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Empirical Analysis of Key Drivers of Gender Equality in Tertiary Education Enrolment in Africa

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Abstract

In addition to analyzing the characteristics of gender equality in tertiary education enrolment in Africa, this paper empirically studies the key drivers of gender equality in tertiary education enrolment, using cross-sectional time series data from 1970 to 2012. Our results show that the coefficient associated with the level of real GDP per capita is positive and statistically significant. Our results also suggest that higher domestic investment, increased economic globalization, the quadratic element of political globalization, economic globalization, ethnic fractionalization, increased democracy, and Christian dominance in a country increase gender equality in tertiary education enrolment in the continent. However, increases in the level of political globalization and increased incidence of civil wars tend to lower it. The policy implications and lessons of these results are discussed.

Keywords: Key drivers; Gender equality; Tertiary education enrolment; Africa.
JEL Classification: J16; J18; I21; I28.

1. Introduction

This paper empirically analyses the key drivers affecting gender equality in tertiary education enrolment in African countries. In particular, three key research questions are addressed in this paper: (a) what is the current state of gender equality in tertiary education enrolment in Africa and how has it changed over time?; (b) what are the key determinants of gender equality in tertiary education enrolment in Africa?; and (c) what policies and strategies should African governments adopt in order to promote gender equality in tertiary education? Thus, the key objectives of the paper are to: examine the extent of the gender gap in tertiary education enrolment in African countries; examine the factors and determinants that are associated to and responsible for gender inequality in tertiary education enrolment African countries; and make recommendations which are useful for policy review, advocacy, and action towards the attainment of the SDG4.3 target - "by 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university" - as well as the related sustainable development goal (SDG) number five (Goal 5), which is that of achieve gender equality and empowering all women and girls.

In addition to analyzing the characteristics of gender equality in tertiary education enrolment in Africa, this paper empirically studies the key drivers of gender equality in gender equality in tertiary education enrolment, using cross-sectional time series data.

This paper is laid out as follows. While Section 1 sets out the introduction, Section 2 briefly examines the importance of gender (in)equality in education. Section 3 reviews the status of gender equality in tertiary education enrolment by global regions and in Africa, and shows that while the situation is improving, gender inequality still persists in Africa. Section 4 reviews the literature documenting empirical evidence of the factors determining gender equality in education enrolment. Section 5 presents the econometric methodology and the data. The main estimation results are presented and discussed in Section 6. Section 7 provides some concluding remarks and the policy implications.

2. Importance and Characteristics of Gender (In) Equality in Education

As the UNICEF (2011) states, gender equality entails that women and men, and girls and boys, enjoy the same rights, resources, opportunities and protections. In addition, it means that girls and women have agency to use those rights, capabilities, resources and opportunities to make strategic choices and decisions about the course of their lives without the fear of coercion and violence. Therefore, equality between boys and girls as well as between women and men is both a human rights issue and a precondition for, and indicator of, sustainable, people-centered development.

Gender disparities in terms of opportunities and women's access to education have become important issues for the developing world and for African countries in particular. This is partly because of the potential negative effects that can result from the exclusion of women in education on both sustainable growth and poverty reduction (see Figure 1). It is, therefore, not surprising that gender equality and the empowerment of women was one of the main attributes of the United Nations Millennium Development Goals (MDGs) program (Baliamoune-Lutz and McGillivray, 2009) and the Sustainable Development Goals (SDGs). It is also the reason that gender equality is on the public policy agenda of almost every country of the world today.

Thus, the focus on gender equality in education in Africa is important for at least two reasons. First, women's education is essential in the fight against poverty. This is not only because of the direct and interrelated contribution education and hence employment makes to household welfare, but also because of the personal power it provides women in shaping and making family decisions and in redirecting household spending on essential needs, especially in favor of children's education and healthcare. Second, from a rights-based perspective, gender equality in education should be enhanced simply from the standpoint that, as recognized internationally, everyone deserves the same opportunities.

Figure-1. Why Does Gender Equality Matter?

Source: Adapted from Smee and Woodroffe (2013)

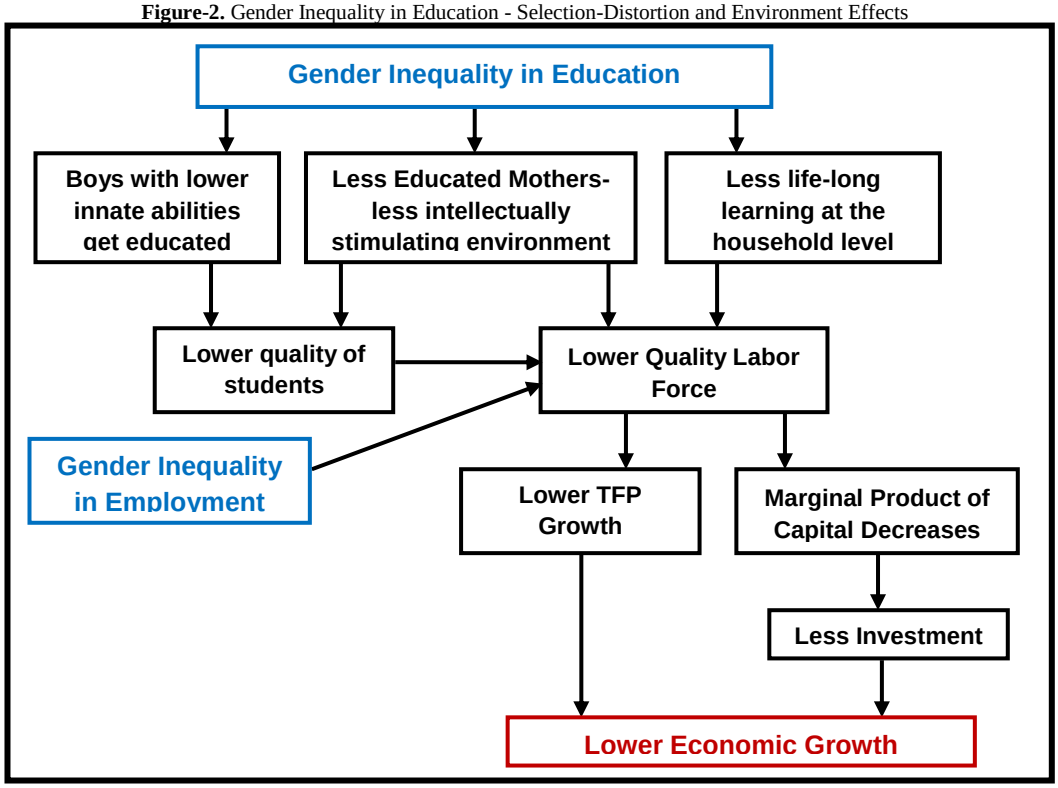
Indeed, as the (World Bank, 2012a;2012b) has noted, gender equality, whether in education or other areas is both about economic empowerment, fairness, equity, increasing productivity, reduction of efficiency losses, and widening of the base of taxpayers and contributors to social protection systems. It is also about improving the opportunities and outcomes of the next generation; enhancing development decision-making; greater opportunities for businesses to expand, innovate and compete; economic/business freedom; and fostering of stronger, better, fairer, more sustainable and inclusive growth and development (Anyanwu and Augustine, 2013).

Investments in education determine women's ability to earn higher wages and to own and operate productive farms and firms. On average, differences in education explain a significant fraction of the variation in wages and incomes among adults. According to the World Bank (2012a), in both high- and low-income countries, gender differences in education have contributed significantly to the productivity and wage gap between men and women. It is also posited that education investments in women are also special in other ways. First, in their roles as mothers, educated women pass on the benefits of higher education to their children. Children born to more educated mothers are less likely to die in infancy and more likely to have higher birth weights and be immunized. Second, high maternal mortality rates have implications for educational investments and the ability of women to participate in society. Women face particular risks during pregnancy and childbirth. For example, in Angola, 1 of every 29 pregnant women dies during childbirth compared with 1 of every 11,400 in Sweden. Therefore, as the risk of dying in childbirth declines, educational investments increase (and more so for girls).

