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Publication Details

Cooray, A. (2009). Does democracy explain gender differentials in education?. Far East and South Asia Meeting of the Econometric Society (pp. 1-26). Tokyo, Japan: University of Tokyo.

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Keywords

democracy, explain, differentials, does, education, gender

Disciplines

Business | Social and Behavioral Sciences

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DOES DEMOCRACY EXPLAIN GENDER DIFFERENTIALS IN EDUCATION?

Arusha Cooray*

Abstract: This study shows that despite a strong empirical association between gender differentials in enrolment ratios and democracy, that democracy alone does not explain gender differentials in education in Africa and Asia. The results indicate that income, employment in agriculture, religious heterogeneity and colonialism also help explain the under-representation of girls in education in these regions. Countries in which the duration of suffrage has been longer tend to perform better on average in terms of gender equality in education.

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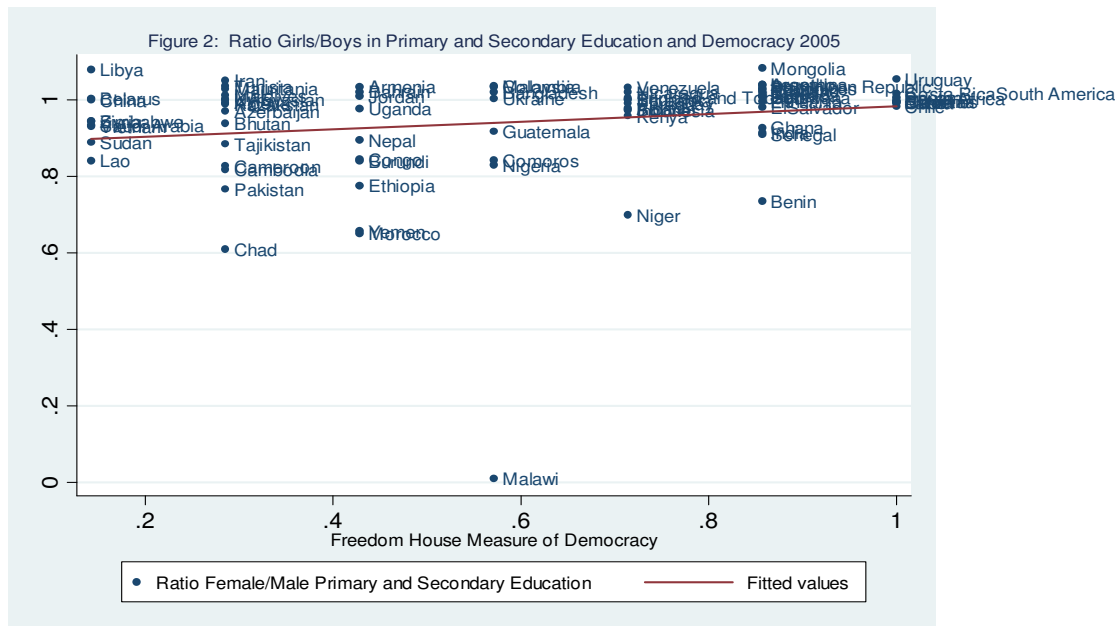
1 Introduction

One of the United Nations Millennium Development Goals (MDG) was to eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education by 2015 (UN 2008). Gender disparity in education at the primary, secondary and tertiary levels continues to persist in certain regions. A number of studies have shown that gender inequality in education can negatively impact upon macroeconomic variables – economic growth (Shultz 1994, Knowles et al. 2002, Klassen 2002, Dollar and Gatti 1999), child mortality (Klassen and Wink 2002), fertility (Basu 2002). Educating girls has been shown to be an important foundation for creating the next generation of human capital as mothers are seen as crucial in determining the education and health of their children (Schultz 2002). “If girls remain uneducated, they are likely to become women who are illiterate, impoverished and less likely to raise healthy and educated families. Society cannot afford to allow another generation to forego its potential” (UNGEI) Many societies have been subject to gender discrimination at some stage. This can be said to have its roots in the colonial administration that marginalised women and restricted their participation in social and economic activity. This was inherited by post-colonial governments which continued to prioritise male education. A number of factors have given rise to increased attention on women’s education in the recent past, including the collapse of authoritarian regimes in Eastern Europe and Latin America, the commitment to reducing fertility rates in Asia and Africa, globalisation and the increased participation of women in economic activity. Gender parity in education therefore can only be understood within the context of these changes in the political, social and economic spheres.

A large literature has been undertaken on democracy and economic growth (Acemoglu *et al.* 2008, Huntington 1991, La Porta *et al.* 1999, Londregan and Poole 1996). The hypothesis that education leads to increased democracy has been supported in the work of Barro (1999), Glaeser *et al.* (2004) and Papaioannou and Siourounis (2005). While many studies have been carried out on the effects of education on democracy, much less attention has been given to the effects of democracy on education. The studies of Barro and Lee 1996 and Brown 2000 examine the effects of democracy on education. The present study contributes to the literature by examining specifically, the effects of democracy on gender inequality in education. The empirical results suggest that democracy alone does not fully explain gender differentials in education in Africa and Asia. This study also represents an initial effort at examining the effects of the *duration* of suffrage on gender in/equality in education. This could provide some explanation as to why some regions/countries perform better than others in terms of gender equality in education.

2 The Hypothesis

According to Hadenius and Teorell (2005) ‘...the existence of certain fundamental democratic rights involving universal suffrage, free and fair elections, the upholding of a number of political liberties’ can be seen as the basic criteria of democracy. Women in many countries did not have the right to vote until the twentieth century. It can be argued that greater democracy improves the status of women through educational development and increased employment opportunities, empowering women and leading women to positions of leadership. Women in positions of responsibility and leadership can promote the development of women at grassroots levels.



This can be attributed to several factors that include: ethno-lingual fractionalisation (Easterly and Levine 1997), colonial heritage (Brown 2000), culture (Dollar and Gatti 1999, Inglehart and Baker 2000), trade openness (Baliamoune-Lutz and McGillivray 2007). In an attempt to explain the case of Africa, Brown (2000) shows that political regime, whether authoritarian or democratic, cannot account for the variance in enrolment in Africa. According to him, colonial heritage has important implications for the impact of political institutions on education in Africa¹. Easterly and Levine (1997) show that Africa’s high ethnic fragmentation explains a large part of its poor growth performance and political instability. Baliamoune-Lutz and McGillivray in an investigation of Sub-Saharan African and Arab countries demonstrate that trade induced growth can generate greater inequalities in education.

