa	Lower middle income	Algeria
ERI	Sub-Saharan Africa	Low income	Eritrea
GHA	Sub-Saharan Africa	Lower middle income	Ghana
GIN	Sub-Saharan Africa	Low income	Guinea
GMB	Sub-Saharan Africa	Low income	Gambia, The
GNB	Sub-Saharan Africa	Low income	Guinea-Bissau
HND	Latin America & Caribbean	Lower middle income	Honduras
KGZ	Europe & Central Asia	Lower middle income	Kyrgyz Republic
KHM	East Asia & Pacific	Lower middle income	Cambodia
KIR	East Asia & Pacific	Lower middle income	Kiribati
LAO	East Asia & Pacific	Lower middle income	Lao PDR
LBR	Sub-Saharan Africa	Low income	Liberia
LKA	South Asia	Lower middle income	Sri Lanka
MAR	Middle East & North Africa	Lower middle income	Morocco
MDG	Sub-Saharan Africa	Low income	Madagascar
MLI	Sub-Saharan Africa	Low income	Mali
MNG	East Asia & Pacific	Lower middle income	Mongolia
MOZ	Sub-Saharan Africa	Low income	Mozambique
MRT	Sub-Saharan Africa	Lower middle income	Mauritania
MWI	Sub-Saharan Africa	Low income	Malawi
NER	Sub-Saharan Africa	Low income	Niger
NGA	Sub-Saharan Africa	Lower middle income	Nigeria