In addition, changes in education have also facilitated women's integration in the labor market. More educated women have traditionally exhibited higher participation rates than their less educated counterparts; so as education levels have increased around the world, more women have ventured into paid work (World Bank, 2012a). Evidence shows that women's access to education is associated with higher rates of participation in the labor market, better employment conditions and with higher access to decision-making positions (Darcy, 1987; Gaddie and Bullock,

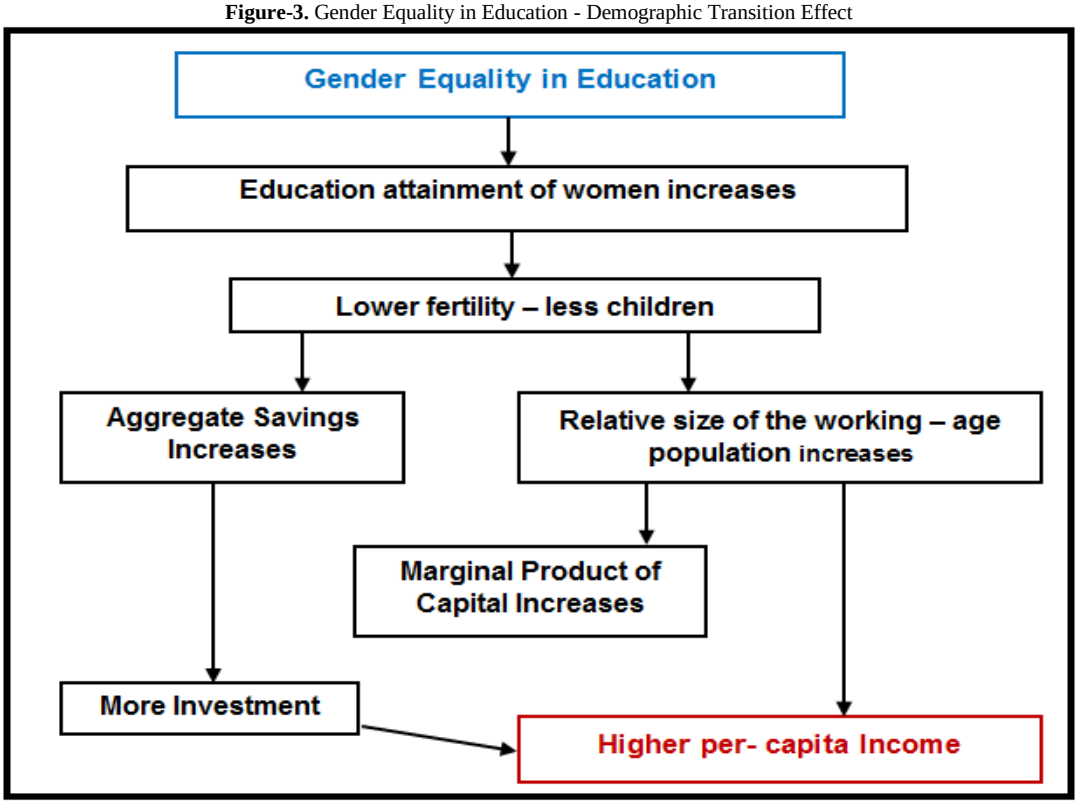
1995). As Chen (2004) notes, having relatively less educated women tends to lower the intellectual environment at home, leading to a less productive workforce and lower economic growth (Figure 2). In the same vein, higher gender equality in terms of higher female education would indirectly lead to a transitory increase in economic growth via demographic effects (Figure 3).

Figure-2. Gender Inequality in Education - Selection-Distortion and Environment Effects



Source: Adapted from Chen (2004)

Figure-3. Gender Equality in Education - Demographic Transition Effect



Source: Adapted from Chen (2004)

Understanding the key factors affecting gender inequality in tertiary education enrolment and what can be done about them is also critical for any notion of human justice. For all of these reasons, Goal #3 of the MDGs and goal #5 of the SDGs are important in their own right and are salient to all the other MDG/SDG goals. Indeed, as Smee and Woodroffe (2013) note, the goal on gender equality and women's empowerment in the new post-2015

framework is essential to complement mainstreaming gender equality in the indicators and targets of all development goals and to provide the leadership and visibility necessary for effective implementation.

3. Stylized Facts on the Status of Gender Equality in Tertiary Education Enrolment

At the Millennium Summit in 2000, the 189 member states of the United Nations made a commitment in the Millennium Declaration to achieve eight goals, labeled the Millennium Development Goals (MDGs) (Table 1). The third goal on this list seeks to achieve gender equality and the empowerment of women. In setting this goal, the U.N. member states recognized the contributions that women make to economic development and the costs to societies of the multiple disadvantages that women face in nearly every country. This is also goal number 5 of the SDGs – to achieve gender equality and empower all women and girls.

Table-1. The Millennium Development Goals

Goal 1	**Eradicate extreme poverty and hunger**
Goal 2	Achieve universal primary education
Goal 3	Promote gender equality and empower women
Goal 4	Reduce child mortality
Goal 5	Improve maternal health
Goal 6	Combat HIV/AIDS, malaria and other diseases
Goal 7	Ensure environmental sustainability
Goal 8	Develop a global partnership for development

Source: Adapted from the UN MDGs

In 2000, 189 UN member states adopted the Millennium Declaration, which distils the key goals and targets agreed at the international conferences and world summits during the 1990s. Drawing on the Declaration, the UN system drew up eight Millennium Development Goals (MDGs) to provide a set of benchmarks to measure progress towards the eradication of global poverty. MDG 3, to promote gender equality and women's empowerment, includes one target on education and additional indicators on women's employment and political representation. Global agreement to include this goal was a very positive development and signaled a recognition by member states that gender inequality not only decreases the likelihood of achieving the other goals, but also that advancing gender equality and women's empowerment depends on progress made on each of the other goals. MDG 3, to promote gender equality and women's empowerment includes one target and three indicators (Table 2).

Table-2. The Targets and Indicators of MDG 3

Target 3.A **Indicator 3.1**	**Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015.** **The ratio of girls to boys in primary, secondary and tertiary education.**
Target 3.B Indicator 3.2	Eliminate gender inequality in access to economic assets and employment by the year 2015. The share of women in wage employment in the nonagricultural sector
Target 3.C Indicator 3.3	Achieve a 30 percent share of seats for women in national parliaments by the year 2015. The proportion of seats held by women in national parliaments.

Source: Adapted from the UN MDGs

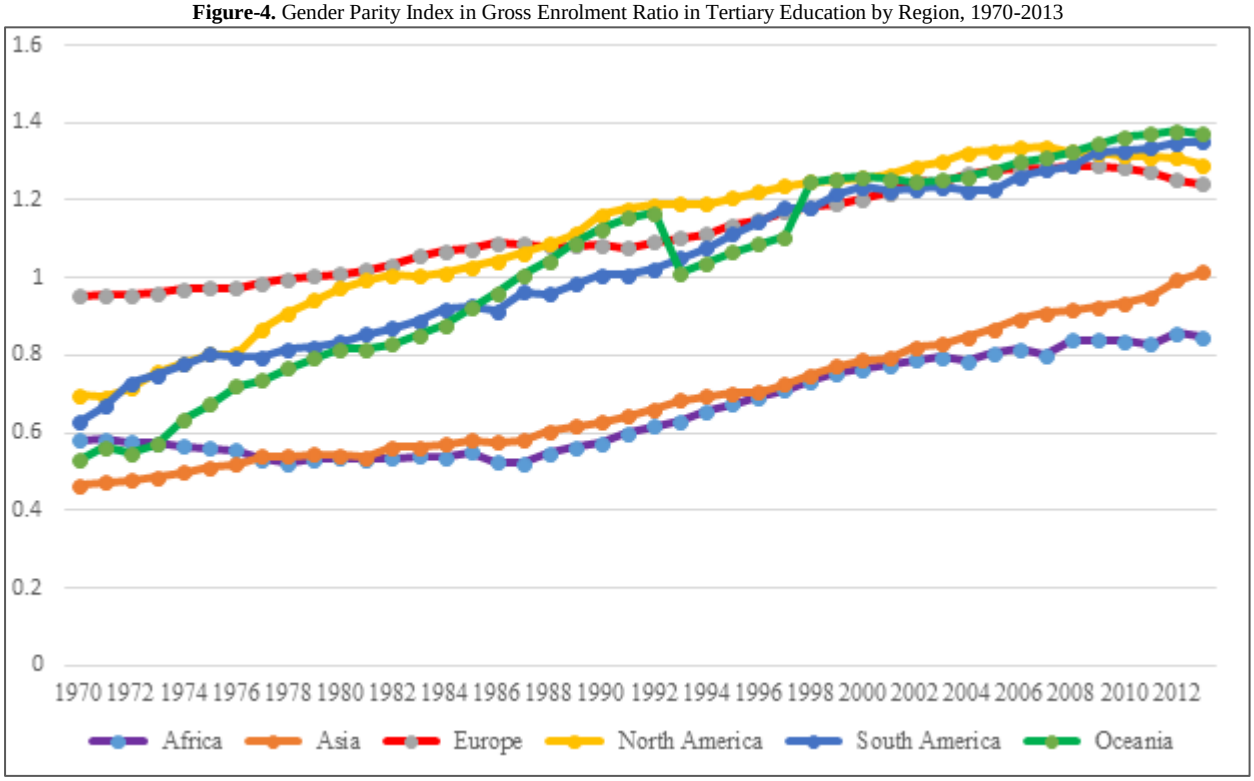
However, SDG 4 relates to ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. In particular, SDG 4.3 target states that by 2030, the international community and nations shall ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.