Malawi

Malawi represents an unique case with relatively high democracy rates but extremely low school gender ratios. Malawi introduced an education programme to improve

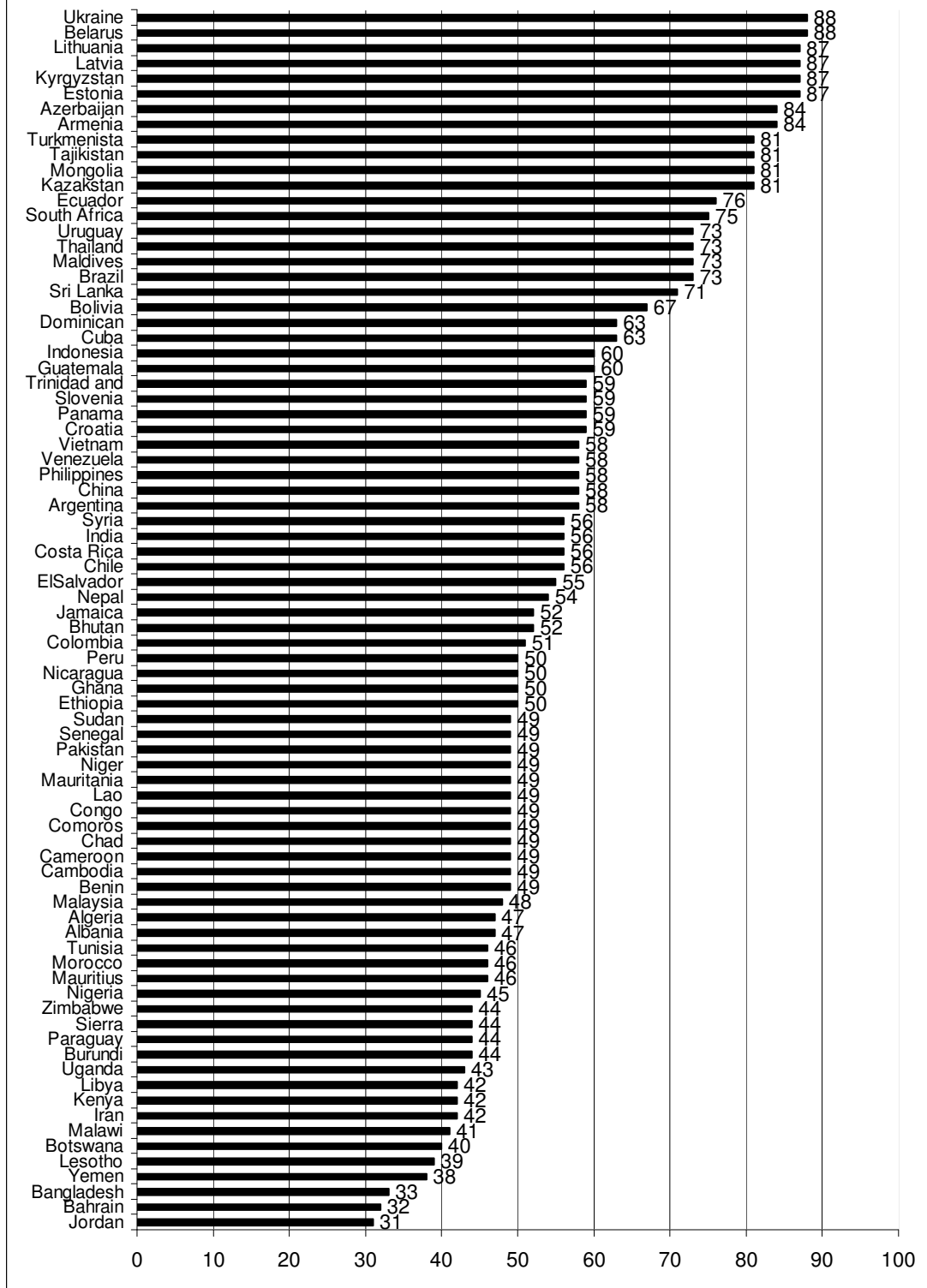
¹ See Cooray (2009) for an examination of the negative impact of colonialism on adult literacy rates of the colonised.

girls' education in the early 1990s which led to a significant increase in primary school gender parity ratio. In the course of the 1990s however, the country failed to maintain the quality of education programmes to cope with this increase. The growth in population and the effects of HIV/AIDS led to little progress in overall girls education despite the increased enrolment ratios (USAID).

Does the Duration of Suffrage Matter for Greater Gender Parity in Education?

Figure 3 illustrates the duration of suffrage up until 2005 (the current year in the present study) for the countries in the sample. The duration of suffrage is longest for females in the Eastern European and Central Asian countries. By 1930, only women in the high income OECD countries, the USSR, Mongolia and Ecuador had acquired suffrage (Ramirez *et al.* 1997). Many African, Asian and Middle Eastern countries gained suffrage only after independence. Evidence shows that the political participation of women was severely undermined under the colonial regime in Asia, Africa and the Middle East (. This perhaps explains the reason for the gender disparity in education in favour of males in Africa and Asia despite relatively high levels of democracy. Although suffrage following independence permitted women to participate in the political process, progress has still to be made in the area of education in these regions.

Figure 3: Duration of Suffrage to 2005



Note: In South Africa white women acquired suffrage in 1930 but black women did not gain suffrage until 1993.

