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# GENDER EQUALITY AND ECONOMIC GROWTH: IS IT EQUALITY OF OPPORTUNITY OR EQUALITY OF OUTCOMES?

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*Aniruddha Mitra, James T. Bang, and Arnab Biswas*

## ABSTRACT

This article explores the impact of gender equality on economic growth. In particular, we focus on the *multidimensional* nature of gender equality with the object of identifying the relative salience of different aspects of equality. Using exploratory factor analysis on five measures of gender equality, we identify two distinct dimensions: equality of economic opportunities and equality in economic and political outcomes. Regression analysis conducted on an unbalanced panel of 101 countries taken over nonoverlapping five-year periods from 1990 to 2000 reveals that a standard deviation improvement in equality in economic opportunity increases growth by 1.3 percentage points and a corresponding improvement in participatory equality improves growth by an average of about 1.2 percentage points. However, this impact is contingent on a country's stage of development: while developing economies experience significant improvements in growth from greater equality in opportunity, developed societies see significant improvements resulting from greater equality in outcomes.

## KEYWORDS

Gender, education, labor force participation, economic growth

JEL Codes: O43, J16

## INTRODUCTION

The impact of gender disparity on economic growth has emerged as an important area of inquiry in the last two decades and there is considerable evidence that gender inequality in education has acted as a significant impediment to economic growth (M. Anne Hill and Elizabeth King 1995; David Dollar and Roberta Gatti 1999; Stephan Klasen 1999, 2002; Stephen Knowles, Paula K. Lorgelly, and P. Dorian Owen 2002; Stephan Klasen and Francesca Lamanna 2009). Perhaps for lack of reliable data, the growth impact of gender inequality in employment remains less explored in

a cross-national context. In particular, there is a lack of consensus on whether such inequality, especially considered in the form of the gender wage gap, constitutes an impediment to growth: while [Stephanie Seguino \(2000\)](#) finds a positive impact of gender wage inequality in the manufacturing sector on economic growth in a sample of semi-industrialized export-oriented economies, [Thomas Schober and Rudolph Winter-Ebmer \(2011\)](#), based on a meta-analysis of micro-level wage data, fail to confirm the result.

Moving beyond the context of semi-industrialized economies, [Klasen and Lamanna \(2009\)](#) use multiple indicators, such as women's share of the labor force and the labor force participation gap, to capture gender inequality in unemployment and present compelling evidence that inequality takes a significant toll on growth. To sum up, therefore, existing evidence on the question appears to be sensitive both to the choice of indicator for gender inequality in employment and to the construction of the sample.

This paper investigates the impact of gender equality on economic growth in an unbalanced sample of 101 countries observed over the period 1990–2000. Our analysis is based on the premise that gender equality is multidimensional and that the various aspects may well differ in their consequences for economic growth. Hence, the dominant convention of focusing on the growth impact of a specific aspect of gender inequality, such as education or employment, is likely to subject the estimates to omitted variable bias. At the same time, any exploration of the consequences of multiple dimensions of gender equality in a unified empirical model is challenging given the degree of collinearity exhibited by various indicators of gender equality. Compounding the problem, the potentially differential impacts of various dimensions of gender equality render the project of aggregating them into a composite index such as the Global Gender Gap Index (GGI) of [Ricardo Hausmann, Laura D. Tyson, and Saadia Zahidi \(2012\)](#) subject to measurement error.

To address the multidimensionality of gender equality, we conduct an exploratory factor analysis (EFA) on five distinct indicators, namely, the fertility rate; the percentage of women in parliament; and the gender gaps in literacy, secondary enrollment, and labor force participation. The procedure reveals two latent dimensions of gender equality that we interpret as *equality in economic opportunity* and *equality in economic and political outcomes*. Since the factors are, by construction, free of high degrees of collinearity, we are able to include both dimensions of equality simultaneously in our growth regressions, thereby avoiding omitted variable bias, multicollinearity, and measurement error.

Our regression analysis reveals that the two dimensions of gender equality differ in their impacts on economic growth: on average, a standard deviation improvement in the equality of opportunity increases growth by 1.30 percentage points, while a corresponding improvement in the equality of outcomes improves growth by an average of 1.19 percentage points.

However, these impacts are contingent on a country's stage of development: while developing economies see significant improvements in growth from greater equality in opportunity, developed societies experience significant improvements from greater equality in outcomes.

## CONCEPTUAL FOUNDATIONS

We devote this section to a brief account of why an improvement in gender inequality may constitute a significant impetus to growth. To do so, we first focus on the impact of gender inequality in education.

### Gender inequality in education

As observed by Klasen (1999, 2002), gender inequality in education reduces the average quality of human capital in an economy. Assuming that the intrinsic cost of skill investment is identically distributed over both sexes, women's restricted access to education substitutes women of low intrinsic cost with men of relatively higher cost. As a result, the average cost of skill investment rises for any given level of human capital, indicating a decline in the average quality of human capital relative to the state of equal opportunity. Hence, an improvement in gender inequality in education is predicted to improve the quality of human capital available and consequently, the rate of growth.