Gender parity in education is reached when the gender parity index (GPI), defined as girls' gross school enrolment ratio divided by the corresponding ratio for boys, is between 0.97 and 1.03. The developing regions as a whole have achieved the target to eliminate gender disparity at all levels of education, with a gender parity index of 1.10 in tertiary education in 2013. However, as the UN (2015) indicates, significant differences remain across regions and countries (Figure 3). Indeed, by the end of 2013, the most extreme disparities in tertiary education enrolment were those at the expense of females in Africa (especially sub-Saharan Africa) and at the expense of males in Asia, Europe, North America, South America, Oceania and North Africa. Africa had the lowest GPI of 0.85 in 2013 despite noticeable progress since 1990 (Figure 3 and 4).

In Africa, especially SSA, girls still face barriers to entering tertiary school although the region has made substantial progress over the past four decades. While the GPI rose in all regions during this period, the relative position of some of the regions shifted. The largest gains occurred in Oceania, where the GPI rose from 0.63 to 1.37 between 1970 and 2013. This made the sub-region move from the bottom of the table in 1970 to the first place in 2013. Europe moved from first to second to fourth place (rising from 0.95 to 1.24), while North America that was second in 1970 (at 0.70) moved to the third place at 1.29. South America moved to the second position from the third while Asia moved from the sixth place to the fifth. Africa dropped from fourth to sixth and last place. However,

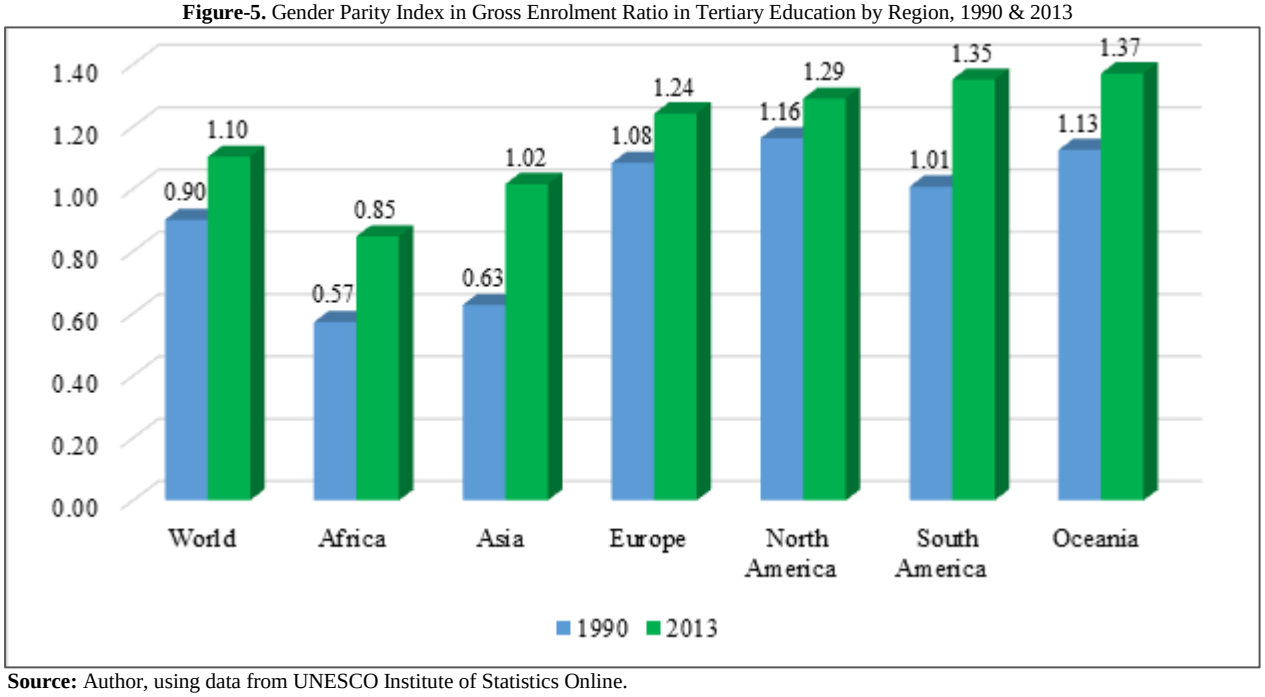
while Africa as a whole recorded a 31.5 percent increase between 1970 and 2013, North Africa's growth was 53.9 percent as against only 6.5 percent in Sub-Saharan Africa.

Figure-4. Gender Parity Index in Gross Enrolment Ratio in Tertiary Education by Region, 1970-2013



Source: Author, using data from UNESCO Institute of Statistics Online.

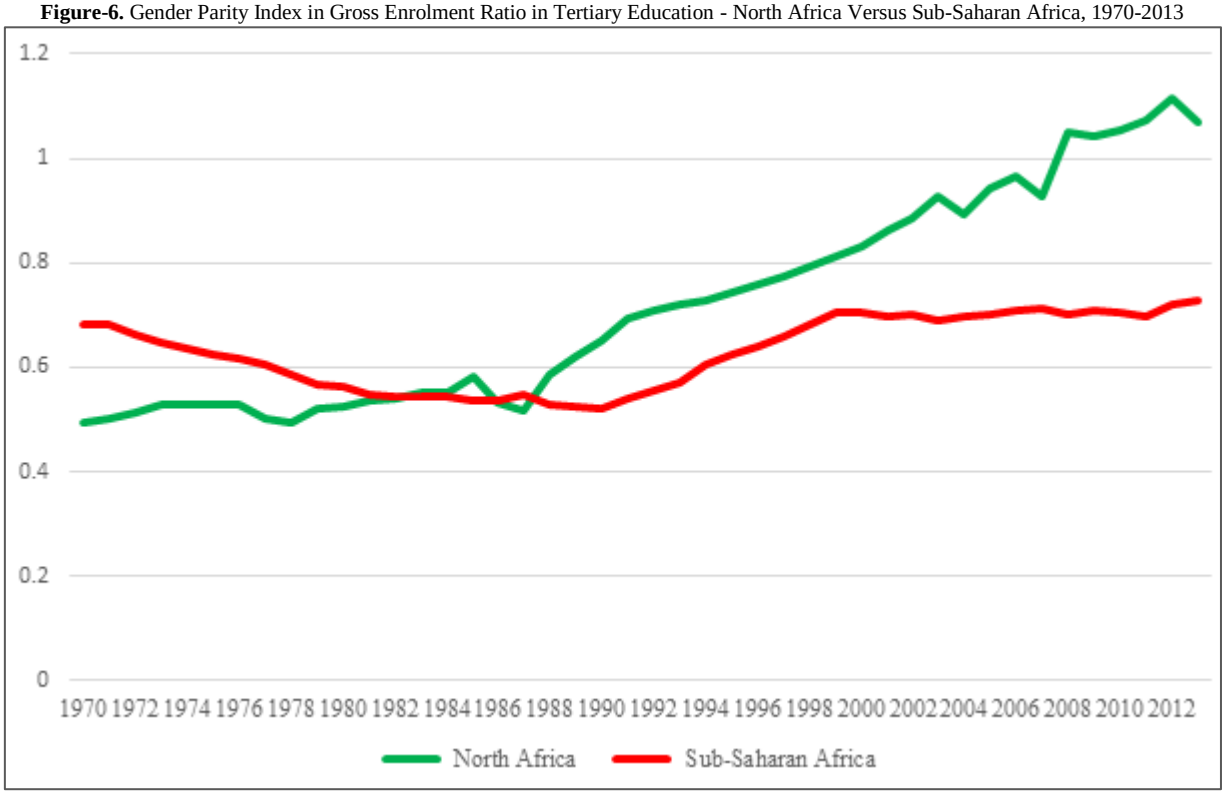
Figure-5. Gender Parity Index in Gross Enrolment Ratio in Tertiary Education by Region, 1990 & 2013



Source: Author, using data from UNESCO Institute of Statistics Online.

