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ON THE GENDER GAP, ICT AND INSTITUTIONAL QUALITY: A DYNAMIC PANEL DATA ANALYSIS

The objective of this study is to examine the relationship between gender gap, information communication technology (ICT), and governance and institutional quality. The study also analyzes how ICT interacts with social and institutional infrastructure to impact gender equality. Using a panel dataset for 209 countries covering the period from 2000 to 2010 and the dynamic panel generalized method of moments estimation (GMM), the paper finds that both ICT and institutional infrastructure have significant positive effect on gender equality. More importantly, simultaneous improvement in ICT and institutional quality exerts an independent influence on gender equality, over and above any influence each of these two variables may separately have.

Keywords: *gender gap; ICT; institutional quality; panel data.*

JEL Code: *J16, O33, H11, C23.*

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ГЕНДЕРНІ ВІДМІННОСТІ, ІКТ ТА ЯКІСТЬ ОРГАНІЗАЦІЇ: АНАЛІЗ ДИНАМІЧНИХ ПАНЕЛЬНИХ ДАНИХ

У статті вивчено взаємозв'язок між гендерними відмінностями, інформаційно-комунікаційними технологіями (ІКТ), а також управлінням і якістю організації. Дослідження також аналізує, як ІКТ взаємодіє з соціальною і інституційною інфраструктурою щодо впливу на гендерну рівність. Використано дані по 209 країнам за період з 2000 по 2010 рр. і метод динамічних панельних даних. Встановлено, що і ІКТ, і інституційна інфраструктура значно позитивно впливають на гендерну рівність. Більш того, одночасне поліпшення ІКТ і якості організації має незалежний вплив на гендерну рівність, що перевищує окремий вплив кожної із цих двох змінних.

Ключові слова: *гендерні відмінності, ІКТ, якість організації, панельні дані.*

Таб. 3. Рис. 3. Фор. 2. Літ. 27.

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ГЕНДЕРНЫЕ РАЗЛИЧИЯ, ИКТ И КАЧЕСТВО ОРГАНИЗАЦИИ: АНАЛИЗ ДИНАМИЧЕСКИХ ПАНЕЛЬНЫХ ДАННЫХ

В статье изучены взаимосвязи между гендерными различиями, информационно-коммуникационными технологиями (ИКТ), а также управлением и качеством организации. Исследование также анализирует, как ИКТ взаимодействует с социальной и институциональной инфраструктурой в плане влияния на гендерное равенство. Использованы данные по 209 странам за период с 2000 по 2010 гг. и метод динамических панельных данных. Установлено, что и ИКТ, и институциональная инфраструктура существенно положительно влияют на гендерное равенство. Более того, одновременное улучшение ИКТ и качества организации оказывает независимое влияние на гендерное равенство, превышающее влияние каждой из этих двух переменных в отдельности.

Ключевые слова: *гендерные различия, ИКТ, качество организации, панельные данные.*

1. Introduction. Gender inequality and disparities between males and females have serious cost implications and these negatively effect human and economic devel-

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opment. The development in information and communication technologies (ICT) may improve human and economic development through its direct and indirect impacts. An indirect impact may arise due its positive impact in reducing gender inequality. Gender and technology relationship were examined in numerous studies. It is commonly expected that ICT should have impact on socioeconomic development and gender equality, especially in developing countries, through different pathways such as increasing productivity (Javala and Pohjola, 2002; Sitiroh, 2002), creating new job opportunities (European Commission, 2004; OECD, 2010). This optimistic view on the relationship between ICT and gender equality is supported by Gajjala and Mamidipudi (1999), Lagesen (2008), and Wajcman (2009), among others. On the other hand, the pessimistic view emphasizes that ICT increases the gender inequality due to socioeconomic inequalities (Arun et al., 2004; Gigler, 2004; Koutsouris, 2010). This view is based on the argument that some factors will limit women's access to ICTs in most countries, especially in rural areas, and this will increase the gender division.

In this study, we propose and test the hypothesis that combination of better ICT and governance and institutional quality exerts an independent influence on gender equality, over and above any influence each of these two variables may separately have. We term this hypothesis as the "simultaneity hypothesis".

The study uses the panel data set for 209 countries for the period from 2000 to 2010 to investigate (1) the impact of ICT on gender equality, (2) the impact of governance and institutional quality on gender equality, and (3) test the simultaneity hypothesis that simultaneous improvement in institutional quality and ICT has an impact above and beyond the separate impact of both on gender equality. The econometric estimation uses 2 measures of gender inequality in education and employment. The ratio of girls to boys in primary and secondary education is used as a measure of the degree of gender equality in education. The ratio of female to male labor force participation rates is used as the measure of gender inequality in employment.

Our study contributes to the existing literature in 3 ways. First, we update the panel data set used in previous studies (Chen, 2004) to cover a longer period and more countries. The paper then uses dynamic panel data estimations methods to properly address the endogeneity issues, which is mostly ignored or only approached with inferior methods in the previous literature. Second, our study, to our knowledge, is the first to investigate the impact of institutional quality and governance on gender inequality. Third, we test the simultaneity hypothesis that combination of better ICT and governance and institutional quality exerts an independent influence on gender equality, over and above any influence each of these two variables may separately have. The study obtains strong evidence in favor of the simultaneity hypothesis.