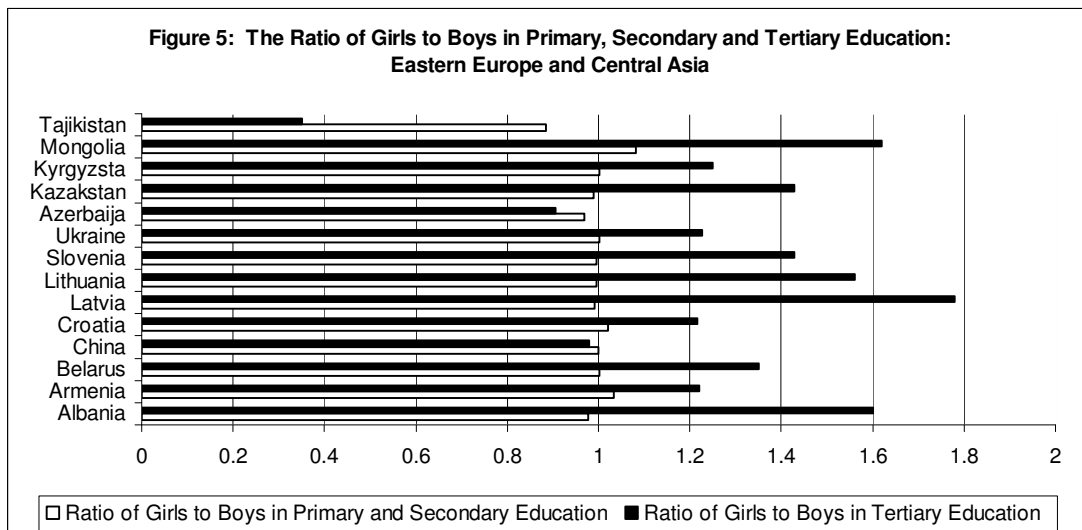
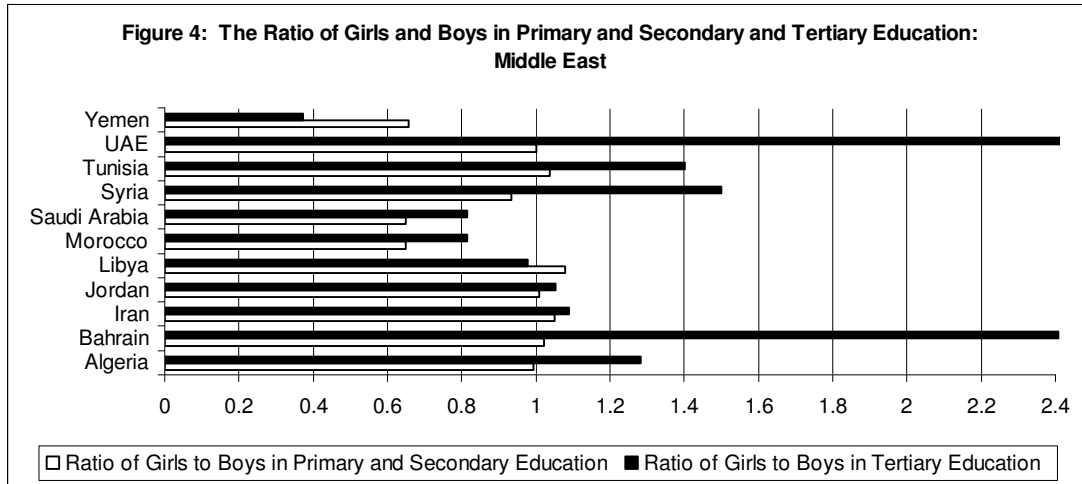
Source: Dates of suffrage acquisition from Ramirez F, Soysal Y and Shanahan S. (1997). Duration of suffrage calculated as the difference between 2005 and the year of suffrage.

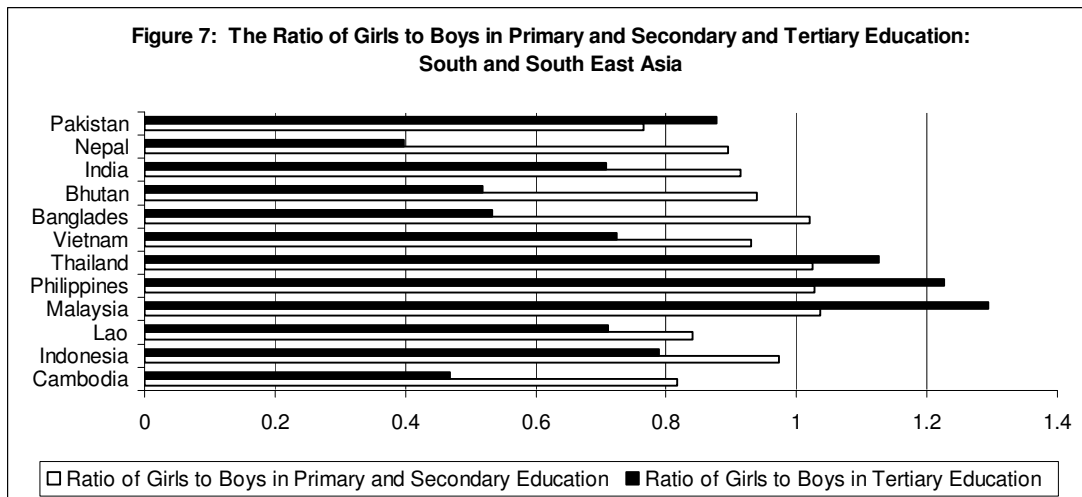
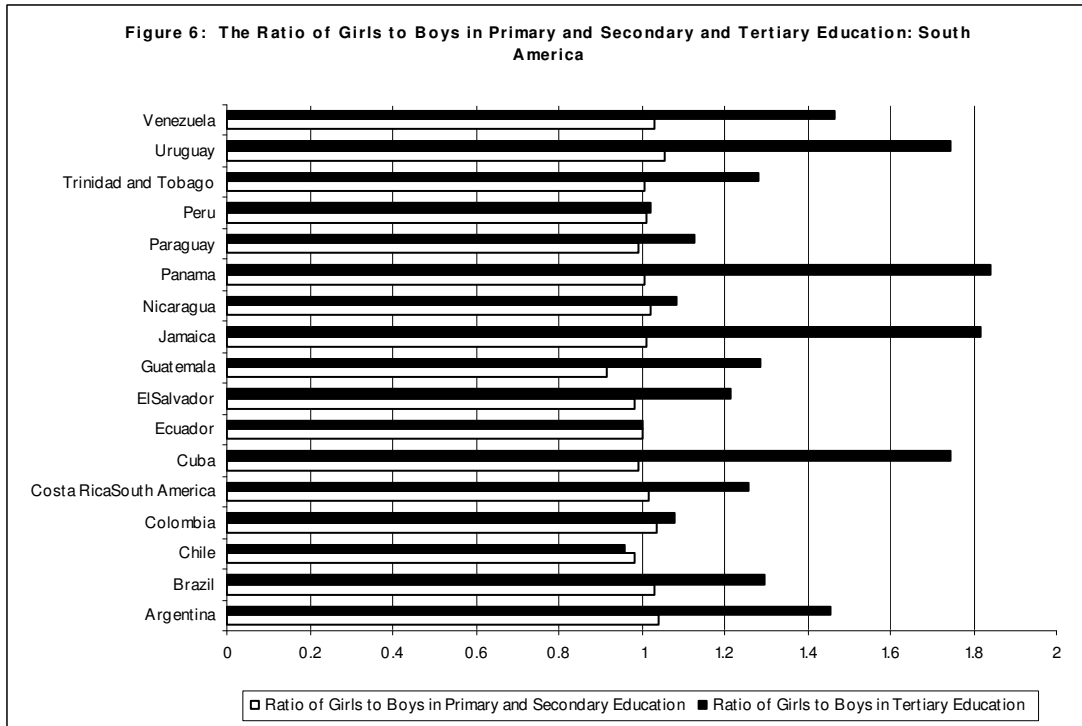
3 Data