For 25 African countries with complete data in 2013, only 36 percent had achieved gender equality in tertiary enrolment in Africa. Overall performance ranged from as a low as 0.39 in Togo to as high as 2.2 in Seychelles in 2013. The most significant progress among developing regions was observed in North Africa, where the GPI increased from 0.49 in 1970 to 1.07 in 2013, having attained parity since 2008 (Figure 5). But Sub-Saharan Africa had never attained parity in any year since 1970.

Figure-6. Gender Parity Index in Gross Enrolment Ratio in Tertiary Education - North Africa Versus Sub-Saharan Africa, 1970-2013



Source: Authors, using data from UNESCO Institute of Statistics Online.

4. The Brief Review of the Literature

From most studies, the various factors which hinder gender equality in education can be grouped broadly into two main categories: (a) on the demand side: socio-economic, familial and cultural factors which affect the behavior and the choices of parents and students; and (b) on the supply side: political, institutional/bureaucratic, infrastructural, contextual factors and factors linked to the school. The results have been limited access to schooling, low female enrolment, high school dropout rate (particularly at puberty age), low female participation in scientific/technical fields, high proportion of illiterate women, scarce or low scale employment opportunities, reduced contribution to national economic and social development, limited bargaining power, and absence from the political decision-making processes (UNESCO, 1997). Also, Subrahmanian (2002) summarizes key factors affecting gender equality in education to include macroeconomic context, household livelihoods and aspirations, prospects and capacities of individual children, and factors relating to schooling provision. In the review that follows, we deeply examine recent key variables that have been found to be important in the literature.

Economic Development

Böserup (1970) argues that the initial stages of economic growth are characterized by a growing gender gap, which only begins to diminish once countries develop beyond a certain threshold. The explanation given is that productivity differentials are negligible prior to urbanization and they start growing with the emergence and development of an urban economy. Eventually, discriminatory practices diminish and women get greater access to education and training as well as greater bargaining power inside the household.

Recently, Eastin and Prakash (2013) find that economic development initially (i.e., below income levels of $4,000 per capita) enhances gender equality. The authors argue this improvement is due to increases in the following areas: female employment opportunities, women's intra-household bargaining power, female social networks, women's social status, and the cultural acceptance of female involvement in the formal labor market. However, as development progresses (i.e., between income levels of $4,000 and $8,000 per capita), the study finds a negative relationship between income and gender equality. The authors contend that at intermediate levels of development men begin to realize that although the size of the pie is growing, so to speak, their portion of it is growing smaller. The attendant backlash from entrenched patriarchal institutions, manifested in various ways such as occupational discrimination, acts to erode gender equality. Nonetheless, Eastin and Prakash find that the gender gap narrows beyond this point (i.e., above income levels of $8,000 per capita) as gender equitable social norms become more pervasive and as women develop the human capital necessary for advancement in the labor market.

While the work of Eastin and Prakash represents a valuable contribution to the literature, several shortcomings compromise the internal validity of this study. In addition to other variables such as Labor-Force Participation, and Female Parliamentary Participation, Eastin and Prakash use the Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM) as indicators of gender equality. However, according to the UNDP, "the GDI is not a measure of gender inequality" (United Nations Development Program (UNDP), 2009). As the GDI is the Human Development Index (HDI) adjusted downwards for gender inequality, the UNDP suggests using either the difference or the ratio of these two indicators to operationalize gender equality. Moreover, due to the nature of

certain variables used to construct the index, a rich country cannot have a low GEM value and a poor country cannot have a high GEM value. Thus, as Dijkstra (2006) observes, the GEM reflects absolute welfare levels rather than the level of gender equality a nation has achieved. Therefore, Eastin and Prakash's study may not accurately measure gender inequality.

Dollar and Gatti (1999) study the impact of economic growth on the education gender gap and find strong evidence that increases in per capita income lead to reductions in gender inequality. However, the relationship seems to be nonlinear for secondary education: moving from being a very poor country to a lower or middle income one makes little difference in terms of gender gap. At higher stages of development though, increases in income tend to reduce this gap. The authors claim that one possible explanation for this nonlinearity is that the market failures that hinder girls' education dissipate as countries become rich enough. Their results basically indicates that, as income increases up to a level of about $2,000 per capita (PPP adjusted), there is no tendency for female educational achievement to catch up with the superior male achievement. After that level of income, on the other hand, there is a strong tendency to catch up. This convex relationship comes through clearly when the data set is broken in half based on per capita income.

Easterly (1999) estimates the gender measure of female to male secondary school enrollment ratio with the only right-hand-side variable as per capita income. In a panel with fixed effects, he shows that there is a positive ("right" sign) relationship between income and gender equality. Easterly's work establishes that the correlation between income and gender equality in secondary education is not simply a cross-sectional association, but in fact is true for individual countries as they develop. Also, Easterly (1999) fixed effects results show that female to male primary enrollment is significant with the "wrong" (negative) sign with respect to income.

Employing OLS and IV panel regressions with country fixed-effects, Chen (2004) shows that while all of the estimated coefficients of the trend real GDP per capita variable are positive, none are statistically significant in affecting gender equality in primary and secondary education enrolment. In addition, the results show that increases in the level of ICT infrastructure and youth sex ratio tend to improve gender equality in education. Also, Chen's results show that education among the general population is important for improving gender equality.

Democracy

Cooray and Potrafke (2011) posit that democracy promotes gender equality, including in particular in education, since women can better express their views and interests in democracies. It is therefore argued that democracies promote gender equality through an educated middle class; democratic governments spend on educating girls; income redistribution and public good provision in democracies reduce pressure on sons to take care of their parents in old age and illness (when parents expect their sons to take care of them in old age, incentives of a family to invest in the education of a son rather than in the education of a daughter increase); and men in democracies have a self-interest in educating their daughters. Beer (2009) also argues that democracy facilitates gender equality through mobilization of women and electoral accountability: women can better organize to express their views and interests; they can obtain and disseminate information; and they may lobby for improving their status through education. Klasen and Wink (2003) note that women may also be empowered to positions of leadership since democracy increases women's bargaining power within the household, which can permit a mother to invest more in health and education of her children. In this sense, the improved bargaining position of a mother can improve the bargaining position of a daughter in relation to a son-in-law (Doepke and Tertilt, 2009).

On the other hand, it has been argued that political elites in autocratically ruled societies have incentives not to encourage education and investment in human capital because economic development will give rise to a middle class that will seek democratic institutions and accountability from government (Bourguignon and Verdier, 2000; Hillman, 2007; Welzman, 2010). Therefore, if education of girls is in particular conducive to economic development, self-preservation of political elites in non-democratic societies will be an explanation for gender bias against girls in education in government schools.

Empirical evidence on the influence of democracy on gender equality in education has produced mixed results. Using a sample of 105 high and low-income countries, Brown (2004) results suggest that only an executive-recruitment sub-component of democracy has a positive influence on gender equality in education, measured as the average number of years women attended school divided by the average number of years men attended school in 1990. On the other hand, using a sample of 179 developed and low-income countries between 1960 and 2004, Beer (2009) finds that democracy may have negatively influenced gender equality in educational attainment measured as the difference between the average years of educational attainment of women and men. However, the results are sensitive to the inclusion of an illiteracy variable, the exclusion of which made the democracy variable positive.

It is also argued that democratically-elected governments have a greater incentive than authoritarian regimes to provide their citizens with primary schooling. Recent evidence from 12 African countries shows a clear link between democracy and greater provision of primary education (Stasavage, 2005;2007).

Cooray and Potrafke (2011) investigate empirically whether political institutions or culture and religion underlie gender inequality in education. The dataset contains up to 157 countries over the 1991–2006 period. The results indicate that political institutions do not significantly influence education of girls: autocratic regimes do not discriminate against girls in denying educational opportunities and democracies do not discriminate by gender when providing educational opportunities. The primary influence on gender inequality in education is through culture and religion. Their results show that discrimination against girls is especially pronounced in Muslim dominated countries.