The rest of the paper is organized as follows. Section 2 introduces underlying economic theory. Section 3 explains the empirical model and estimation methodology. In Section 4, we present the data and the empirical results. Finally, Section 5 concludes the paper.

2. Economic theory on gender equlity, ICT and institutional quality and governance. The objective of this study is to examine the relationship between gender gap, information communication technology (ICT), and governance and institutional quality. The study analyzes how the ICT interacts with social and institutional infrastructure to impact gender inequality. The development in ICT may improve human and economic development through its direct and indirect impacts. An indirect impact may arise due its positive impact of reducing gender inequality. Women are faced in life with "unequal human capabilities" (Nussbaum, 2002, p. 46). Amartya Sen, winner of the 1998 Nobel Prize in economics, gives main theoretical framework on gender discrimination by developing "capability approach". According to this Sen's approach, focusing on what women is able to be or do something is much more important than focusing on what she can consume or the income she receives (Sen, 2001, 2005). On the other hand, the neoclassical approach ignores dynamics and outcomes within a family, and intra-family distribution of income while taking income as overall welfare of people and utility as people's psychological happiness or satisfaction (Hicks, 2002; Sen, 2005). The social structure including the family as well is the main cause of inequalities. Gender inequality leads to reduced access of women to markets, educational and health services, in turn, it causes lower well-being of children and economic growth (World Bank, 2007).

The studies from the feminist point of view largely focus on women's exemption from using information technologies due to various reasons caused by technology itself and society. We can classify the studies on gender and technology relationship under two broad headings. Scholars sharing the first view assume that technology is gender neutral and what is important is how technology is used (Lohan and Faulkner, 2004). The women who have limited opportunities for participating social and economic life due to some constraints, such as time and sociocultural norms, may become more active by using ICT tools.

The second group of scholars assume that technology is gendered, because it is developed and shaped by the society. However, in turn, technology itself affects the society as well (Hodgkinson, 2000; Wajcman, 2009). Lohan and Faulkner (2004) classified the feminist studies on technology as "women in technology" studies, and "women and technology" studies (p. 320). While women in technology studies generally focused on the reasons of being fewer women in technology related occupations, women and technology studies developed two opposite approach to the outcomes of technology, which are optimistic and pessimistic approaches.

According to the group supporting the optimistic view (Gajjala and Mamidipudi, 1999; Lagesen, 2008; Wajcman, 2009), it is commonly expected that ICT should have impact on socioeconomic development and improve gender equality, especially for developing countries, through different channels, such as increasing productivity (Javala and Pohjola, 2002; Stiroh, 2002), creating new job opportunities (European Commission, 2004; OECD, 2010), improving communication without time and place constraint, providing e-commerce and health services, distance education applications (UNDAW, 2002) etc.

Pessimistic view (Arun et al., 2004; Gigler, 2004; Koutsouris, 2010) argues that some factors limit women's access to ICTs in most countries, especially in rural areas, and this increases the gender divide through affecting women empowerment.

Some changes on the structure of institutions for using ICTs may help to empower women and can be the source of gender equality by suggesting new rules such as equality between men and women, rights such as equalizing women's rights, and creating new laws and policies (Prugl, 2004). In this study 6 different dimensions of institutional quality are used to analyze how ICT interacts with social and institutional infrastructure impact gender inequality: i) Bureaucratic quality, which shows the quality and strength of bureaucracy as a shock absorber; ii) Composite risk rating, which shows political, economic and financial risk rates of countries; iii) corruption, which is the failure of governance in economic, financial, and political environment; iv) Democratic accountability, which shows responsiveness of government to its citizenships, as well as free and fair elections; v) Government stability, which shows the ability of government to stay in office and manage programs; vi) Law and order, which shows the strength of the legal system and practice of complying with laws. All these are the supply side components of governance, which have impact on gender inequality in terms of promoting women's rights, effective allocation of resources, increasing economic activities, and building gender sensitive governance (Rao and Kelleher, 2003; Brody, 2009).

3. Empirical methodolgy. The focus of this study is to investigate the impact of institutional quality and governance on gender equality and its interaction with ICT. Validity of simultaneity hypotheses that institutional quality and governance and ICT have interaction, ICT's impact on gender equality improves via indirect channels when institutional quality and governance simultaneously improves.