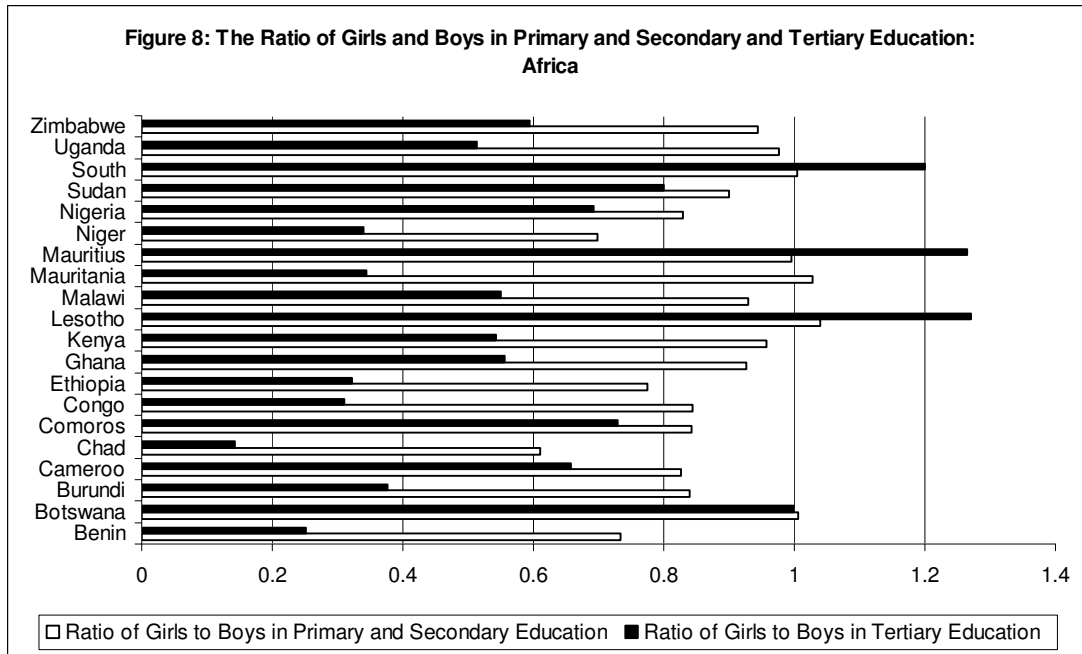
The dependent variable in this study is educational attainment between the genders which is measured by the enrolment ratio for girls divided by the enrolment ratio for boys at the primary and secondary, and tertiary levels. These outcome variables are used specifically because they are associated with the 3rd MDG. The sample comprises 80 countries which constitutes a representative cross section of all regions except the high income OECD countries. These countries are excluded from the sample given that gender parity in education is relatively high in these nations. The data sources are provided in the appendix. Estimation is carried out using both cross sectional and panel data methods. All data are collected for the years 1990, 1995, 2000 and 2005. The observations are taken every fifth year for the panel data estimation year rather than averaging the data to minimise problems associated with serial correlation (see Acemoglu *et al.* 2008). A major constraining factor with respect to the sample period was the lack of gender disaggregated enrolment data prior to 2000 for many countries. As data is collected at five year intervals for the panel data estimation, only two data points were available for girls/boys enrolment ratios for some countries.

A preliminary examination of the data show that there are regional differences in the ratio of girls to boys in primary and secondary and tertiary education (see Figures 4-8). An enrolment ratio of 1 indicates parity between females and males and deviations below (above) 1 can be interpreted as a degree of male (female) advantage on the enrolment measure. South Asia and Africa represent the greatest persistence in underrepresentation of girls. Regional differences are particularly striking at the

tertiary level where there are more female enrolments in all regions overall, except South East Asia, South Asia and Africa.







The main independent variable in this study is the democracy index. Democracy in the present study is measured by two indices². The Polity 4 Democracy Index which ranges from a scale of 0-10 with 0 representing no democracy (full autocracy) and 10 representing full democracy, and the Freedom House Political Rights Index which assigns countries a numerical rating from 1-7, with 1 indicating the highest degree of freedom and 7 the lowest degree of freedom. To maintain consistency with the Polity 4 Index, the Freedom House Political Rights Index is reversed so that 7 represents the highest level of democracy and 1 the lowest level (as in Brown 2004). Both democracy indices are normalised to one. Figures 1 and 2 in Section 2 depict the relation between democracy using both these indices and gender parity in education at the primary and secondary levels. Democracy appears to explain gender differentials in education in most countries except some African and Asian countries that fall below the regressions represented by the fitted lines.

² These two measures are commonly used in the literature. See Acemoglu *et al.* (2008), Brown (2004).

The next variable of interest is the duration of suffrage. It is possible to argue that the longer the time period since women acquired the right to vote, the greater the opportunity for women to avail themselves to educational expansion and increased employment opportunities. A variable 'Time' is created to capture the time length since the right was granted for women to vote. This is calculated by subtracting from the current year (2005 in the present study), the year in which women gained the right to vote in each country.

To control for the effect of other factors, the study includes a number of variables based upon the previous literature. As a high level of per capita income is associated with greater gender equality (Dollar and Gatti 1999, Klasen 1998), per capita income is used to measure a country's overall level of economic development. Government expenditure per student at the primary, secondary and tertiary levels is included to capture government investment in education. Reduced fertility is shown to improve not only gender parity in education but also lower the dependency burden, leading to increased savings rates and economic growth (Klasen 2002). Therefore the fertility ratio is used to estimate the effects of fertility on the gender ratio in education (see Klassen 2002, Dollar and Gatti 1999). The percentage of the population engaged in agriculture has been traditionally associated with greater gender disparity and income inequality in favour of males. The studies of Cagatay and Ozler (1995), Fontana and Wood (2000) and (Balliamoune-Lutz and McGillvray 2007) also show that increased openness to trade in agricultural economies could lead to increased gender inequality due to the fact that labour for these export industries are supplied primarily by unskilled females. To account for this, variables for employment in agriculture and trade openness are incorporated as independent variables. Employment in agriculture

is measured by those employed in the agricultural sector as a % of total employment and trade openness by the export of goods and services as a % of GDP.