Further, if we consider men's and women's education to be separate entities and assume that the marginal impact of both types of human capital on economic growth is subject to diminishing returns, gender inequality means that marginal returns to education are greater for women than they are for men. Hence, an improvement in gender equality that increases the educational attainment of women should increase growth (Knowles, Lorgelly, and Owen 2002).

Critically, an increase in women's educational attainment due to improving gender equality provides a significant impetus to growth via an interdependent set of externalities, namely, an improvement in various indicators of child health; a reduction in fertility; and an improvement in the level and quality of human capital of future generations.

Consider first the impact on child health. Intuitively, the impact of maternal education is not hard to see: a more educated mother is expected to be aware of the best nutritional and medical regime for her and her children, be more likely to adhere to it, and be able to access modern medical services. If we consider child health as the output of a production function, this yields two complementary impacts of maternal education on the health of children: a more educated mother will utilize a given level of health inputs more efficiently (Michael Grossman 2000), and she will be able to avail her

family of the most efficient combination of inputs (Mark R. Rosenzweig and T. Paul Schultz 1982).

There is a wealth of evidence that identifies the health of children as a key determinant of educational attainment in a society (see Paul Glewwe and Edward A. Miguel 2008 and references therein). Thus, the causal impact of women's education on growth via the accumulation of human capital is not hard to establish. Reducing child mortality should also reduce the incentive to have a large number of children. Indeed, there is a great deal of evidence that women's education plays a critical role in reducing fertility by decreasing the desired family size; reducing the need to plan a greater number of births to achieve the desired family size; and increasing the ability to implement the planned number of births (Mamta Murthi, Anne-Catherine Guio and Jean Drèze 1995; Jean Drèze and Mamta Murthi 2001; Una Okonkwo Osili and Bridget Terry Long 2008).

This again should enhance growth by increasing the amount of capital per worker (Oded Galor and David N. Weil 1996); reducing the youth dependency ratio (Allen C. Kelley and Robert M. Schmidt 2001); and improving the productivity of the labor force by allowing parents to devote a greater fraction of familial resources to each child (Gary S. Becker, Kevin M. Murphy and Robert F. Tamura 1990).

### Gender inequality in employment

As previously mentioned, the growth impact of the employment dimension of gender equality may be sensitive to both the choice of indicator and the economy in question. Consider first an improvement in the gender gap in labor force participation. Analogous to the argument made for gender inequality in education (Klasen 1999, 2002), the systemic exclusion of women from the labor market reduces the productivity of the labor force by substituting more productive women workers with men of relatively lower productivity. As such, an improvement in women's labor force participation should increase labor productivity (Berta Esteve-Volart 2004) and hence, the rate of growth. Further, improved prospects for women's employment should reduce fertility by increasing the opportunity cost of childbearing (Galor and Weil 1996), which, in turn, should enhance growth for the reasons stated earlier.

A key impact of increasing labor force participation on economic growth by women operates via reducing the gender asymmetries in education. Note that an increase in women's employment in the economy should, on average, lead to a rise in household income. This should reduce the incentive to prioritize boys in resource allocation decisions of the household.<sup>1</sup> As importantly, increasing the expected returns from educating girls should reduce gender asymmetries in familial investment on children (Gary S. Becker 1985).

The increased probability of employment increases the bargaining power of women within the household and facilitates the erosion of traditional norms that legitimize men's dominance over labor and sexuality (Ester Boserup 1970; Claudia Goldin 1990; Stephanie Seguino 2007). There is evidence that this renegotiation of bargaining power in favor of women leads to reduced fertility, greater household saving, a greater fraction of income being diverted to investment in health and education, and reduced exclusion of the girl child from familial investment (Esther Duflo 2012). Each of these provides an impetus to growth.

However, it is not clear if an improvement in gender equality in employment will necessarily stimulate growth once we measure it with the gender wage gap. On one hand, a reduction in the gender wage gap may stimulate women's labor force participation (Galor and Weil 1996) and increase the rate of growth for reasons already described. On the other hand, such an improvement may impede growth for export-oriented semi-industrialized economies that rely on low-paid women workers in export sectors to acquire a competitive edge in the international market (Robert Blecker and Stephanie Seguino 2002). Indeed, the influential study by Seguino (2000) presents compelling evidence supporting this argument.

Schober and Winter-Ebmer (2011) have criticized the results obtained by Seguino (2000) on the grounds that the aggregate earnings data used to construct the gender wage gap does not accurately measure wage discrimination, a proper identification of which requires micro-level wage data. Relying on a cross-national dataset constructed from a meta-analysis of Blinder–Oaxaca decomposed micro data, Schober and Winter-Ebmer find no evidence of a negative impact of wage equality on growth. The debate, however, is far from resolved, since the rejoinder by Stephanie Seguino (2011) has questioned both the applicability of the meta-regression methodology Schober and Winter-Ebmer use and their decision to extend the data coverage beyond the manufacturing sector, given Seguino's specific objective of estimating the growth impact of wage inequality in semi-industrialized economies.

### Gender inequality in political outcomes

There is an emerging consensus that increasing political participation by women may have significant benefits, though it should be acknowledged that most empirical studies, including our own, focus on a specific aspect of such participation, namely, women's presence in government.