We use two empirical specifications to investigate the impact of ICT and institutional quality on gender equality. Specifications do differ mainly in terms of their dependent variables, although control variables also differ slightly across the specifications. The first specification uses gender equality in employment as the dependent variable. Gender equality in employment is defined as the ratio of female to male labor force activity rates, which is obtained by dividing the labor force participation rates for females by the labor force participation rate for males. We use 6 measures of ICT access and density in the specification. These are: (1) the number of computers per 100 people, (2) the number of Internet users per 100 people, (3) the number of telephones per 100 people, (4) ICT expenditure as a share of GDP, (5) ICT expenditure per capita, and (6) mobile subscribers per 100 people. Due to high correlation between different ICT measures each variable is used in a separate regression, leading to 6 estimations for the specification. The institutional quality and governance is proxied by 6 variables obtained from PRS. These 6 indicators are: (i) corruption, (ii) law and order, (iii) bureaucratic quality, (iv) composite risk rating, (v) government stability, and (vi) democratic accountability. Since all 6 measures are highly correlated, we construct the index of institutional quality from the underlying 6 series using principal components analysis, which proxies the institutional quality and governance in the estimated regressions. In the first regression specification, per capita real GDP, female average years of total schooling for age 15 and above, total average years of total schooling for age 15 and above, urbanization ratio, and unemployment rate are used as control variables. To account for the possibility of endogeneity, most independent variables are lagged by one year.

The panel regression specification for the gender equality in employment can be written as follows:

$$\Delta RFMLFAR_{i,t} = \beta_1 + \beta_2 \Delta LGDPPC_{i,t-1} + \beta_3 \Delta UR_{i,t-1} + \beta_4 \Delta U_{i,t} + \beta_5 \Delta BLST_{i,t-1} + \beta_6 \Delta BLSF_{i,t-1} + \beta_7 \Delta INSTQ_{i,t-1} + \beta_8 \Delta ICT_{i,t-1} + \beta_9 [\Delta ICT_{i,t-1} * \Delta INSTQ_{i,t-1}] + \beta_{10} \Delta RFMLFAR_{i,t-1} + \varepsilon_{it}, \quad (1)$$

where *i* denotes country, *t* denotes year, and Δ denotes first differences. The variables are defined as follows:

FLFPR = Labor participation rate, female (% of female population above 15 y. o.)

MLFPR = Labor participation rate, male (% of male population above 15 y. o.)

RFMLFAR = Ratio of female to male labor force activity rates, defined as FLFPR/MLFPR

LGDPPC = Logarithm of GDP per capita (current US$)

U = Unemployment, total (% of total labor force)

UR = Urban population (% of total)

BLSF = Barro-Lee average years of total schooling, age 15 and above, female

BLST = Barro-Lee average years of total schooling, age 15 and above, total

INSTQ = Institutional Quality Index

ε = Error Term.

and ICT is one of the following measures of ICT access and density,

LIU = Logarithm of Internet users (per 100 people)

LMCS = Logarithm of mobile cellular subscriptions (per 100 people)

LPC = Logarithm of personal computers (per 100 inhabitants)

LTL = Logarithm of telephone lines (per 100 people)

ICTEPC = Information and communication technology expenditure per capita (current US$)

ICTEPGDP = Information and communication technology expenditure (% of GDP)

The second specification uses gender equality in education as the dependent variable. Gender equality in education is defined as the ratio of female to male primary and secondary school students, which is obtained as the percentage of girls to boys enrolled at primary and secondary levels in public and private schools. The second dynamic panel regression is specified as follows:

$$\Delta RFMPSSS_{i,t} = \beta_1 + \beta_2 \Delta LGDPPC_{i,t-1} + \beta_3 \Delta YR_{i,t} + \beta_4 \Delta BLST_{i,t-1} + \beta_5 \Delta BLSF_{i,t-1} + \beta_6 \Delta INSTQ_{i,t-1} + \beta_7 \Delta ICT_{i,t-1} + \beta_8 [\Delta ICT_{i,t-1} * \Delta INSTQ_{i,t-1}] + \beta_9 \Delta RFMPSSS_{i,t-1} + \varepsilon_{it}, \quad (2)$$

where:

RFMPSSS = Ratio of female to male primary and secondary school students

YR = Youth sex ratio, calculated as ratio of the number of females between the ages of 0 to 14 to the number of males between the ages of 0 to 14.

We estimate the dynamic fixed effects panel data model using the Arellano-Bond system generalized method of moments (GMM) method for the countries with available data. The number of observations used in each regression varies due the data availability for the related variables.

4. Empirical results. The study employs the panel data set for 209 countries for the period from 2000 to 2010. The data is obtained from various sources. The underlying regressions uses gender gap measures obtained from the World Bank World Development Indicators (WDI) database and the OECD. We use several variables for ICT, which are obtained from the International Telecommunication Union's (ITU) ICT Indicator's Database. The data for the governance and institutional quality is obtained from the Political Risk Services Group's (PRS) International Country Risk Guide (ICGR) database. Average years of schooling of the total population, or equivalently average educational attainment, has been frequently used in the growth literature as control variable. Cohen and Soto (2001) and Barro and Lee (1994, 2001) are the two main source of the data on educational attainment. We combine and extend this data set in our study.