Given the variation in education between the genders across regions, four dummy variables are created for Africa, the Middle East, South East and South Asia, and South America and the West Indies with Eastern Europe and Central Asia as the benchmark group. Dollar and Gatti (1999) and Inglehart and Baker (2000) among others show that cultural influences have a significant impact on education. The effects of cultural heritage on gender are therefore captured by four dummy variables for religion – Roman Catholicism, Islam, Buddhism and Hinduism with Christianity as the base group. Acemoglu *et al.* (2008) highlight the importance of historical factors in influencing institutions, Brown (2008) the effect of colonialism on enrolment and Cooray (2009) the impact of colonialism on the adult literacy rate. Therefore, a dummy variable is created to control for the influence of colonialism on enrolment. As many of the countries that have a male bias in enrolment ratios were either British or French colonies, this dummy variable takes on a value of one if a country was a British or French colony and zero if not.

4 Empirical Results

The following model forms the basis of the empirical analysis.

$$E_{FMit} = \mathbf{x}_{it} \beta + \mu_t + \delta_i + \nu_t + \nu_i$$

where E_{FMit} is the enrolment ratio female/male for the primary and secondary and tertiary levels for country i in period t . All control variables mentioned in Section 3 are captured by the vector \mathbf{x}_{it} . μ_t represents a set of regional dummy variables, δ_i a series of religion dummy variables and ν_t a colonialism dummy variable. ν_i is a

random error term that captures all other variables. The empirical estimation is carried out using both cross sectional and panel data methods.

Cross Sectional Estimation: Full Sample

Table 1 presents cross section results for the full sample. Equations (1)-(4) are estimated with the enrolment ratio girls/boys at the primary and secondary level as the dependent variable and equations (5)-(8) are estimated with the enrolment ratio girls/boys at the tertiary level as the dependent variable in 2005. Both the Polity 4 and Freedom House Democracy indices are used to ensure the robustness of the results to the measure of democracy. Equations (1), (3), (5) and (7) are estimated with the Polity 4 Democracy Index and equations (2), (4), (6) and (8) with the Freedom House Democracy Index.

The results presented in Table 1 show that per capita income is only one of the contributing obstacles to gender parity in education. The variable of interest which is the democracy index is consistently statistically significant at the 1% and 5% levels in all equations. The Time variable is positive and significant in equations (1) –(4), (7) and (8) providing support for the argument that the longer the duration since suffrage the higher the level of gender parity. The coefficient on the colonialism dummy variable is significant in equations (1) – (6). The explanatory power of the models are high and in the range of 0.66-0.75.

Table 1: Gender Differentials in Education for the Full Sample: OLS Estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Enrolment Ratio Girls/Boys Primary and Secondary 2005				Enrolment Ratio Girls/Boys Tertiary 2005			
Per Capita Income 1990	0.035 (0.021)*	0.032 (0.019)*	0.024 (0.015)*	0.015 (0.009)*	0.45 (0.12)***	0.45 (0.15)***	0.21 (0.10)**	0.22 (0.10)**
Exp. Per Student at Primary Level	0.03 (0.02)	0.01 (0.02)	0.048 (0.026)*	0.047 (0.027)*	-	-	-	-
Exp. Per Student at Secondary Level	0.01 (0.02)	0.01 (0.02)	0.008 (0.017)	0.013 (0.018)	-	-	-	-
Exp. Per Student at Tertiary Level	-	-	-	-	0.01 (0.14)	0.02 (0.03)	0.01 (0.10)	0.02 (0.15)
Africa Dummy	-0.08 (0.05)*	-0.09 (0.05)*	-	-	-0.09 (0.05)*	-0.07 (0.04)*	-	-
Asia Dummy	-0.05 (0.03)*	-0.07 (0.04)*	-	-	-0.05 (0.03)*	-0.08 (0.05)*	-	-
Middle East Dummy	-0.01 (0.08)	-0.01 (0.08)	-	-	-0.04 (0.03)	-0.05 (0.07)	-	-
South America Dummy	-0.05 (0.04)	-0.06 (0.04)	-	-	-0.01 (0.04)	-0.03 (0.05)	-	-
Buddhism Dummy	-	-	0.04 (0.05)	0.02 (0.06)	-	-	0.09 (0.09)	0.08 (0.08)
Hinduism Dummy	-	-	-0.042 (0.020)**	-0.05 (0.03)*	-	-	-0.043 (0.024)*	-0.010 (0.006)*
Islam Dummy	-	-	0.069 (0.033)*	0.057 (0.032)*	-	-	0.031 (0.19)*	0.021 (0.012)*
Roman Catholic Dummy	-	-	0.043 (0.024)*	0.042 (0.025)*	-	-	0.026 (0.016)*	0.025 (0.015)*
Democracy (Polity4)	0.09 (0.04)**	-	0.011 (0.002)***	-	0.020 (0.010)***	-	0.011 (0.004)***	-
Democracy (Freedom House)	-	0.022 (0.010)* *	-	0.015 (0.006)**	-	0.011 (0.005)**	-	0.010 (0.004)***
Employment in Agriculture	-0.05 (0.01)***	-0.004 (0.02)**	-0.045 (0.017)**	-0.036 (0.017)**	-0.082 (0.047*)	-0.090 (0.050)*	-0.170 (0.100)*	-0.167 (0.100)*
Fertility Rate	-0.04 (0.05)	-0.04 (0.06)	-0.08 (0.04)*	-0.086 (0.046)*	0.11 (0.28)	0.04 (0.011)	-0.48 (0.30)*	-0.48 (0.36)
Exports	0.002 (0.002)	0.002 (0.002)	0.002 (0.001)	0.001 (0.001)	0.01 (0.01)	0.01 (0.01)	0.001 (0.001)	0.001 (0.002)
Time	0.002 (0.001)**	0.002 (0.001)* *	0.0024 (0.0013)*	0.002 (0.001)**	0.001 (0.001)	0.001 (0.001)	0.0025 (0.0014)*	0.0024 (0.0013)*
Colony Dummy	-0.088 (0.051)**	-0.05 (0.025)* *	-0.03 (0.02)*	-0.02 (0.01)**	-0.023 (0.014)*	-0.024 (0.015)*	-0.001 (0.001)	-0.002 (0.002)
Joint St. Significance Region Dummy: p Value	0.09	0.10	-	-	0.09	0.10	-	-
Joint St. Significance Religion Dummy: p Value	-	-	0.07	0.08	-	-	0.08	0.08
R ²	0.68	0.66	0.70	0.66	0.67	0.66	0.72	0.75

Note: Standard errors reported in parenthesis. ***, **, *, significant at the 1%, 5% and 10% levels respectively.