Various mechanisms have been unearthed, not the least of which being the fact that the increased presence of women in government can, at least partially, remedy gender bias in public policy. In a panel study of

American states, [Timothy Besley and Anne Case \(2003\)](#) find that greater presence of women in state legislatures increases public expenditure on family assistance programs and leads to greater enforcement of child support laws. Critically, for our purpose, this is not exclusively a feature of political participation in developed societies: [Raghabendra Chattopadhyay and Esther Duflo \(2004\)](#) find that reserving a third of the seats in self-governments at the village level significantly increased infrastructural investment specifically needed by women in the Indian states of West Bengal and Rajasthan.

There is also reason to believe that greater presence of women in legislative bodies may alter the composition of public expenditure in favor of investment in health and education.<sup>2</sup> [M. Marit Rehavi \(2008\)](#) finds that the increase in the number of women in American state legislatures from 1970 to 2000 accounts for a modest but significant share of the increase in state health expenditures. [Helena Svaleryd \(2009\)](#) finds that women's representation in Swedish local councils increases the expenditure on education and child care relative to that on caring for the elderly.<sup>3</sup> Remarkably, [Irma Clots-Figuerasa \(2012\)](#) links women's presence in government with educational outcomes: in a study of district-level data from India, increasing women's representation in urban districts increases the probability with which an individual from that district attains primary education.

Finally, a key impact of women's political representation on economic growth operates via improving the quality of domestic institutions. There is evidence that gender equality in political representation reduces corruption ([David Dollar, Raymond Fisman, and Roberta Gatti 2001](#); [Anand Swamy, Stephen Knack, Young Lee and Omar Azfar 2001](#)). There is also evidence from [Klaus Deininger, Songqin Jing, Hari K. Nagarajan, and Xia Fang \(2011\)](#) that it improves popular perception of government accountability at the local level, and, consequently or otherwise, the willingness to contribute to public goods. Further, it has been documented that political representation for women improves the quality of the judicial system in terms of increasing the ability of women to report crimes ([Lakshmi Iyer, Anandi Mani, Prachi Mishra, and Petia Topaleva 2011](#)). Finally, there is increasing evidence that women in government reduces the likelihood of collective violence in the form of state-sponsored human rights abuses ([Eric Melander 2005a](#)), civil war ([Eric Melander 2005b](#)), and interstate conflict ([Patrick M. Regan and Aida Paskeviciute 2003](#)).

## DATA AND METHODOLOGY

We test the impact of gender equality on economic growth in the context of a standard neoclassical model ([Robert J. Barro 1991](#); [Robert J. Barro and](#)

Xavier Sala-i-Martin 1995) augmented with measures of gender equality:

$$\begin{aligned} Growth_{it} = & \alpha + \rho Growth_{it-1} + \beta_1 \ln(GDP_{p.c.})_{it-1} + \beta_2 Invest_{it} + \beta_3 Gov.Exp_{it} \\ & + \beta_4 Inflation_{it} + \beta_5 E \end{aligned} \quad (1)$$

To calculate the dependent variable,  $Growth_{it}$ , we first calculate the annual growth rate of gross domestic product (GDP) per capita in each country for each year in our sample.<sup>4</sup> We then calculate the average of this variable over five-year intervals. We correspondingly calculate the five-year averages for each of the explanatory variables on the right-hand side of equation (1) and keep only the non-overlapping five-year averages corresponding to the years that are evenly divisible by 5.<sup>5</sup> Our final sample covers a sample of 101 countries forming an unbalanced panel of 228 observations for the five-year periods ending in 1990, 1995, and 2000. Table 1 reports summary statistics for our sample.<sup>6</sup>

### Standard correlates of economic growth

The first set of controls includes the natural logarithm of per capita GDP at the end of the previous period; the growth rate of per capita GDP over the previous period; investment, measured by gross capital formation (GCF) as a percentage of GDP; government consumption net of defense and education expenditure as a percentage of GDP; the consumer price index (CPI) inflation rate; and the secondary completion rate from Robert J. Barro and Jong-Wha Lee (2001) to capture the average level of human capital in a country.

### Measures of gender equality

We utilize information from five distinct indicators of gender equality.<sup>7</sup> The gender gaps in literacy and secondary enrollment from the World Development Indicators (WDI) capture constraints on skill investment arising from a social ethos that prioritizes boys in education (Jean Drèze and Geeta G. Kingdon 2001; Geeta G. Kingdon 2005; Monazza Aslam and Geeta G. Kingdon 2008). The gender gap in labor force participation, also taken from the WDI, captures the consequences of biased resource allocation in addition to women's restricted access to formal employment (Jean Drèze and Amartya Sen 1995; Lourdes Benería 2001), discrimination in the labor market (Esteve-Volart 2004), reduced mobility of women workers, and social norms that prioritize fertility over professional attainment (Kaivan Munshi and Jacques Myaux 2006). The inverse of the adolescent fertility rate, also from WDI, explicitly captures the fertility aspect of gender bias.<sup>8</sup> Lastly,



the percentage of women in parliament from the Women in National Parliaments Dataset released by the Inter-Parliamentary Union captures the voice of women in the design and implementation of social policy.<sup>9</sup>