Since 6 measures of institutional quality and governance — bureaucracy quality (BQ), composite risk rating (RR), corruption (CO), democratic accountability (DA), government stability (GS), law & order (LO), are highly correlated (See Table 3, third panel) we convert these 6 measures into an index of institutional quality and governance using principal component analysis, which is called INSTQ. INSTQ used in the empirical analysis as an indicator of institutional quality and governance. A major focus of this study is the interaction between ICT and institutional quality. In order give a rough idea on the relationship between these variables Figure 1 plots ICT expenditure per capita against each of 6 institutional quality variables. The linear regression fits are also given in the graphs. Figure 1 shows that all measures of institutional quality are positively correlated with ICT expenditure, which is a measure of ICT availability. In order illustrate that in addition to indirect impact of institutional quality via its impact on ICT, there is also a direct impact on gender equality Figures 2 and 3 plot each of 6 measures of institutional quality against ratio of female to male labor force activity rates (gender equality in employment) and ratio of female to male primary and secondary school students (gender equality in education), respectively. Both Figures 2 and 3 indicate a positive direct impact of institutional quality on gender inequality, although some of the variables are only slightly correlated.

Arellano-Bond System GMM estimation is carried out for both Eq. 1 and 2. Since all 6 measures of ICT access and availability we consider are strongly correlated, which is shown by the Pearson correlation coefficient estimates in Table 1, each ICT measure was entered into a separate regression, leading to 6 regressions for each specification in Eq.1 and 2. The specification of the gender equality in employment (Eq. 1) and education (Eq. 2) introduces correlation between the errors and the lagged first-differenced endogenous variable. This correlation is handled using instrumental variables (IVs). Anderson and Hsiao (1982) proposed using lagged past differences or levels of endogenous variables as instruments (Anderson-Hsiao IV approach). These IVs are proposed within the framework of the generalized method of moments (GMM), since they may not be highly correlated with the first-differenced dependent variable. Alternative, Arellano and Bond (1991) suggested that first differences of the endogenous variable be instrumented with lags of its own levels. This is known as the Arellano-Bond GMM approach.