Equations (1) – (2) and (5) and (6) indicate that gender parity is lower in all regions compared to the benchmark group which is Eastern Europe and Central Asia. The coefficients on the Africa and Asia regional dummy variables are statistically significant at the 10% level. Thus, the regions in which per capita income is lowest, girls are least represented in primary and secondary and tertiary education. An examination of the coefficients on the religion dummy variables show that the Hinduism, Islam and Roman Catholicism variables are statistically significant at the 10% level. A country's religious beliefs seem to have some effect on gender dis/parity. While the Islam and Catholicism appear to have a positive effect on gender parity compared to the benchmark group Christianity, Hinduism have a negative effect.

Inglehart and Baker (2000) show that that the populations of the historically Catholic countries, have similar political, religious and economic beliefs thereby forming a cluster. Similarly the Middle Eastern countries form a cluster due to common beliefs. The countries that belonged to the former Soviet Union also appear to form another cluster. It is possible that religious heterogeneity in Asia and Africa contribute towards slowing down attainment towards greater gender equality. Employment in agriculture is significant at the 5% and 10% levels in all equations and the fertility rate is significant at the 10% level in equations (3), (4) and (7).

The joint statistical significance of the region coefficients cannot be rejected at the 10% level, suggesting that region matters for gender disparity in education. Estimation is therefore carried out on the sample by region in the following section.

Cross Sectional Estimation: By Region

The openness variables is dropped in the regional estimations as they are statistically not significant in all of the above equations. The rest of the analysis is carried out using the Polity 4 democracy index as the measure of democracy given that both the Freedom House and Polity 4 indices yield similar estimates in Table 1. The SUR estimation method is used to take into account cross correlation between the error terms of the regions. Table 2 presents results for estimation with the primary and secondary enrolment ratio in 2005 as the dependent variable.

Table 2: Gender Differentials in Education at the Primary and Secondary Levels by Region: SUR Estimation

Dependent Variable: Enrolment Ratio Girls/Boys in Primary and Secondary Education 2005					
	(1)	(2)	(3)	(4)	(5)
Independent Variables	Middle East	Eastern Europe and Central Asia	South East and South Asia	Africa	South America and the West Indies
Per Capita Income 1990	0.010 (0.006)*	0.020 (0.011)**	0.025 (0.012)**	0.026 (0.011)**	0.020 (0.011)**
Exp. Per Student at Primary Level	0.041 (0.022)*	0.042 (0.021)*	0.041 (0.022)*	0.042 (0.021)**	0.039 (0.023)*
Exp. Per Student at Secondary Level	0.012 (0.026)	0.012 (0.015)	0.013 (0.016)	0.012 (0.015)	0.005 (0.01)
Buddhism Dummy	-	0.005 (0.005)	-0.001 (0.007)	-	-
Hinduism Dummy	-	-	-0.005 (0.003)*	-	-
Islam Dummy	0.005 (0.008)	0.01 (0.01)	-0.009 (0.004)**	- 0.008 (0.011)*	-
Christianity Dummy	-	0.002 (0.01)	-	-0.001 (0.011)	-
Roman Catholic Dummy	-	0.001 (0.012)	-	0.002 (0.008)	0.001 (0.008)
Other Religion Dummy	-	-	-	-	-
Democracy	0.008 (0.002)***	0.008 (0.002)***	0.008 (0.002)***	0.008 (0.002)***	0.009 (0.001)***
Employment in Agriculture	-0.05 (0.025)**	-0.047 (0.024)**	-0.047 (0.014)***	-0.047 (0.014)***	-0.047 (0.024)**
Fertility Rate	-0.034 (0.022)	-0.036 (0.020)*	-0.035 (0.021)*	-0.036 (0.021)*	-0.032 (0.022)
Time	0.007 (0.005)	0.008 (0.004)**	0.002 (0.002)	0.008 (0.012)	0.002 (0.007)
Colony Dummy	-0.036 (0.021)**	-0.031 (0.025)	-0.040 (0.023)**	-0.042 (0.024)**	-0.025 (0.020)
R ²	0.61	0.62	0.61	0.62	0.60

Note: Standard errors reported in parenthesis. ***, **, *, significant at the 1%, 5% and 10% levels respectively.

The variable of interest which is democracy is significant at the 1% level in all regions. The variable Time is significant at the 5% level in Eastern Europe and Central Asia. This is the region in which women have had the right to vote for the longest period. In many of the Asian, African and Middle Eastern countries women gained the right to vote only after independence. Despite the fact that South America gained independence long before these regions, women in South America also gained the right to vote only around the same time as these regions. Therefore the duration of suffrage appears to matter for gender equality in education. The coefficient on the colonialism dummy variable is significant in the Africa, Asia and the Middle Eastern regions demonstrating the importance of historical factors in school enrolment. Per capita income and government expenditure per student at the primary level are significant for all regions. The proportion employed in the agricultural sector is significant at the 1% level in Africa and Asia and at the 5% level in the rest of the regions. The fertility rate is significant at the 10% level in Eastern Europe and Central Asia, East and South Asia and Africa. The coefficients on the Islam and Hinduism dummy variables are negative and statistically significant in the East and South Asia region and the Islam dummy variable is negative and statistically significant in the Africa region. Note that the Islam dummy variable is positive and not statistically significant in the Middle East suggesting that religion has a positive effect in the Middle East. This result confirms the result obtained in Table 1 above that religion appears to have a negative impact on gender equality only in regions that are characterised by religious diversity.

Table 3 reports results by region with the gender ratio at the tertiary level as the dependent variable.