*Table 1* Summary statistics

*Table 1a* Full sample summary statistics

			<i>No. of observations</i>	228
			<i>No. of countries</i>	101
			<i>Observations per country</i>	
			Minimum	1.0
			Average	2.3
			Maximum	3.0
<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
Per capita GDP growth	2.081	2.534	-5.149	10.951
Per capita GDP growth <sub><i>t</i>-1</sub>	1.472	2.882	-9.592	9.268
Ln(GDP per capita) <sub><i>t</i>-1</sub>	7.741	1.627	4.902	10.486
Investment (% of GDP)	22.186	6.422	7.703	56.196
Net government spending	12.321	5.665	-3.330	25.508
Inflation	14.131	25.510	0.198	242.309
Secondary enrollment	17.184	12.048	0.543	52.413
Opportunity factor	-0.037	0.752	-1.727	1.891
Outcome factor	-0.020	0.644	-1.351	1.715

*Table 1b* OECD subsample summary statistics

			<i>No. of observations</i>	63
			<i>No. of countries</i>	22
			<i>Observations per country</i>	
			Minimum	2.0
			Average	2.9
			Maximum	3.0
<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
Per capita GDP growth	2.480	1.817	-1.156	8.577
Per capita GDP growth <sub><i>t</i>-1</sub>	2.083	1.811	-1.156	8.577
Ln(GDP per capita) <sub><i>t</i>-1</sub>	9.656	0.583	7.899	10.486
Investment (% of GDP)	22.282	4.165	16.725	37.475
Net government spending	15.747	4.688	4.389	25.508
Inflation	7.157	14.828	0.305	79.302
Secondary enrollment	27.414	10.935	1.905	47.092
Opportunity factor	0.589	0.350	-0.853	1.287
Outcome factor	0.335	0.632	-0.841	1.715

(Continued)

Table 1 Continued

Table 1c Non-OECD subsample summary statistics

	<i>No. of observations</i>		165	
	<i>No. of countries</i>		79	
	<i>Observations per country</i>			
	Minimum		1.0	
	Average		2.1	
	Maximum		3.0	
<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
Per capita GDP growth	1.928	2.748	-5.149	10.951
Per capita GDP growth <sub><i>t</i>-1</sub>	1.238	3.171	-9.592	9.268
Ln(GDP per capita) <sub><i>t</i>-1</sub>	7.010	1.261	4.902	10.146
Investment (% of GDP)	22.149	7.108	7.703	56.196
Net government spending	11.012	5.466	-3.330	23.760
Inflation	16.794	28.139	0.198	242.309
Secondary enrollment	13.278	10.007	0.543	52.413
Opportunity factor	-0.277	0.727	-1.727	1.891
Outcome factor	-0.155	0.597	-1.351	1.431

### Methodological concerns

Estimating Equation 1 confronts us with a number of concerns, the first relating to the measurement of gender equality. Most cross-national studies on the impact of gender inequality on economic growth focus on a specific aspect of such inequality, such as education (Hill and King 1995; Dollar and Gatti 1999; Klasen 2002; Knowles, Lorgelly, and Owen 2002; Mina Balamoune-Lutz and Mark McGillivray 2009) or employment (Seguino 2000; Schober and Winter-Ebmer 2011). While there are contributions that explore the consequences of more than one aspect of inequality (Klasen 1999; Mark Blackden, Sudharshan Canagarajah, Stephan Klasen, and David Lawson 2006; Klasen and Lamanna 2009), these dimensions are generally considered in separate regressions.

However, if one believes that an ethos of gender bias in society manifests itself along multiple dimensions, then focusing on one dimension is likely to understate the impact of gender stratification. In particular, restricting the set of measures of gender disparity is likely to subject the estimated impacts to omitted variable bias (James T. Bang and Aniruddha Mitra 2011b).

Accounting for multiple aspects of gender inequality in a single empirical model faces the problem that these variables exhibit a high degree of collinearity; for example, the correlation between the fertility rate and the gender gap in education. As mentioned in the last section, there is

evidence that increasing women's educational attainment reduces fertility. At the same time, a decline in fertility may reduce the gender gap in education. [Rodrigo R. Soares and Bruno L. S. Falcão \(2008\)](#), for example, consider the impact of a reduction in mortality due to technological progress. On one hand, this should increase the expected returns to human capital investment for both genders. On the other hand, the reduced incentive to have a large family and the associated decline in fertility should mobilize women into the labor force. The resultant increase in the bargaining power of women should then reduce the gender gap in education.

One may, of course, address the problem of multicollinearity by aggregating various indicators of gender equality into a unidimensional index, as has been the practice in the literature on formal institutions ([Stephen Knack and Philip Keefer 1995](#); [Alberto Alesina and Roberto Perotti 1996](#); [Roberto Perotti 1996](#)).<sup>10</sup> Indeed, existing indices such as the Gender Empowerment Measure (GEM), the Gender-Related Development Index (GDI), and the GGI are based on precisely this convention.