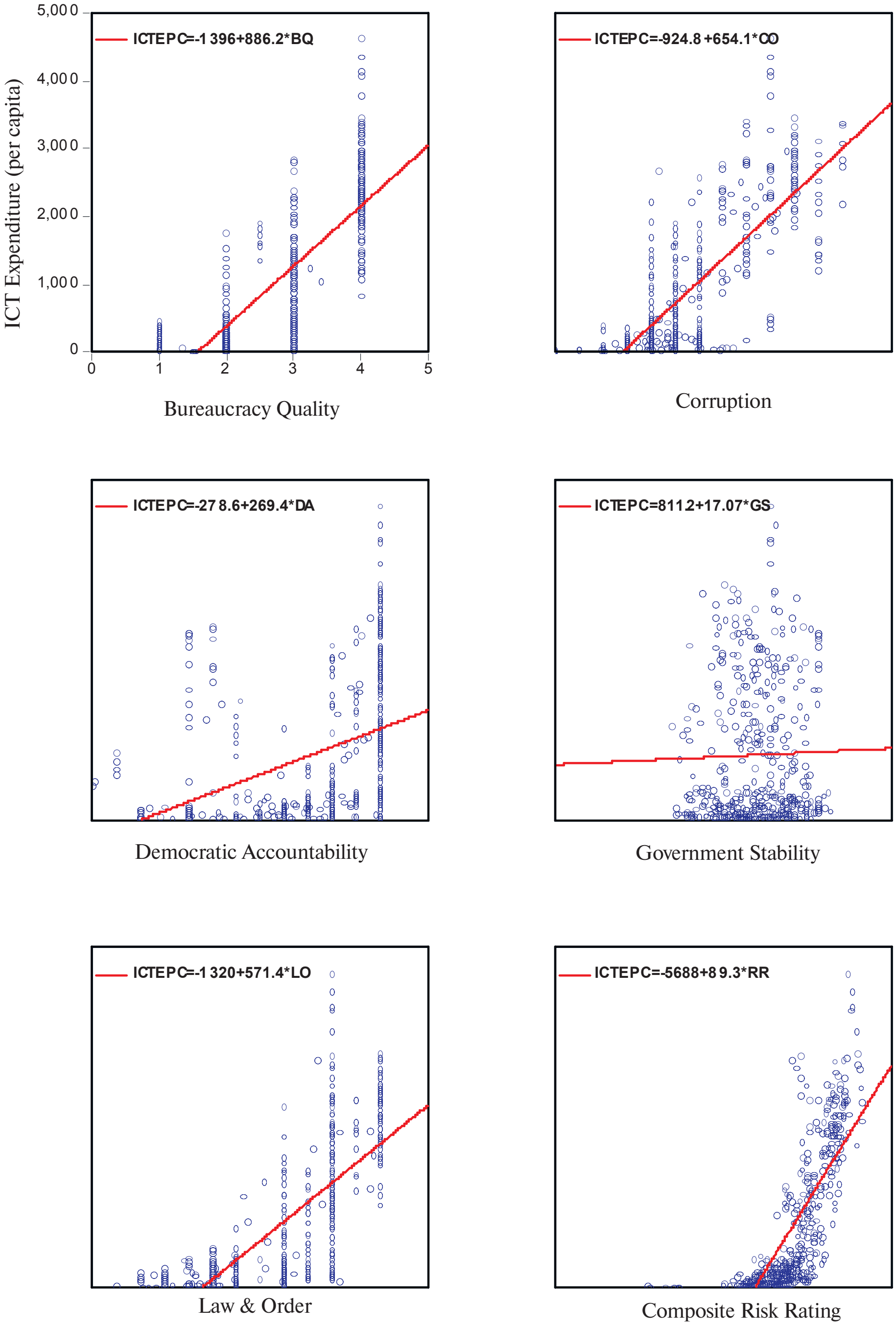

Figure 1. **Institutional Quality and ICT**

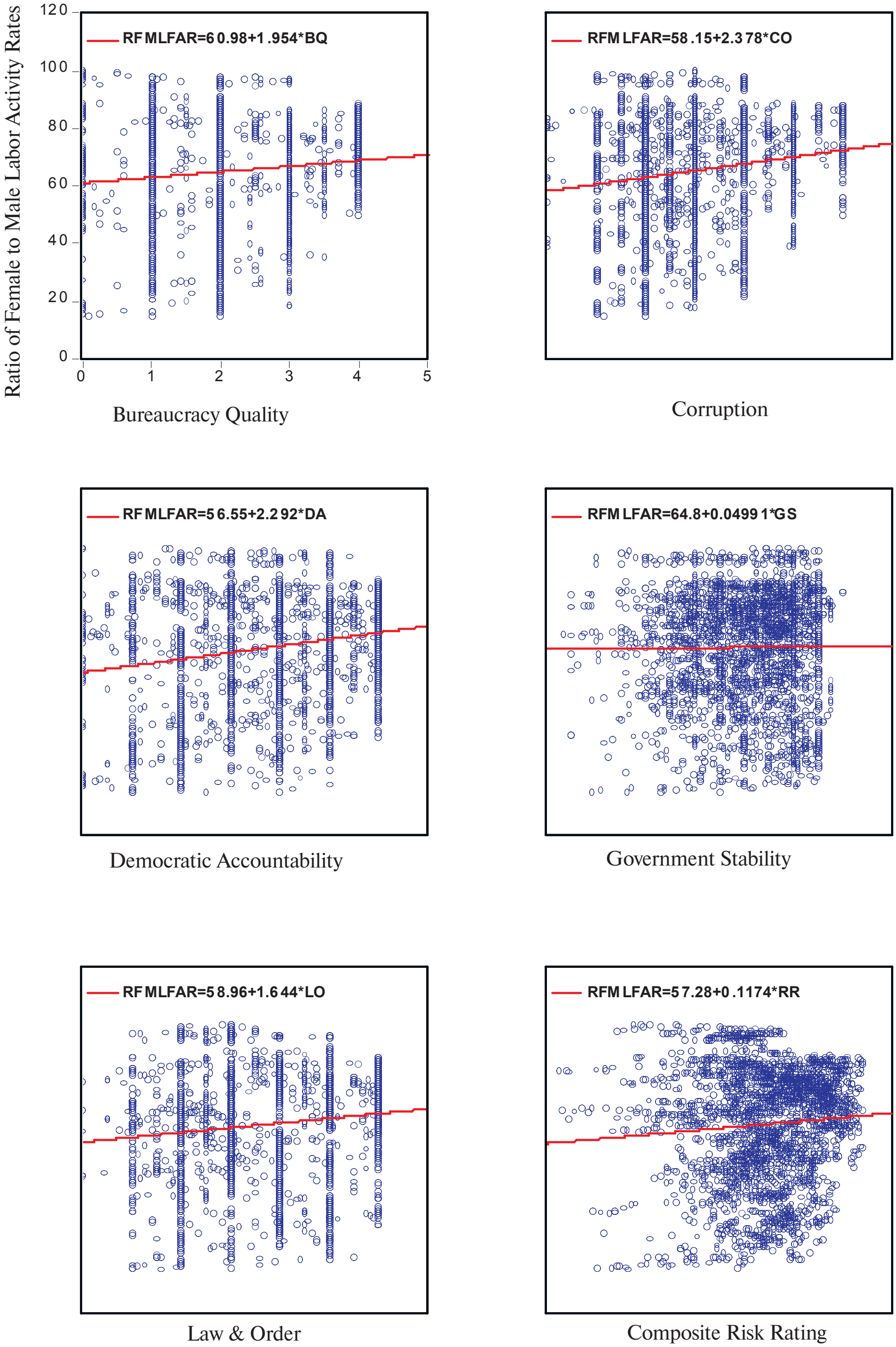

Figure 2. **Institutional Quality and Gender Equality in Employment**

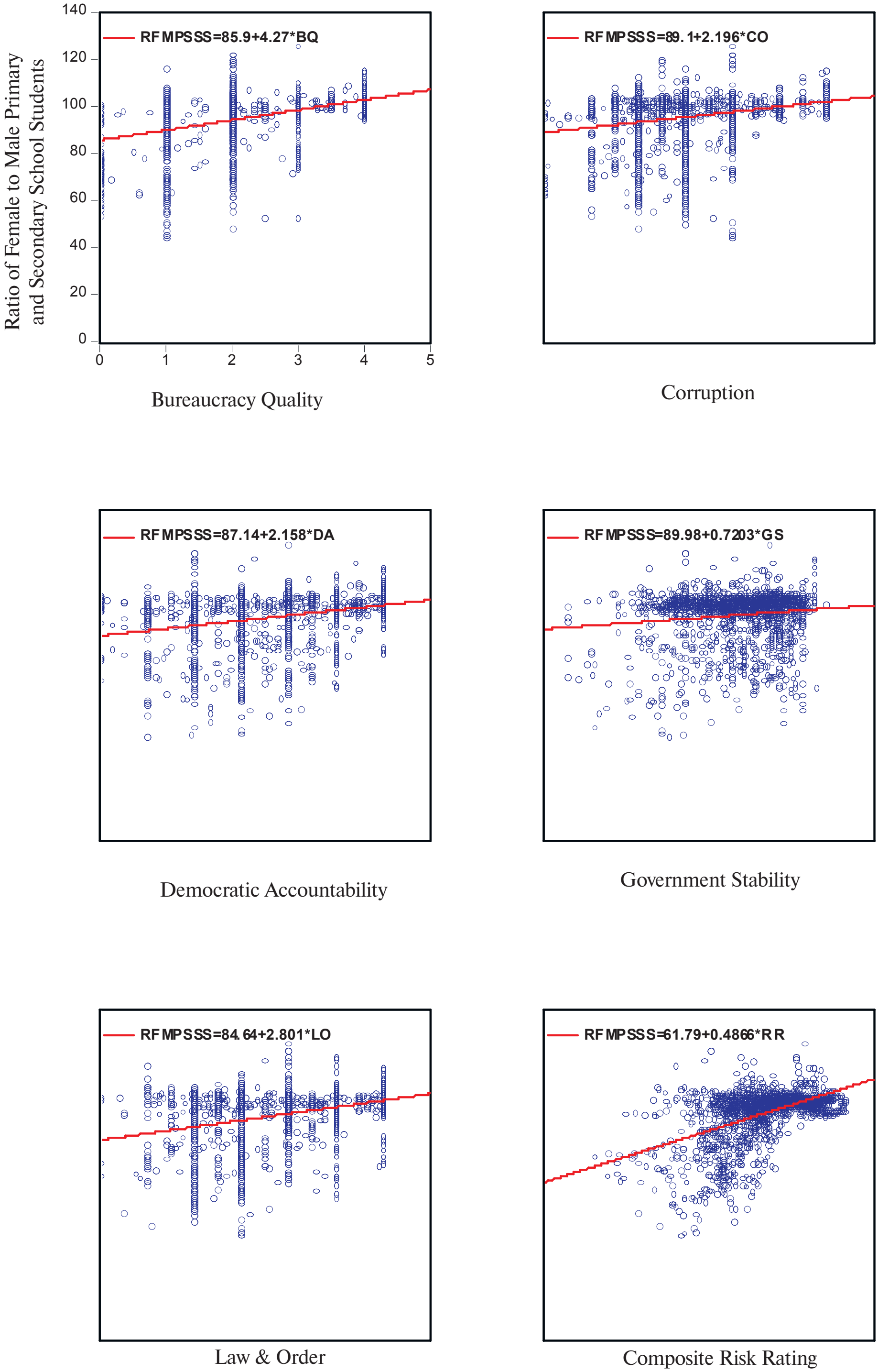

Figure 3. **Institutional Quality and Gender Equality in Education**

Blundell and Bond (1998) pointed out that lagged levels are often poor instruments for first differences. They proposed using all information on both endogenous and exogenous variables. This is known as the Arellano and Bond system (Arellano-Bond System GMM approach) method and provides more efficient and unbiased estimates in small samples. In our implementation of the Arellano-Bond System GMM model, we specify the use of the first to fifth lags of all the variables included in the regression as GMM-style instruments. To make sure all appropriate variables are used as instruments, but to avoid biasing our parameters, we included one instrument for each variable and lag distance rather than one instrument for each variable, time period, and lag distance. This was done because as the number of instruments included becomes large relative to the number of observations, the parameter estimates become biased towards FGLS (Blundell and Bond, 1998). We estimated Eq. 1 and 2 using 3 methods above, but report only Arellano-Bond System GMM estimations results to save space. The results from other two methods are quite close to GMM results and available from the author upon request.

Table 1. **Pearson Correlation Coefficients between Measures of ICT**

	LPC	LIU	LTL	LMCS	ICTEPC	ICTEPGDP
LPC	1.00					

LIU	0.71	1.00				
	(40.8)	-----				
LTL	0.76	0.48	1.00			
	(48.0)	(22.4)	-----			
LMCS	0.67	0.87	0.45	1.00		
	(36.6)	(70.7)	(20.9)	-----		
ICTEPC	0.35	0.16	0.24	0.11	1.00	
	(15.2)	(6.50)	(10.3)	(4.35)	-----	
ICTEPGDP	-0.23	-0.37	-0.08	-0.38	0.02	1.00
	(-9.87)	(-16.2)	(-3.29)	(-16.7)	(0.83)	-----

Notes: *t*-statistics for the significance of the Pearson correlation coefficients are given in parentheses.