Table 3: Gender Differentials in Education at the Tertiary Level by Region: SUR Estimation

Dependent Variable: Enrolment Ratio Girls/Boys in Primary and Secondary Education					
	(1)	(2)	(3)	(4)	(5)
Independent Variables	Middle East	Eastern Europe and Central Asia	South East and South Asia	Africa	South America and the West Indies
Per Capita Income 1990	0.266 (0.122)**	0.264 (0.116)**	0.264 (0.120)**	0.267 (0.118)**	0.266 (0.118)**
Exp. Per Student at Secondary Level	0.041 (0.027)	0.033 (0.122)	0.039 (0.026)	0.035 (0.124)	0.034 (0.124)
Exp. Per Student at Tertiary Level	0.104 (0.086)	0.091 (0.084)	0.102 (0.085)	0.092 (0.085)	0.091 (0.085)
Buddhism Dummy	-	0.006 (0.039)	-0.002 (0.089)	-	-
Hinduism Dummy	-	-	-0.007 (0.004)*	-	-
Islam Dummy	-0.04 (0.02)*	0.004 (0.042)	-0.016 (0.009)*	-0.080 (0.050)*	-
Christianity Dummy	-	0.006 (0.041)	-	-0.001 (0.016)	-
Roman Catholic Dummy	-	0.031 (0.055)	-	0.023 (0.041)	0.025 (0.044)
Democracy	0.015 (0.007)**	0.016 (0.007)**	0.015 (0.007)**	0.010 (0.005)**	0.022 (0.01)**
Employment in Agriculture	-0.214 (0.100)**	-0.29 (0.15)*	-0.212 (0.100)**	-0.208 (0.098)**	-0.208 (0.098)**
Fertility Rate	-0.271 (0.218)	-0.291 (0.210)	-0.275 (0.216)	-0.286 (0.212)	-0.287 (0.213)
Time	0.004 (0.006)	0.004 (0.002)**	0.006 (0.005)	0.005 (0.006)	0.008 (0.063)
Colony Dummy	-0.261 (0.016)*	-0.022 (0.019)	-0.019 (0.011)**	-0.027 (0.014)**	-0.014 (0.010)
R ²	0.71	0.71	0.71	0.71	0.71

Note: Standard errors reported in parenthesis. ***, **, *, significant at the 1%, 5% and 10% levels respectively.

The results for the tertiary level are slightly different to that of the primary and secondary levels, with government expenditure per student and fertility losing significance. The coefficient on democracy continues to be significant at the 5% level. The coefficient on per capita income is significant at the 5% level in all regions. The variable Time is significant at the 5% level again in Eastern Europe and Central Asia. As before, the colonialism dummy variable is significant in the Middle East, Asia and Africa highlighting the negative effect exerted by colonialism in these regions. Note that at the tertiary level, religion has a significant and negative impact

on education in the Middle East as opposed to the primary and secondary level. Similarly the coefficient on Islam is significantly negatively related to gender parity in education in Africa, and Hinduism and Islam negatively related to education in Asia. There is a significant negative relationship between the school gender ratio and agricultural employment. The explanatory power of the models are high with the independent variables explaining 71% of the variation in the dependent variable.

Panel Data Estimation

Given that the cross country results suggest region specific effects, panel data is used in this section to capture any country specific effects. A question that arises in this regard is whether a fixed or random effects model is more appropriate. A fixed effects model involves estimating the individual country effects as parameters. This leads to a substantial loss in degrees of freedom. In particular, when the number of countries exceed the number of time periods as in the case of this study, a random effects model will permit more efficient use to be made of the available data. Therefore a random effects model is used for the purpose of estimation. Estimation is also carried out using pooled OLS. A panel for the period 1990-2005 is used with the observations taken every fifth year. The random effects GLS results are reported in Table 4.

Table 4: Panel Data Estimation of Gender Differentials in Education at the Primary, Secondary and Tertiary Levels.

	(1)	(2)	(3)	(4)
	Dependent Variable: Enrolment Ratio Girls/Boys Primary and Secondary		Dependent Variable: Enrolment Ratio Girls/Boys Tertiary	
Independent Variables	Pooled OLS	Random Effects	Pooled OLS	Random Effects
Per Capita Income 1990	0.028 (0.012)**	0.02 (0.008)*	0.34 (0.04)***	0.17 (0.03)***
Exp. Per Student at Primary and Secondary Level	0.019 (0.012)	0.01 (0.01)	-	-
Exp. Per Student at Tertiary Level	-	-	0.094 (0.040)**	0.001 (0.02)
Buddhism Dummy	0.055 (0.029)*	0.06 (0.06)	0.157 (0.217)	0.21 (0.18)
Hinduism Dummy	-0.069 (0.033)**	-0.05 (0.03)**	-0.169 (0.098)*	-0.313 (0.088)***
Islam Dummy	0.051 (0.023)**	0.06 (0.044)*	0.094 (0.064)*	0.062 (0.152)
Roman Catholic Dummy	0.063 (0.019)***	0.048 (0.035)*	0.153 (0.058)***	0.151 (0.110)*
Democracy	0.013 (0.002)***	0.01 (0.005)***	0.018 (0.007)***	0.024 (0.012)**
Employment in Agriculture	-0.121 (0.025)***	-0.071 (0.017)***	-0.191 (0.080)**	-0.110 (0.076)*
Fertility Rate	-0.012 (0.001)	-0.011 (0.017)	-0.037 (0.030)	-0.145 (0.063)**
Time	0.002 (0.0012)*	-0.001 (0.0004)***	0.004 (0.002)**	-0.002 (0.0012)*
Colony Dummy	-0.018 (0.011)*	-0.03 (0.02)*	-0.130 (0.059)**	-0.106 (0.105)
R ²	0.50	0.47	0.69	0.62
Observations	225	225	205	205

Note: Standard errors reported in parenthesis. ***, **, *, significant at the 1%, 5% and 10% levels respectively.

The coefficients on the democracy index continue to be significant at the 1% and 5% levels. The coefficients on the time variable are significant at the 1%, 5% and 10% levels. Per capita income has a positive and significant impact on gender parity in enrolment, and employment in agriculture a negative and significant effect. Of the religion dummy variables, Hinduism has a significant negative effect on gender parity in enrolment and Roman Catholicism a positive significant effect. The coefficient on Islam is positive and significant in equations (1) – (3) and the coefficient on

colonialism negative and significant in the same three equations. The results are consistent with those obtained above under the cross sectional method.