Dollar and Gatti (1999) have emphasized the role of legal rights, political freedom and religion affiliation; countries that invest poorly in women education are characterized by social and cultural backwardness that limit their growth potential; moreover, they have found that more gender equality is associated with higher levels of family income. Noland (2005) concludes that the reason for the autocratic nature of nations with higher Muslim population is a reflection of being Arab rather than Islamic.

As indicated above, in the literature, religious practices and gender relations are examined by several studies and it is generally concluded that Islam as a reason of persistent gender inequality. For example, Fish (2002) analyzed the impact of Islam on literacy rate, sex ratio, women's political participation, and GEM by using cross-section data and concluded that that as overall, status of women in Muslim countries are inferior rather than in non-Muslim countries. However, Fish explained that the only reason of this result is due to the democratic deficit in these countries.

Demographic Factor (Female Population Share)

To measure the effect of key demographic variable on gender equity in education, female population share is used. Increasing population of women in the national population is expected to increase gender equality in education. More specifically, increases in female-population ratio, a measure of female labor supply, are expected to lead to increases in gender equity in education. Thus, the higher the proportion of women in a nation's total population (an equally empowerment variable), the greater the level of gender equality in education in that country.

In like manner, Gomez-Salvador and Leiner-Killinger (2008) find that there is a positive relationship between the share of young people in the total population and the youth unemployment rate in the Euro Area, i.e. the smaller the share of young people in the population, the lower the risk of them being unemployed in the Euro Area. Also, Chen (2004) finds that the youth sex ratio, being a pure demographic variable, has significant positive effect on gender equality in education. In a recent study, Tseloni *et al.* (2011) find that a relatively greater participation of women in paid employment is evidenced in more populous countries and with a greater share of women in their populations. Also, recently, Anyanwu and Augustine (2013) find that the ratio of female to male population has negative and highly statistical significant effect on gender equality in employment in Africa.

The inclusion of the female population share is also a control variable that ensures that changes in gender equality in education due to changes in the gender population ratio are properly accounted for. In light of the above, the female population share is expected to have a positive effect on gender equality in education. More specifically, increases in the female population share are expected to lead to increases in gender equality in education.

Culture/Religion

Cultural factors can exacerbate gender inequality as societal norms may inculcate reticence, value obedience and deference to males, and limit women's involvement in the public sphere, including school attendance. And Böserup (1970) acknowledges that cultural traditions, including the role of women in the traditional sector of market trade, seem to be a more important factor in determining the place of women in the modern trade sector than is the stage of general 'modernization' achieved by the country. In addition, patriarchal family structures, discriminatory labor practices, differential inheritance laws, and social mores shape the male-female power relationship and foster gender inequality. Some studies find that Muslim and Latin American countries are more likely to be characterized by entrenched patriarchal institutions (Böserup, 1970; Moghadam, 1994; Shukri, 1996). In a study of 143 countries and using an additive index of gender equality, Brym (2005) investigate the relationship between gender parity and culture. They find a statistically significant negative relationship between Muslim nations and gender equality, explaining 10.6 percent of the variation in gender equality. Also, in their longitudinal study, Forsythe *et al.* (2000) find that gender inequalities are less likely to decline over time in countries with strong patriarchal institutional legacies.

As Seguino and Lovinsky (2009) argue, the nature of religions as organizational structures, which tend to be hierarchically structured and conservative rule-based institutions, is a strong explanation for their inculcation of gender inequitable norms. A further impetus towards hierarchy is related to the economic role organized religions play. To varying degrees, they have access to and control over material resources, and as such, exercise power to create and maintain social norms that perpetuate structures of power that preserve their control. Elite groups tend to capture power in institutions, and thus, patriarchal dominance in the economic sphere is likely to be replicated in religious organizations.

Thus, as Norris and Inglehart (2004), Kardam (2005), and Sen (2007) argue, religious institutions may reflect patriarchal values in order to buttress the economic, social and political power of males to the disadvantage of women. If religious institutions inculcate gender norms and rules that disadvantage women, we might also expect they would hinder policy efforts aimed at closing gender gaps in important areas such as education.

Indeed, where patriarchal norms dominate the social landscape, the heterosexual family and the norm that women's primary role is to care for children and others, serving as unpaid homemaker, are emphasized. Also, sons tend to be more valued than daughters in patriarchal contexts.

Two transmission mechanisms exist on why religiosity might have an impact on education inequality. First, at the micro level, gender unequal attitudes act as a "stealth" factor, shaping every day decisions in labor markets, in household decision resource allocation, and through impacts on government spending and resource allocation. For example, families make decisions on which child to invest resources in. Thus, it is expected that insofar as religion affects norms and attitudes, there will be consequent and measurable effects at the country level on gender gaps in education. The second transmission mechanism is the effect of religious attitudes on government's distribution of

resources (e.g., for education, health care) and regulation, such as enactment and enforcement of anti-discrimination legislation in education, among others. Therefore, in countries with dominant religions that are gender inequitable in their attitudes, it is possible that gender outcomes (such as access to education) are worsened through the government channel as well.

Empirical results from Seguino and Lovinsky (2009) indicate that the greater the degree of religiosity in a country, the more gender inequitable well-being outcomes (including access to education), even after controlling for level of GDP. According these authors, the effect of religiosity is likely transmitted via a "stealth" effect on everyday behavior in a variety of transactions and interactions, such as in labor markets, in household decision resource allocation, and through impacts on government spending and resource allocation.

In a more recent paper, Seguino (2011) investigates the effect of religiosity on attitudes toward gender equality using World Values Survey data. Results indicate that religiosity is strongly correlated with gender inequitable attitudes across countries. In particular, OLS, TSLS, and 3SLS regression estimates reveal that gender inequitable attitudes are associated with negative effects on of gender equality in education though no single religion stands out as more gender inequitable than others. Again the conclusion is that the impact of religiosity is likely transmitted via "stealth" effects on everyday behavior in economic transactions in labor markets, household resource allocation, and government spending.

According to the Inglehart and Norris (2003), the reason for cultural conflict between Islamic countries and the West is not their political system (democracy), but gender equality. They find that Muslim societies are significantly less supportive on equal opportunities and rights for women. Rauch and Kostyshak (2009) analyze the gender gap in education and labor force participation in Muslim countries. They use the Muslim percentage of county's population as an explanatory variables and found that gender gap in 100% Muslim countries is 18.3% higher than a country with 0% Muslim population share. However, when they add a dummy variable for Arab countries, Muslim ratio loses its significance. They conclude that Arab effect explains Islamic effect. According to their suggestion, if it is not Islamic effect, there are two reasons to explain the results; social pressure on married Arab women due to the common belief of supporting them by husbands, and very strong beliefs and expectations about mothers to continue their careers as mothers at home. Abdelali-Martini (2011) also adds that staying at home, instead of working, is seen as a symbol of prestige for women in MENA region, which may explain these trends. Additionally, Donno and Russett (2004) concluded that the effect of Islam is much stronger and consistent in Arab countries.

However, studies analyzing gender equality in the 73 MENA region from the Islamic orientation point of view argue that Muslim countries still have some cultural and political drawbacks affecting equality within society (Fish, 2002; Inglehart and Norris, 2003). Dollar and Gatti (1999), Inglehart and Baker (2000) and Hillman and Jenkner (2004) indicate that religion and other aspects of culture including ethics and the absence of the rule of law can inhibit education of girls. Indeed, in the cases of radical Islam, education of girls may be punishable by death, for the girls and for their teachers as recently evidenced in the case of Pakistani girls, whose faces Malala Yousafzai respresents today. Therefore, Brotman *et al.* (2008) suggest understanding the role of political Islam (Law of Islam) in the MENA region before understanding the policy or traditional culture in that region.

Using a sample of 97 high and low-income countries, Norton and Tomal (2009) find that the proportion of Hindu and Muslim adherents in a country has had a negative influence on female educational attainment, measured as the absolute differences between male and female percentages for four levels of educational attainment.