Arellano-Bond System GMM estimation results for ratio of female to male labor force activity rates (gender equality in employment) are presented in Table 2. Table 3 reports the Arellano-Bond System GMM estimation results for ratio of female to male primary and secondary school students (gender equality in education). Since results are qualitatively the same, we will comment on the results pertaining to both Eq. 1 and 2 jointly. There are 3 major conclusions to draw from the empirical results. First, in both regressions the interaction variables between the ICT and institutional quality are strongly significant (statistical significance is attained at the 1 % level in all regressions) and positive. This result establishes strong evidence in favor of the simultaneity hypothesis that joint improvements in ICT and institutional quality have positive impact on gender equality in employment and education above and beyond the direct impacts of ICT and institutional quality and governance alone. Second, a significant direct impact from ICT measures to gender equality is found only with few exceptions. Third, the direct impact of institutional quality and governance on both educational and employment gender equalities is positive and significant uniformly across all the regression estimates.

Table 2. **Arellano-Bond system GMM Panel Regression**

Independent Variables	Eq. 1.1	Eq.1.2	Eq. 1.3	Eq. 1.4	Eq. 1.5	Eq. 1.6
$\Delta RFMLFAR_{i,t-1}$	0.037519	0.080496	0.069776	0.080906	0.067817	0.067945
	(0.0309)	(0.0282)**	(0.0257)**	(0.0260)**	(0.0257)**	(0.0257)**
$\Delta LGDPPC_{i,t-1}$	0.723951	0.225325	2.355709	0.521432	1.653219	1.042393
	(0.3760)	(0.2762)	(0.2830)**	(0.2933)	(0.2738)**	(0.3021)**
$\Delta UR_{i,t-1}$	0.390726	0.425242	0.697569	0.385550	0.705209	0.634579
	(0.0587)**	(0.0527)**	(0.0467)**	(0.0482)**	(0.0423)**	(0.0431)**
$\Delta U_{i,t}$	-0.060815	-0.057839	-0.035472	-0.060056	-0.064078	-0.039007
	(0.0336)	(0.0319)	(0.0337)	(0.0308)	(0.0320)*	(0.0320)
$\Delta BLST_{i,t-1}$	0.001777	0.005028	0.002781	0.004330	0.001203	0.001923
	(0.0006)**	(0.0005)**	(0.0006)**	(0.0014)**	(0.0006)**	(0.0006)**
$\Delta BLSF_{i,t-1}$	0.001613	0.004768	0.000053	0.004626	0.001469	0.002379
	(0.0003)**	(0.0003)**	(0.0004)**	(0.0001)**	(0.0003)**	(0.0003)**
$\Delta INSTQ_{i,t-1}$	0.172841	0.167678	0.186616	0.153809	0.156608	0.329779
	(0.0457)**	(0.0381)**	(0.0445)**	(0.0328)**	(0.0408)**	(0.0450)**
$\Delta LPC_{i,t-1}$	3.800912					
	(0.8037)**					
$\Delta LPC_{i,t-1}$*$INSTQ_{i,t-1}$	0.144641					
	(0.0177)**					
$\Delta LIU_{i,t-1}$		2.034288				
		(0.2451)**				
$\Delta LIU_{i,t-1}$*$INSTQ_{i,t-1}$		0.063215				
		(0.0056)**				
$\Delta LTL_{i,t-1}$			2.706005			
			(0.7128)**			
$\Delta LTL_{i,t-1}$*$INSTQ_{i,t-1}$			0.059636			
			(0.0175)**			
$\Delta LMCS_{i,t-1}$				2.319099		
				(0.2256)**		
$\Delta LMCS_{i,t-1}$*$INSTQ_{i,t-1}$				0.075535		
				(0.0054)**		
$\Delta ICTEPC1_{i,t-1}$					0.000010	
					(0.0016)	
$\Delta ICTEPC1_{i,t-1}$*$INSTQ_{i,t-1}$					0.000039	
					(0.0000)	
$\Delta ICTEPGDP1_{i,t-1}$						0.011913
						(0.0016)**
$\Delta ICTEPGDP1_{i,t-1}$*$INSTQ_{i,t-1}$						0.000313
						(0.0000)**

The End of *Table 2*

Independent Variables	Eq. 1.1	Eq.1.2	Eq. 1.3	Eq. 1.4	Eq. 1.5	Eq. 1.6
Observations	1087	1329	1478	1408	1479	1479
R-squared	0.98	0.98	0.97	0.98	0.98	0.98
F or Wald χ^2-statistics	77.34	121.54	115.26	101.60	109.80	109.72
Hansen's J-statistics	8.93	7.44	7.99	7.67	8.43	8.94
Levin–Lin–Chu panel unit root test (*t*-statistics)	-11.42	-11.42	-11.42	-11.42	-11.42	-11.42
Arellano–Bond test of AR(1) in residuals (*z*-statistics)	-2.33	-2.61	-2.45	-2.65	-2.34	-2.29
Arellano–Bond test of AR(2) in residuals (*z*-statistics)	-0.81	-0.84	-0.77	-0.78	-0.83	-0.79

Notes: Robust standard errors, given in parentheses, are estimated using hetroskedasticity and autocorrelation consistent covariance matrix estimation. Specifications tests were performed that indicated there was no overall serial correlation in the errors (Wooldridge, 2002) but there was group-wise heteroskedasticity (Greene, 2003). As a result, we used a specification that considered each country a "cluster" and allowed a covariance structure where error terms were correlated within cluster, but uncorrelated across them.