5 Conclusion

This study investigates the reason for gender disparity in education at the primary and secondary and tertiary levels. Democracy is consistently seen to impact upon education at all levels of education. It can be argued that greater democracy leading to women in positions of leadership can promote the development of women who are less privileged. There also seems to be some basis for the argument that the duration of suffrage matters for greater gender parity in education. Regions in which there is an under-representation of girls in education, namely Asia and Africa, income, the percentage of population employed in agriculture, colonialism and religious heterogeneity also appear to be important. Although democratic institutions are in place in these regions, the operation of institutions can be far from ideal with low participation in the political process (Hadenius and Teorell 2005). The results also demonstrate a negative relation between religious fractionalisation and political regimes. This is because greater diversity can pose difficulties in arriving at a general consensus with regard to common set of laws (Hayo and Voigt 2005) and greater conflict (Fish and Brooks 2006).

Appendix

The data used in the empirical estimation come from the following sources:

- Enrolment Rates, Primary, Secondary, Tertiary 1990, 2005: UNESCO Literacy statistics: <http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx> (downloaded January 2009), Human Development Reports, World Development Indicators.
- GDP per Capita 1990, 1995, 2000, 2005 (PPP adjusted): World Development Indicators and World Development Reports.
- Public Expenditure per Student, Primary, Secondary, Tertiary % of GDP Per Capita, 1990, 1995, 2000, 2005: UNESCO and Human Development Reports. Barro R and Lee J (2000). International Data on Educational Attainment: Updates and Implications. Centre for International Development Working Paper 42-2000.
- Employment in agriculture as a % of total employment 1990, 1995, 2000, 2005: World Development Indicators, Human Development Reports.
- Democracy Index: Marshall M and Jaggers K (2006). Polity IV Country Reports 2006. <http://www.systemicpeace.org/polity/polity06.htm#nam> (downloaded February 2009). Data for 1990, 1995, 2000, 2005.
- Political Rights Index: Freedom House (2009), Freedom of the World: 2005 (<http://www.freedomhouse.org/template.cfm?page=22&country=7460&year=2009>) downloaded February 2009. Data for 1990, 1995, 2000, 2005.
- Fertility Rate Total, Births per Woman 1990, 1995, 2000, 2005 – World Development Indicators
- Current Account Balance % of GDP 1990, 1995, 2000, 2005 – World Development Indicators.

References

- Acemoglu D, Johnson S, Robinson J and Yared P (2008) 'Income and Democracy,' *American Economic Review*, 91, 808-842.
- Baliamoune-Lutz M and McGillivray M (2007) 'Gender Inequality and Growth: Evidence from Sub-Saharan and Arab Countries,' <http://www.uneca.org/aec/documents/Mina%20Baliamoune-Lutz.pdf> (downloaded February 2009).
- Barro R and Lee J (2000). *International Data on Educational Attainment: Updates and Implications*. Centre for International Development Working Paper 42-2000.
- Basu A (2002) 'Why Does Education Lead to Low Fertility? A Critical Review of Some of the Possibilities,' *World Development*, 30, 1779-1790.
- Barro R (1999) 'Determinants of Democracy,' *Journal of Political Economy*, 107, 158 – 183.
- Barro R and Lee J (1996) 'International Measures of Educational Achievement,' *American Economic Review*, 86, 218-223.
- Brown D (2000) 'Democracy, Colonization, and Human Capital in Sub-Saharan Africa,' *Studies in Comparative International Development*, 35, 20-40.
- Cagaty N and Ozler S (1995) 'Feminization of the Labour Force: The Effects of Long Term Development and Structural Adjustment,' *World Development* 23, 1883-1894.
- Cooray A (2009) Does
- Dollar D and Gatti R (1999) 'Gender Inequality, Income and Growth: Are Good Times Good for Women?' *Policy Research Report on Gender and Development Working Paper Series No. 1*, World Bank, Washington.

- Easterly W and Levine R (1997) 'Africa's Growth Tragedy: Policies and Ethnic Divisions,' *Quarterly Journal of Economics*, 112, 1203-1250.
- Fish S and Brooks R (2004) 'Does Diversity Hurt Democracy?' *Journal of Democracy*, 15, 154-166.
- Fontana M and Wood A (2000) 'Modelling the Effects of Trade on Women, at Work and at Home,' *World Development* 28, 1173-1190.
- Glaeser E, La Porta R, Lopez-de-Silanes F and Shleifer A (2004) 'Do Institutions Cause Growth,' *Journal of Economic Growth*, 9, 271-303.
- Hadenius A and Teorell J (2005) 'Cultural and Economic Prerequisites of Democracy,' *Studies in Comparative International Development*, 39, 87-106.
- Hayo B and Voigt S (2005) *Explaining de Facto Judicial Independence*, Phillips Universitat Marburg, Working Paper No: 200507.
- Huntington S (1991) 'The Third Wave: Democratization in the Late Twentieth Century,' Norman OK: University of Oklahoma Press.
- Inglehart R and Baker W (2000) 'Modernization, Cultural Change and the Persistence of Traditional Values,' *American Sociological Review*, February, 19-51.
- Klassen S (2002) 'Low Schooling for Girls, Slower Growth for All? Cross Country Evidence on the Effect of Gender Inequality in Education on Economic Development,' *World Bank Economic Review*, 16, 345-373.
- Klassen S and Wink C (2002) 'A Turning Point in Gender Bias in Mortality?' *Population and Development Review* 28, 285-312.
- Knowles S, Lorgelly P and Ownen P (2002) 'Are Educational Gender Gaps a Brake on Economic Development? Some Cross Country Empirical Evidence,' *Oxford Economic Papers*, 54, 118 – 149.

- La Porta R, Lopez-de-Silanes F, Shleifer A and Vishny R (1999) 'The Quality of the Government,' *Journal of Law, Economics and Organization*, 15, 222-279.
- Londregan J and Poole K (1996) 'Does High Income Promote Democracy?' *World Politics*, 49, 1-30.
- Papaioannou E and Siourounis G (2005) 'Economic and Social Factors Driving the Third Wave of Democratization.' Mimeo, London Business School.
- Ramirez F, Soysal Y and Shanahan S (1997) 'The Changing Logic of Political Citizenship: Cross-National Acquisition of Women's Suffrage Rights, 1890 to 1990' *American Sociological Review*, 62, 735-745.
- Schultz T P (2002) 'Why Governments Should Invest More to Educate Girls,' *World Development*, 30, 207-225,
- Schultz T P (1994) 'Human Capital Investment in Women and Men: Micro and Macro Evidence of Economic Returns,' Occasional Paper 44, International Centre on Economic Growth, San Francisco.
- United Nations (2008) – 'Millennium Development Goals'
<http://www.unmillenniumproject.org/goals>) downloaded February 2008.
- USAID (2008) Strengthening Gender and Education Programming in the 21st Century, Working Paper Equip 2.