Cooray and Potrafke (2011), in a study of 157 countries, find that the primary influences on gender inequality in education are culture and religion. In particular, their results show a positive and significant effect of Christianity on girls-and-boys enrolment ratios at the primary and secondary level. By contrast, the results show that Islam and indigenous religion significantly and negatively affect gender equality in education at the primary and secondary levels. These results remain with or without the inclusion of Eastern European and high-income countries.

Also, Kucuk (2013) uses a cross-sectional data set for 209 countries to examine the relationship between gender inequality and its determinants, such as education in the Middle East and North Africa (MENA) region. The aim is to test whether the regulation of social life by Islamic norms and values is related to gender inequality and whether the impacts differ for the MENA countries, as well as Arab and Muslim majority countries. The study finds that the impact on gender inequality differs for the MENA, Arab and Muslim majority countries only when control variables are excluded from the regressions. The apparently significant religious and oil impacts disappear once control variables, such as the institutional quality, education, and ICT, are incorporated into the regressions. Thus, the paper obtains empirical evidence against the belief that the religion and oil are culprits responsible for holding women back in the MENA, Arab, and Muslim majority countries.

Dollar and Gatti (1999) also find that high female primary attainment is associated with the Protestant religions and with good civil liberties, while low achievement is weakly associated with the Muslim and Hindu religions. The religious variables indicate the share of the population that follows a particular religion. There are also large positive coefficients on the Shinto variable (virtually an indicator for Japan).

Domestic Investment/Gross Capital Formation

One of the macroeconomic variables affecting gender equality in education is domestic investment. Domestic investment is a key source of employment, wealth creation and innovation. Increasing domestic investment levels is also fundamental to poverty reduction. Without it, countries are unable to spur the growth of their economies or to sustain the reduction of poverty over the long term. Where domestic investment is low, the productive capacity of the economy fails to increase. This results in lower rates of economic growth, fewer opportunities for the poor to improve their livelihoods, and lower rates of job creation. As Anyanwu (2013) had argued, the higher the value of

investment rate, the more resources a government and the private sector ostensibly have at their disposal to spend on economic and social programs, including investments for education expansion and policies/programs for enhancing education equality. Domestic investment creates employment opportunities for females and increases economic growth which again enhances the states' ability to invest in social sector and women specifically. Domestic investment increases demand for inputs and consumption, resulting in increased skilled labor. This works as a motivation to invest in human capital expansion such as education. It also increases the productivity and efficiency of labor, resulting in increased employment level and lessening of the gender bias.

ICT/Infrastructure

According to Chen (2004), there are several ways in which an established ICT infrastructure or a high level of ICT availability can lead to improvements in gender equality, including influencing public opinion on gender equality, increasing educational opportunities for females, and increasing economic opportunities for women. Since ICTs allow an increased flow of information and knowledge, their availability and use increased exposures to the customs, norms and practices of other cultures and societies. This in turn tends to increase awareness of issues surrounding gender inequality, which can positively change people's attitude, including women themselves, towards women by disseminating educational programs on gender equity. Also, increased pressure from an informed constituency that are sensitive to gender inequality issues can motivate, if not force, policy makers to include gender as an important component of their social and economic policies. In addition, ICTs can provide innovative ways for women to obtain and update their skills, for instance, through distance learning. It is recognized that ICTs that reduce time on family chores are likely to increase family members' ability to engage in educational opportunities. Further, it has been shown that new and emerging technologies, when accessible, can help people, by opening new education and economic (including employment) opportunities, breaking down information barriers, enabling people to take collective action, and helping those in isolated communities engage in educational activities and commerce. In this study, we use telephone and mobile phones (per 1,000 persons) to proxy infrastructure.

Natural Resources

Another important issue is that most countries in the MENA region and Africa are natural resources-endowed, especially oil-exporting countries, and in most studies, oil sector is classified as male dominated sector, which discourages women to enter labor market (Moghadam, 2004; Ross, 2008) and hence promotes gender inequality. In such studies, this is analyzed as a "cultural effect" in Muslim-dominated countries where female education, for example, is considered socially and culturally acceptable as long as it does not interfere with women's primary role as wives and mothers given the notion, belief and persistent stereotypes that motherhood and child care represent a "woman's true vocation" (Blackburn, 2004; Stivens, 2006). However, in Africa, the pattern of gender equality in education in Africa partly reflects natural resource endowment structure, whereby gender equality in education is relatively higher in fossil fuel and mineral-rich economies. In addition, as the case of Tunisia demonstrates, legislation can codify social norms and "gendered beliefs" into gender-equalizing education practices.

Current research on gender (in) equality is subject to a number of key limitations. Firstly, as this section has demonstrated, the literature to date has primarily focused on the effect of economic growth on gender-based outcomes in lieu of other potential determinants of the gender gap. Given the increasing focus on reducing the role of government (including its consumption) in an era of fiscal constraints, an investigation of this relationship is merited. Moreover, given the role that oil production and exportation, culture, demographic factors, democracy, and the role of the number of primary teachers play in promoting female school enrolment, and the impact of these factors on female empowerment, a comprehensive evaluation of these factors and their effect on gender equality is needed. In addition, in part due to data constraints, a large portion of the existing research is not disaggregated by major regions and does not compare North African to Sub-Saharan African outcomes. This limits quantitative analysis and makes it difficult to uncover evidence of gender inequalities by sub-region.

Additionally, several studies use the household as the primary unit of analysis, dividing households into male- and female-headed households. While this distinction has been useful in demonstrating the extent of female poverty and the hardships experienced in female-headed households, it conceals the differential impact on women in male-headed households and obscures the complexities of intra-household gender relations. This data collection method erroneously assumes either perfect egalitarian sharing of resources within households or an asymmetric distribution across all households, with the former predominating (Razavi, 1997).

Finally, the overwhelming majority of the research to date is qualitative in nature, partially as a result of problems with data measurement and availability. Qualitative studies provide important insights into the nature of the gender gap in tertiary education enrolment in specific contexts and are able to uncover the mechanisms through which inequalities affect women's lives. However, unlike qualitative analysis, quantitative research is able to isolate the effects of certain factors on gender equality in education enrolment. Given the complex, often-interrelated nature of the determinants of gender (in) equality, a comprehensive quantitative study represents an important contribution to this burgeoning field of research.

5. The Model and Data

5.1. The Model and Estimation Techniques

Based on the above review and following the frameworks posited by Chen (2004), Tseloni *et al.* (2011), Eastin and Prakash (2013), and (Anyanwu, 2012;2013), the relationship that we want to estimate can be written as:

$$logGETE_{it} = \sigma_i + \beta_1 \log(rgdppc_{it}) + \beta_2 \log\left(rgdppc_{it}^2\right) + \beta_3(X_{it}) + \delta_i + \varepsilon_{it} \ (i = 1, \ldots . N; t = 1, \ldots . T) \ldots \ldots \ldots (1)$$

where GEPE is the measure of gender equality in tertiary education enrolment (ratio of female to male tertiary education enrolment) in country i at time t; α_i is a fixed effect reflecting time differences between countries; β_1 is the elasticity of gender equality with respect to real per capita GDP in 2000, rgdppc; β_2 is the gender equality elasticity with respect to quadratic real per capita GDP; X is the control variables, including domestic investment, net ODA, economic globalization, political globalization, political globalization, ethnic fractionalization, mobile phone subscriptions (ICT) (per 100 people), democracy, civil war prevalence, religion dominance (Christianity or Muslim), women's population share, and natural resource rent (% of GDP). In addition, δ_i denotes regional effects, while ε_{it} is an error term capturing all other omitted factors, with $E(\varepsilon_{it}) = 0$ for all *i* and *t*.

The model defined in equation (1) includes a lag dependent variable. Due to potential endogeneity bias, OLS may lead to inconsistent parameter estimates. We therefore use the Generalized Method of Moments (GMM) estimation technique.

5.2. The Data

Data (1970 to 2012) for the variables in equation (1) are largely drawn from the World Bank's WDI Online database, except democracy from the Polity iv project (2013) and religious dominance from the World Fact Book. The descriptive statistics are presented in Table 3. It reports the sample mean and standard deviation of the variables used in the estimations.