However, as observed by [Richard Jong-A-Pin \(2009\)](#) in the context of political instability and [Bang and Mitra \(2011a\)](#) in the context of institutions, the limitation of this method is that the aspects of gender equality being aggregated may differ in their impacts on economic growth. Hence, the composite index will likely be subject to measurement error.<sup>11</sup> As such, we follow [Bang and Mitra \(2011b\)](#) in conducting an EFA on the set of gender variables. This allows us to identify two distinct dimensions of gender equality that are essentially uncorrelated. These dimensions are included in the vector  $Z_{it}$ . We provide a brief description of the EFA and robustness checks we perform on it in the next section.

Turning to the estimation procedure, any growth regression must address the fact that the classical least-squares estimator is likely to be biased if any of the explanatory variables are endogenously determined by the same factors that determine growth. Further, any panel study faces the problem of serial correlation within panels and unobservable entity-specific heterogeneity across panels.

The problem of endogeneity is particularly relevant in our context since there is a substantial literature that investigates the role of development in promoting gender equality. To review the proposed mechanisms, recall that the rise in household income due to development should reduce the incentive to prioritize boys in the allocation of household resources. Further, the improvement in employment prospects for women that accompanies development increases the returns to girls' education and reduces gender bias in familial investment in education ([Becker 1985](#)).

Improved prospects for employment and the diffusion of productivity-augmenting technology that allows women to devote less time to domestic duties and seek formal employment ([Roger D. Clark, Thomas W. Ramsbey,](#)

and Emily S. Adler 1991) also allows women to renegotiate power relations within the family (Boserup 1970; Goldin 1990). The literature identifies this increase in bargaining power of women as a key contributor to empowerment.

Finally, it has been argued that as economic development expands education, it also transforms a society from a traditional culture that emphasizes physical and economic security in favor of one that promotes *postmaterialist values* that encourage gender equality (Ronald Inglehart 1997; Ronald Inglehart and Pippa Norris 2003).

The traditional response to endogeneity in growth regressions is to employ an instrumental variables technique, using geographic or institutional variables as instruments. However, this method has recently come under criticism based on the fact that many of the commonly used instruments are of dubious strength or validity (Michael P. Murray 2006; Samuel Bazzi and Michael A. Clemens 2013).

To address the problem of endogeneity simultaneously with that of unobserved heterogeneity, we employ the estimator of Manuel Arellano and Stephen Bond (1991), which estimates the dynamic model in first differences, instrumenting for current-period differences in the endogenous variables with their lagged values, and uses the generalized method of moments, also known as the “difference–GMM” estimator. While the estimator does have its own caveats (David Roodman 2009; Bazzi and Clemens 2013), the fact that it utilizes a greater number of exclusion restrictions compared to the two-stage least-squares model has made it a staple in empirical studies on economic growth.<sup>12</sup>

Our response to the problem of serial correlation within panels employs a twofold strategy. First, we consider non-overlapping five-year averages of our variables in order to filter out the serial correlation in growth rates arising from short-term fluctuations attributable to changes in the business cycle. Second, we include lagged values of the growth rate of per capita GDP to account for autocorrelation in the dependent variable as well as lagged values of log per capita GDP to account for the *convergence hypothesis* of the neoclassical growth model (Barro 1991; N. Gregory Mankiw, David Romer, and David N. Weil 1992).

Finally, since the gender variables of interest are generated factor scores, the standard errors of our coefficients may also be biased (Adrian Pagan 1984). A common strategy to deal with this problem is to employ a bootstrap technique. However, given the dynamic structure of the model used to calculate the difference–GMM estimator, generating bootstrap samples that can be considered to be *random* presents a challenge (David Roodman 2003). Hence, we calculate heteroskedasticity-consistent robust standard errors using a *jackknife* technique (Russell Davidson and James G. McKinnon 1993) that includes clustering by country to account for heteroskedasticity across panels.

## MULTIDIMENSIONALITY OF GENDER EQUALITY

The methodology of EFA is based on the assumption that each of a set of potentially correlated variables is generated by a linear combination of a smaller set of *latent factors* and an error term. The hypothesized latent factors include *common factors* that impact more than one observed variable and *specific factors* that are unique to each variable. Hence, variation in each observed variable can be decomposed into the part caused by variation in the common factors and the part unique to the variable in the form of specific factors and measurement error.<sup>13</sup>

The value of EFA lies in its ability to explore a theoretical structure underlying multivariate data, since the common factors identified by the method ideally lend themselves to theoretical interpretation. Further, since the factors emerge from an optimization process, they are less susceptible to measurement bias than indices constructed on the basis of subjective assignment of weights to the constituent variables. In addition, being extracted by identifying common sources of variation in the observed variables, the factors are free of high degrees of multicollinearity. This allows us to include multiple dimensions of gender equality simultaneously in the growth regression, thus avoiding the problem of omitted variable bias.