** indicates significance at the 1% level.

Table 3. **Arellano-Bond system GMM Panel Regression**

Independent Variables	Eq. 1.1	Eq.1.2	Eq. 1.3	Eq. 1.4	Eq. 1.5	Eq. 1.6
Δ RFMPSSS $_{i,t-1}$	0.107214	0.139164	0.064483	0.130728	0.063443	0.07177
	(0.0344)**	(0.0317)**	(0.0286)*	(0.0308)**	(0.0287)*	(0.0287)*
LGDPPC$_{i,t-1}$	0.376886	0.593195	0.228494	0.746318	0.268223	0.381680
	(0.1252)**	(0.2846)*	(0.0836)**	(0.3256)*	(0.1267)**	(0.1057)**
YR$_{i,t}$	0.742304	4.220571	2.087670	2.165357	3.083460	3.062585
	(0.3263)*	(0.3577)**	(0.2360)**	(0.2869)**	(0.2140)**	(0.2142)**
BLST$_{i,t-1}$	0.019412	0.050321	0.07372	0.0266521	0.056134	0.024512
	(0.0042)**	(0.0017)**	(0.0053)**	(0.0049)**	(0.0054)**	(0.0054)**
BLSF$_{i,t-1}$	0.017482	0.036855	0.096078	0.0202970	0.071886	0.010701
	(0.0039)**	(0.0044)**	(0.0049)**	(0.0046)**	(0.0050)**	(0.0050)**
INSTQ$_{i,t-1}$	0.065920	0.066539	0.177350	0.067524	0.063477	0.101453
	(0.0039)**	(0.0040)**	(0.0383)**	(0.0036)**	(0.0047)**	(0.0053)**
LPC$_{i,t-1}$	1.587970 (0.6785)*					
LPC$_{i,t-1}$*INSTQ$_{i,t-1}$	0.036878					
	(0.0152)*					
LIU$_{i,t-1}$		1.896811				
		(0.2282)**				
LIU$_{i,t-1}$*INSTQ$_{i,t-1}$		0.039872				
		(0.0054)**				
LTL$_{i,t-1}$			5.360034			
			(0.6381)**			
LTL$_{i,t-1}$*INSTQ$_{i,t-1}$			0.075289			
			(0.0153)**			
LMCS$_{i,t-1}$				2.031191		
				(0.2430)**		
LMCS$_{i,t-1}$*INSTQ$_{i,t-1}$				0.039048		
				(0.0060)**		
ICTEPC1$_{i,t-1}$					0.003661	
					(0.0011)**	
ICTEPC1$_{i,t-1}$*INSTQ$_{i,t-1}$					0.005314	
					(0.0002)**	

The End of *Table 3*

Independent Variables	Eq. 1.1	Eq.1.2	Eq. 1.3	Eq. 1.4	Eq. 1.5	Eq. 1.6
$ICTEPGDP1_{i,t-1}$						0.010608
						(0.0021)**
$ICTEPGDP1_{i,t-1}{}^{*}INSTQ_{i,t-1}$						0.000245
						(0.0000)**
Observations	1119	1436	1661	1518	1662	1662
R-squared	0.91	0.93	0.91	0.91	0.91	0.91
F-statistics	441.78	460.56	385.03	471.45	414.87	415.09
Hansen's J-statistics	7.63	6.44	7.99	7.67	8.43	8.94
Levin–Lin–Chu panel unit root test (*t*-statistics)	-8.41	-8.41	-8.41	-8.41	-8.41	-8.41
Arellano–Bond test of AR(1) in residuals (**z**-statistics)	-2.84	-2.86	-2.84	-2.78	-2.63	-2.92
Arellano–Bond test of AR(2) in residuals (*z*-statistics)	-0.74	-0.78	-0.78	-0.77	-0.76	-0.77

Notes: See notes to Table 2.

5. Conclusion. The objective of this study was to examine the relationship between gender equality, ICT, and governance and institutional quality. The study focused on how the ICT interacts with institutional quality and governance to impact the gender equality. A panel data set for 209 countries over the period 2000-2010 is used in the study. The findings of the study indicate that the current status of women in ICT related education, access and employment surrounds many a positive prospect as well as considerable confronts. The regression estimates show a significant positive relationship between gender equality in employment and education, and the level of ICT infrastructure. A more significant relationship is found between gender equality and institutional quality. The estimates show that simultaneous improvement in both ICT and institutional quality and governance creates a higher positive impact from ICT to gender gap, beyond the impact of ICT alone. Thus, ICT is more effective in reducing gender inequality in countries with better bureaucratic quality, less corruption, less political risks, more stable governments, good legal system, and better democracy.

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