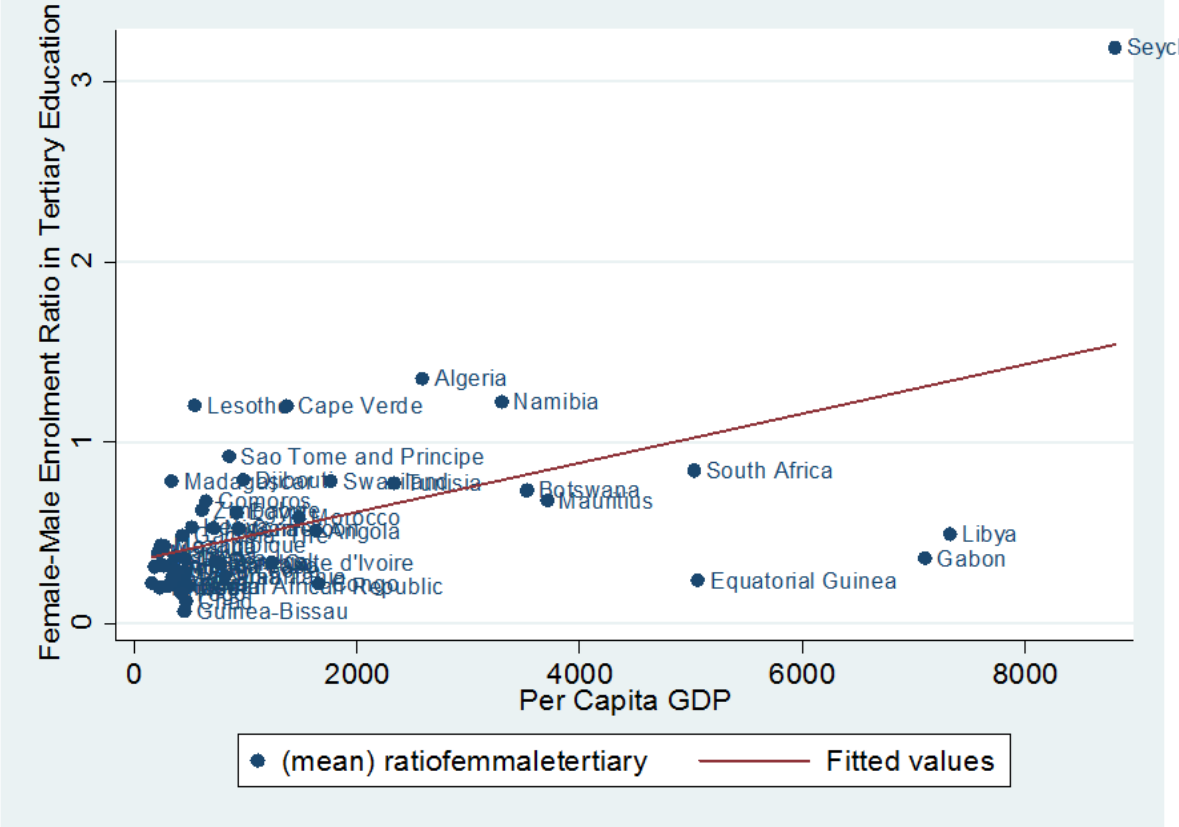
Table-3. Descriptive Statistics of Main Regression Variables (Excluding Dummies), 1970-2012

Variable	Observations	Mean	Standard Deviation
Gender equality in tertiary school enrolment	973	0.480	0.371
Log of Real GDP per capita	2007	1397.514	2106.888
Domestic investment (%GDP)	1822	21.517	15.322
Net ODA (%GDP)	2025	0.112	0.124
Economic globalization	1843	38.217	14.406
Political globalization	2185	46.025	19.466
Social globalization	2190	24.791	10.807
Ethnic fractionalization	2236	0.640	0.246
Mobile phone subscriptions (ICT)/(per 100 people)	2059	9.960	24.246
Democracy	2113	-2.361	5.858
Christian dominance	2092	39.322	32.837
Moslem dominance	2092	40.018	38.666
Female population share	2322	50.362	0.844
Natural Resource Rent	2065	12.414	14.818

Note: These are raw data before the log and other transformations.
Source: Author's Calculations.

Figure 7 shows a positive linear relationship between average gender equality in tertiary education enrolment and per capita GDP over the period, 1970 to 2012.

Figure-7. Africa: Positive Linear correlation between gender equality in tertiary education enrolment and GDP per capita, 1970-2012.



Source: Author, using estimation data.

6. Empirical Results and Analysis

Table 4 shows the results when Equation (1) is estimated using the GMM with sub-regional fixed effects. The Sargan test of overidentifying restrictions fails to reject that the instruments are valid, i.e., not correlated with the error term at conventional significance levels in all reported regressions (p-value of 0.1582 in column 1, 0.3290 in column 2 (see Table 4). The Sargan's test statistics are insignificant throughout, indicating that the instruments are valid.

I*nertia (Lag of Gender equality in tertiary school enrolment*

Our results indicate that recent performance in gender equity in tertiary education in a country seems to hugely and significantly increase future gender equality in tertiary education in the same country. The lag of gender equality in tertiary education is positive in sign and significant at the 1 percent level.

Level of Economic Development

In our results, the coefficient associated with the level of real GDP per capita is found to be positive and statistically significant. The result provides evidence of a linear relationship between real GDP per capita and gender equality in tertiary education and an inverted U-shaped relationship was not found. Thus, the higher the level of real GDP per capita (economic development) the higher the level of gender equality in tertiary education enrolment. This finding supports those of Chen (2004) and McDaniel (2014), among others.

Domestic Investment

A nation's domestic investment rate is found to be positively and significantly associated with gender equality in tertiary education enrolment in Africa. This shows that domestic investment matters for gender equality in tertiary education in the continent and agrees with the findings of Seguino (2006).

Globalization

The relationship between political globalization is not linear, but U-shaped. This novel result suggests that although higher levels of political globalization are negatively associated with gender equality in tertiary education enrolment, the effect is not constant. For levels of political globalization above a certain point, higher levels of political globalization act to increase gender equality in tertiary education enrolment Africa, holding other factors constant. This relationship suggests that the marginal effect of political globalization exhibits increasing returns for gender equality in tertiary education enrolment in the continent.

However, while social globalization has insignificant effect (unlike in Potrafke and Ursprung (2012)), economic globalization has positive significant effect on gender equality in tertiary education enrolment (confirming the results Potrafke and Ursprung (2012)) but leads to the non-significance of economic development.

Ethnic Fractionalization

Ethnic fractionalization has high positive and significant effect on gender equality in tertiary education enrolment in Africa, demonstrating the sensitivity to ethnic composition of the population in admission policies of most tertiary institutions, especially as most of them are federally-owned. In some countries like Nigeria, the federal character principle works in adequate representation of various states and ethnic groups in admission policies. In addition, state- or regionally-owned tertiary institutions help to make up any short fall at the federal level.

Democracy

Democracy is found to have a statistically significant, linear positive impact on gender equality in tertiary education in the continent. This supports a number of existing literature that more open, democratic societies promote gender equality in education. Democracy is positive in sign and significant at the 5 percent level. Thus, holding other variables constant, more democratic societies tend to experience greater levels of gender equality in tertiary education. This confirms earlier findings such as Anyanwu and Erhijakpor (2007). However, it contradicts Eastin and Prakash (2009) find little evidence that democracy is associated with gender equality in tertiary education.

Civil War/Conflict

Our results indicate that civil war, as a political destabilizer, acts as deterrent to gender equality in Africa's tertiary education enrolment. This supports the earlier findings of Lai and Thyne (2007), Merrouche (2006), Akresh and de Walque (2008), Akbulut-Yuksel (2009), and Bell and Huebler (2010).

Culture/Religion

One of the coefficients associated with culture — as proxied by countries with a majority Christian population — is found to be positive in sign and statistically significant at the 1 percent level in our basic estimation (column 1 of Table 4). Holding the other variables in the model constant, countries with a majority Christian population experience a lesser gender gap than countries with majority Muslim population. These results confirm the findings of Forsythe *et al.* (2000), Spierings *et al.* (2008), and Inglehart and Norris (2003) that the Muslim-majority countries have more gender gap than less-Muslim majority ones. In spite of the statistically significant relationship we find in the paper, the result potentially masks large differences between Muslim countries. For instance, Muslim-majority nations vary widely in their geography, abundance of natural resources, per capita GDP, and their interpretation and application of Sharia law.

Sub-Regional Effects

The sub-regional fixed effects, which shift the intercepts, imply that North African countries systematically have more gender equality in tertiary education enrolment than those in Sub-Saharan Africa. This supports the stylized facts presented in section II. Thus lends credence to the assertion that North Africa is indeed different.