The EFA conducted on the gender variables employs the *principal factor* extraction method with a *promax* rotation procedure and factor loadings

Table 2 Factor analysis

Factor analysis/correlation		Observations	203
Method: Principal factors		Factors	2
Rotation: Oblique promax (Kaiser off)		Parameters	9
Factor	Variance	Proportion	
Equality in opportunity	1.083	0.790	
Equality in outcome	0.752	0.549	

Rotated factor loadings (pattern matrix) and unique variances

Variable	Equality in opportunity	Equality in outcome	Uniqueness
Labor force participation gap	0.196	0.563	0.645
Percent of parliament women	0.300	0.566	0.590
Literacy rate gap	0.300	0.103	0.900
Secondary enrollment gap	0.652	0.146	0.554
Fertility inverse	0.663	0.290	0.476

Factor rotation matrix

	Equality in opportunity	Equality in outcome
Equality in opportunity	0.796	0.606
Equality in outcome	-0.606	0.796

Note: Shading indicates a factor loading >0.5.

from the exercise are reported in Table 2.<sup>14</sup> Two common factors underlying the observed variables emerge from the analysis. Of these, the first is interpreted as reflecting equality in economic opportunity and the second as capturing equality in economic and political *outcomes*.<sup>15</sup> In the remainder of this section, we clarify the interpretations of these factors.

The first factor is primarily composed of the inverse of the fertility rate, which acquires a rotated factor loading of 0.663, and the secondary enrolment gap, with a loading of 0.652. The gender gap in secondary enrollment directly reflects constrained women's access to skill investment while the fertility rate implies the existence of cultural norms that limit women's access to education and employment. As such, we interpret this factor to represent *gender equality in economic opportunity*. The second factor is determined by the percentage of women in parliament (0.566) and the gender gap in labor force participation (0.563). These two variables may be regarded as capturing complementary dimensions of participatory equality. Hence, we interpret this factor as representing *gender equality in economic and political outcomes*.

Two points bear clarification in this context. First, in observing that a dimension of gender equality is *primarily* composed of a set of variables, we are not asserting that this factor is *solely* composed of these variables. The methodology of factor analysis is based on the premise that *each* of the variables reflects an impact from *all* of the underlying latent factors. Hence, the factor loading of 0.566 on the percentage of women in parliament in the outcome factor is capturing the impact of this variable that is uncorrelated with the opportunity factor. Second, it may appear surprising that the gender gap in literacy does not contribute significantly to either of the factors. However, definitions of literacy vary widely across countries, and even within the same country, have evolved over time. As such, we are unsure if we would have expected any meaningful contribution from this variable.<sup>16</sup>

Finally, Table 3 provides an idea of how countries in our sample rank with respect to the two dimensions of gender equality in 2000. Given the legacy of the universal education policy under state socialism, it is not surprising that Bulgaria, Estonia, and Latvia rank among the top five in equality of opportunity. However, despite the history of state commitment to guaranteed employment for both genders, none of these countries appear to have performed as satisfactorily in terms of gender equality in economic and political outcomes. Indeed, a 2010 report by the Confederation of Independent Bulgarian Unions (KNSB) finds that the average salary of women is likely to be 15.7 percent lower than that of men. Further, the employment rate for women aged 20–64 stands at only 58.3 percent, in contrast to 66.9 percent for men. The example of Bulgaria highlights the need to distinguish between different aspects of equality. More importantly, it adds a note of caution to the discourse on empowerment by indicating

Table 3 Selected percentiles of gender factor variables

	<i>Opportunity</i>	<i>Outcome</i>
<i>Top five</i>		
1	Bulgaria	Sweden
2	Latvia	Norway
3	Spain	Finland
4	Estonia	Denmark
5	Italy	Iceland
<i>First quartile</i>		
23	Korea	Malawi
24	Norway	Ghana
<i>Middle five</i>		
43	Sri Lanka	Senegal
44	Colombia	Gabon
45	Panama	Zambia
46	Jamaica	Thailand
47	Albania	Bolivia
<i>Third quartile</i>		
67	Algeria	Panama
68	Egypt	Malaysia
<i>Bottom five</i>		
84	Malawi	Iran
85	Cote d'Ivoire	Niger
86	Mali	Morocco
87	Niger	Jordan
88	Togo	Pakistan

that progress on the path to gender equality has not been uniform with respect to the different dimensions of equality in many societies.

## RESULTS

The difference–GMM estimation of Equation 1 reported in column 1 of Table 4 confirms our hypothesis that various aspects of gender equality have a significant impact on economic growth: a standard deviation improvement in economic opportunity increases the rate of growth by 1.30 percentage points and the impact is significant at the 0.05 level. Similarly, a standard deviation improvement in the outcome dimension of gender equality increases economic growth by 1.19 percentage points and the impact is again significant at the 0.05 level.

The standard correlates of growth have the signs predicted by theory. Consistent with the existing literature and the convergence hypothesis, the lagged log of per capita GDP negatively and significantly impacts growth