None of net ODA, mobile phone subscription (ICT), Moslem dominance, natural resource dependence or female share of the population was found to have significant effect on gender equality in tertiary level enrolment.

Table-4. GMM Estimates of the Determinants of Gender Equality in Tertiary Education Enrolment

Variable	(1)	(2)
Lag of gender equality in tertiary education enrolment	0.604 (19.00)***	0.684 (20.36)***
Log of Real GDP per capita	0.045 (2.01)**	0.020(0.92)
Domestic investment (%GDP)	0.002 (2.45)**	0.001 (1.85)*
Net ODA (%GDP)	0.096 (1.05)	0.060 (0.68)
Economic globalization		0.002 (1.85)*
Political globalization	-0.009 (-3.65)***	-0.007 (-3.02)***
Political globalization^2	0.0001 (2.62)***	0.0001 (2.27)**
Social globalization	0.002 (1.45)	0.001 (0.37)
Ethnic fractionalization	0.325 (3.63)***	0.255 (2.99)***
Mobile phone subscriptions (ICT)/(per 100 people)	0.001 (0.79)	0.0003 (0.40)
Democracy	0.004 (2.54)**	0.005 (3.22)***
Civil war	-0.029 (-1.85)*	-0.033 (-2.17)**
Christian dominance	0.003 (2.67)***	0.003 (2.45)**
Moslem dominance	0.002 (1.56)	0.001 (1.39)
Female population share	-0.001 (-0.07)	0.010 (0.55)
Natural Resource Rent	-0.001 (-0.94)	-0.001(-1.01)
Sub-Saharan Africa		-0.135 (-2.00)**

North Africa	0.114 (1.85)*	
Constant	-0.263 (-0.26)	-0.646 (-0.68)
Wald chi2	2119.00	2467.93
Prob > F	0.0000	0.0000
N	530	512
Sargan test	417.9619 (0.1582)	389.6268 (0.3290)

Note: t-values are in parentheses; ***= 1% significant level; **=5% significant level; *=10% significant level.
Source: Author's Estimations.

That oil-exporting nations tend to increase gender inequality by excluding women from the formal economy.

7. Conclusion and Policy Implications

Our results show that the coefficient associated with the level of real GDP per capita is positive and statistically significant in Africa Our results also suggest that inertia (lag of gender equality in tertiary education), higher domestic investment, economic globalization, ethnic fractionalization, democracy, and Christian dominance in a country increase gender equality in tertiary education enrolment in the continent. However, increases in civil war prevalence tends to lower it. Also, the relationship between political globalization and tertiary education is not linear, but U-shaped, suggesting that although higher levels of political globalization are negatively associated with gender equality in tertiary education enrolment, the effect is not constant.

What are the implications of these results for African countries? First, our results confirm that prosperity (higher economic development) promotes equality in tertiary education in African countries. In particular, increases in GDP per capita, a measure of standard of living, lead to a large increase in gender equality in tertiary education in Africa, especially at their current initial levels of development. Therefore, African countries must take measures to increase their national incomes. To increase per capita income, African countries must deepen macroeconomic and structural reforms to increase their competitiveness, create increasing and more quality jobs and hence increase participation in economic activity, dismantle existing structural bottlenecks to private and public investment, scale-up investments in hard and soft infrastructure to enhance local production and regional integration, structurally transform the economy for increased trade competitiveness in knowledge-intensive manufacturing, and increase productivity, especially in agriculture, through creating incentives and opportunities for the private sector and increasing government support to small farm holders in terms of finance, formalization of land ownership, and technical advice.

Second, given our finding that the domestic investment rate increases gender equality in tertiary education in most of Africa, achieving higher levels of investment as its effectiveness must remain an active goal of governments in Africa. A key challenge, for African countries, therefore, is to mobilize increased resources for high domestic investment. Successful promotion of investment in Africa will require actions and measures at the national and regional level as indicated earlier. Further efforts should also be made to improve the efficiency and effectiveness of public institutions, if these are to serve as genuine partners with the private sector. Sustainable domestic investment needs increased human capital investment to enhance the health and welfare of populations and generate the skills required in a competitive global environment.

Third, given the differential impacts of globalization, instead of rapid liberalization, especially in the political and social spheres, a selective approach to liberalization should be adopted. Regional cooperation in the area of policy coordination in reaching common positions on global issues is paramount. This is especially because policies that used to be taken at the national level as the prerogative of national governments are increasingly being made at fora, institutions and negotiations at both the international and regional levels. In the absence of a more effective collective voice at such international fora, African countries will find even more that their national policies on economic, social and cultural matters will continue to be made and dominated by the more powerful Western governments and the institutions they control. African policy coordination should give priority to efforts to strengthen global bodies such as the UN system and to democratize international institutions and relations. This will enable countries of the continent to have the space and opportunity to strengthen their economies and to develop their political and social infrastructure that are conducive for greater gender equality in various sphere of development.

Fourth, African countries must implement policies to reduce the incidence of civil wars in the continent as well as promote effective peace and stability. They must prevent and properly manage key scenarios fueling civil wars due to oil wealth (especially rentier, repression and corruption effects) and societal fractionalization and polarization. Actions will include institutionalization of inter-ethnic elite accommodation, in which elites from rival ethnic groups are co-opted into the political system (ethnic power sharing) as a means by which to reduce coup d'états that precede wars as well as federate the different ethnic groups via a coalition of their elites. Greater accountability and transparency in managing natural resource revenues, promotion of the rule of law and hence democracy, will be part of the solution (Anyanwu, 2014).

Fifth, the promotion of effective democracy will help in the design of policies friendly to gender equality in tertiary education. This requires political will, commitment, good governance (including the control of corruption, transparency and accountability, the rule of law, government effectiveness, and political stability), inclusive development, collaborative spirit to formulate and faithfully implement the requisite policies, strategies, plans and collective action as well as the institutional changes needed for increased gender equality in education. Following their empirical results, Anyanwu and Erhijakpor (2014) advance critical measures to promote democracy in Africa, including promoting and maintaining effective rule of law, deepening macroeconomic and structural reforms and

increasing investments to raise national income, and implementing greater economic and political inclusion, especially in North Africa.

Democracy will thrive and be sustained and stable when there is the willingness to lose (contestation) and when there are capacities to challenge and enforce the rules of the game. Contestation means that parties are able to win but are willing to lose. In other words, opposition parties have to be able to compete effectively with incumbents, with the credible potential to hold incumbents accountable while voters and parties must be willing to lose elections. Also, laws must be effectively enforced. This means that a sturdy, thriving, durable and stable democracy requires a government with the capacity to enforce both the rules of the game and the policies produced through those rules against violation or nullification either by abusive agents of the government itself or by private actors, whether common criminals, would-be warlords or the military.

Sixth, policies to transform cultural/social norms and practices, especially in predominantly Muslim countries, are essential. In particular, the process of rapid urbanization in most African nations that is currently underway brings with it the possibility of newly defined roles for men and women, as traditional social norms and production relations become more relaxed and new parameters regarding appropriate forms of behavior are formed. The education system (right from nursery to tertiary levels) should also be used as an important means to change gender inequality and promote social norms from a young age. Indeed, the integration of gender equality principles into the school and professional curricula can tackle the value system of children early on and challenge discriminatory social norms. In addition, promoting women's voice and participation in public settings and increased information obtained from exposure to enlightened television programming also play a critical role in changing social norms.

The range of strategies that we have proposed in this paper based on our empirical results to promote greater gender equality in tertiary education addresses key supply and demand constraints. In conclusion, it is important to note that the SDGs' campaign offers an opportunity to attend to the unfinished business of development by fulfilling the promises made by world leaders to reduce poverty, end hunger, improve health and eliminate illiteracy. Gender inequality fuels many of these ubiquitous challenges and is exacerbated by them. Conversely, gender equality and the empowerment of women can secure the future of women themselves, their households, and the communities in which they live. Ensuring that girls/women do not continue to suffer the disadvantage of illiteracy and lack of education, including at the tertiary level, is critical for building women's capabilities, a first step in the empowerment process. It is also an essential ingredient for ensuring child health and welfare, reducing maternal mortality, and breaking the cycle of intergenerational poverty. Collectively and individually working towards equality between girls/women and boys/men in education is vital if girls and boys are to look ahead to a better future.

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