Table 4 Unbalanced panel results

Variables	(1) <i>Full sample</i>	(2) <i>OECD only</i>	(3) <i>Non-OECD only</i>	(4) <i>Interactions</i>
GDP growth <sub><i>t</i>-1</sub>	-0.549*** (0.0821)	-0.582*** (0.126)	-0.450*** (0.127)	-0.509*** (0.0844)
Ln(GDP) <sub><i>t</i>-1</sub>	-7.051*** (2.540)	-4.592 (3.864)	-6.962** (3.119)	-6.645*** (2.435)
Investment (% of GDP)	0.149*** (0.0541)	0.170* (0.0915)	0.164** (0.0688)	0.168*** (0.0562)
Government expenditure (net of Education and Military, % of GDP)	-0.261*** (0.0982)	-0.508** (0.220)	-0.213* (0.119)	-0.250*** (0.0925)
Inflation (CPI, %)	-0.0101 (0.00953)	-0.0375 (0.0422)	-0.00564 (0.0140)	-0.0117 (0.0124)
Secondary completion rate	0.101* (0.0573)	0.117* (0.0669)	0.0435 (0.101)	0.0849 (0.0667)
Opportunity	1.735** (0.827)	0.857 (1.264)	1.842* (1.073)	1.677* (0.993)
Outcome	1.847** (0.895)	2.348* (1.210)	0.484 (1.577)	0.394 (1.403)
OECD X opportunity				-0.493 (1.169)
OECD X outcome				2.577** (1.280)
Constant	55.80*** (19.92)	47.87 (34.97)	48.74** (22.38)	52.05*** (19.16)
Observations	228	75	153	228
Number of countries	101	28	75	101
Arellano-bond statistic	-1.46	-0.46	-1.88	-1.56
Hansen over-ID statistic	26.87	20.71	21.56	25.18
Degrees of freedom	20	20	20	20
P-Value	0.139	0.414	0.365	0.195

Notes: Dependent variable = per capita growth; Estimation method = Difference-GMM. Instruments for first differences equation: Standard:  $\Delta$  Investment, Government, Inflation, Secondary Education, Opportunity, Outcome, Interactions. GMM-type (separate instruments for each period):  $L(\text{Growth}_{t-1}, \ln(\text{GDP})_{t-2})$ . Robust standard errors in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1, 5, and 10 percent levels, respectively.

at the 0.01 level. Also consistent with the existing literature, the lagged growth rate of per capita GDP has a negative and significant impact, and investment has a positive and significant impact. We also observe a negative and significant effect for net government consumption that has been documented by Barro (1991), but the lack of consensus regarding



the impact of this variable (Niloy Bose, M. Emranul Haque, and Denise R. Osborn 2007) prevents us from reading too much into this result.<sup>17</sup> Finally, the inflation rate also exhibits the predicted negative sign but fails to achieve statistical significance.

In addition, the various specification tests for the Arellano–Bond model remain with the bounds necessary to conclude that the assumptions of no second-order serial correlation in the errors and that of the validity of the instruments hold. To investigate the first assumption, we report the Arellano–Bond test statistic for first-order serial correlation in the first-differenced errors. In each case, this statistic fails to reject the null hypothesis of zero first-order correlation at the 0.05 level. Note, however, that since our panel is only three periods long, testing for second order serial-correlation is not possible. However, given the fact that there is such weak evidence of first-order serial correlation, we find it very unlikely that second-order correlation could exist. Secondly, since Arellano–Bond estimators generate large numbers of instruments, it is often the case that these models result in overidentification. To test for this, we report the Hansen J statistic for overidentification. In each of our specifications, this statistic passes the criteria for no overidentification problem (fails to reject the null). Hence, we conclude that the problem of excessive instruments and overidentification is not too serious in our specification.

At first blush, the results presented in column 1 may appear to imply that both dimensions of gender equality are of approximately equal importance for economic growth. To explore this further, we now test whether the impacts of various dimensions of gender equality on economic growth depend on the stage of development of a society. To do so, we distinguish between countries that are members of the Organization for Economic Co-operation and Development (OECD) and ones that are not, the rationale being that membership in the OECD is likely to correlate with a relatively higher stage of economic and institutional development.<sup>18</sup>

Accordingly, we first estimate our model for the subsample of countries that belong to the OECD. As seen from column 2 in Table 4, it is the participatory dimension of gender equality alone that has significantly impacted economic growth over the period in question: while a standard deviation improvement in the outcome factor increased the rate of growth by about 1.51 percentage points at the 0.10 level, equality in economic opportunity did so by about 0.55 percentage points only and the impact is statistically insignificant.

Interestingly, the relative salience of the two aspects of gender equality appears to reverse for countries that are not members of the OECD: as seen from column 3, a standard deviation increase in the equality of opportunity improves growth by about 1.38 percentage points and the impact is significant at the 0.10 level. By contrast, an improvement in the

participatory dimension has a small positive impact of about 0.31 percentage point but fails to acquire significance to any acceptable level.

The last exercise in this set addresses the dichotomy between the opportunity and participatory dimensions in a unified model by introducing a dummy variable that takes the value 1 if a country is a member of the OECD and 0 if it is not, and considering interaction effects of the dummy with the two dimensions of gender equality.<sup>19</sup> As before, the impact of participatory equality is only significant for the subset of OECD members, with a standard deviation improvement in outcomes increasing growth by 1.91 percentage points on average and the impact being significant at the 0.05 level. At the same time, the opportunity dimension of gender equality significantly impacts growth for non-OECD countries exclusively, with a standard deviation increase in the factor resulting in a 1.26 percentage point increase in the rate of growth.

It, therefore, appears that the opportunity dimension of gender equality is of greater salience as a determinant of economic growth for developing nations while it is the participatory dimension that plays a greater role in stimulating growth for societies that have attained a threshold level of economic and institutional development. However, it should be clarified that in emphasizing the relative salience of the opportunity dimension of gender equality in developing countries, we are not claiming that variables such as the gender gap in labor force participation or the percentage of women in parliament, which contribute significantly to the outcome dimension, do not have an important impact on growth. Rather, insofar as these variables positively contribute to both dimensions of gender equality, our point is that these variables stimulate growth *more* by improving women's access to education in particular and economic opportunity in general than by increasing participation in the economic and political sphere.

## ROBUSTNESS

Since conventional gender-aggregated measures of human capital are strongly correlated with our variables of interest, it is natural to ask if our results are being confounded by the eventuality that women's access to education is too highly correlated with the overall level of opportunity and hence, the gross secondary completion rate. To address this concern, we follow [Klasen and Lamanna \(2009\)](#) in replacing the latter with the secondary completion rate for men. Interestingly, men's secondary completion rate fails to achieve statistical significance at the 5 percent level or better in the results of this exercise.<sup>20</sup> We have also re-estimated the model by excluding the secondary completion rate altogether. With respect to the gender equality variables, the results of each of these robustness checks confirm the basic flavor of the analysis conducted in the previous section.<sup>21</sup>

We now return to our initial specification to explore whether our results are robust to our choice of controls. Accordingly, we begin by testing whether the observed impacts of gender equality are robust to the consideration of a nonlinear quadratic impact of inflation (Robert Pollin and Andong Zhu 2006; Jenny Minier 2007) and trade openness, defined as the sum of exports and imports expressed as a percentage of GDP (Jeffrey D. Sachs and Andrew M. Warner 1995; Jeffrey Frankel and David Romer 1999; David Dollar and Aart Kraay 2004).<sup>22</sup> Once again, the basic results with respect to relative impacts of equal opportunity and equal outcome prove to be robust to the inclusion of these two variables.<sup>23</sup>

Finally, note that the results reported so far have been obtained on the basis of an unbalanced panel. As such, it may be asked if they are biased since the estimation weighs countries with a full complement of observations over the entire time series two or three times as heavily as the countries for which we only observe one time period. To allay these concerns, we re-estimate the model with a balanced panel of 45 countries, including 22 OECD countries and 23 non-OECD countries.<sup>24</sup> If anything, the results of this exercise sharpen the dichotomy between opportunity and participatory dimensions of gender equality, and also between OECD and non-OECD members.<sup>25</sup>

## CONCLUSION

This article investigated the consequences of gender equality on the growth experience of nations. An EFA conducted on five indicators of gender equality revealed two latent dimensions of gender equality, namely, equality in economic opportunity and equality in economic and political outcomes. Confirming our hypothesis on the differential impacts of various dimensions of gender equality on economic growth, subsequent regression analysis found a robust positive impact of the opportunity dimension for developing societies, while the impact of the outcome dimension was found to be significant for countries that had already attained a threshold level of development.

In addressing the multidimensionality of gender equality, the paper provides a more nuanced analysis of the role of the gender equality as a determinant of economic growth. No study on the topic of gender can understate the importance of attaining greater equality in the access to education and this is indeed a conclusion that emerges from our analysis. Yet a key implication of our study is that this is not all that needs to be done. In fact, the focus of policy intervention to address the problem of gender inequality should be contingent on the stage of development of a society: a developing nation embarking on a growth trajectory will benefit more from policy intervention directed at improving women's access to education and economic opportunity. Once a threshold level of economic and institutional

development has been achieved, however, it would benefit more from policies directed at ensuring equality of participation in economic activity and parity of voice in the political sphere.

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## NOTES

- <sup>1</sup> This should also reduce the precautionary demand for children and the resultant decline in fertility should stimulate growth.
- <sup>2</sup> It should be mentioned that [Fernando Ferreira and Joseph Gyourko \(2010\)](#) fail to obtain any impact of gender on expenditure by American city councils.
- <sup>3</sup> While [Svaleryd \(2009\)](#) investigates the consequences of female representation in government, [John R. Lott, Jr. and Lawrence W. Kenny \(1999\)](#) consider the impact of women's suffrage in America and identify it as a key determinant of the increase in public expenditure on education observed from 1870 to 1940.
- <sup>4</sup> Annual percentage growth in GDP per capita =  $(\text{GDP p.c.it} - \text{GDP p.c.i,t-1})/\text{GDP p.c.i,t-1}$ .
- <sup>5</sup> Also note that in constructing the time dimension of the panel as five-year intervals, the one-period lagged value of any variable in our specification represents the five-year lagged value of the five-year average.
- <sup>6</sup> A list of countries included in our sample is also available online as a supplemental table at <http://dx.doi.org/10.1080/13545701.2014.930163>.
- <sup>7</sup> We have not considered the gender wage gap due to the unavailability of reliable wage data for many of the countries in our sample.
- <sup>8</sup> All gender gaps are defined as the ratio of female to male magnitudes of the relevant variables, where a higher value indicates greater equality. To maintain parity with this convention, we take the inverse of adolescent fertility.
- <sup>9</sup> For countries with a bicameral legislature, we take the percentage of women in the lower chamber. The Inter-Parliamentary Union (<http://www.ipu.org/wmn-e/classifarc.htm>) does not provide data prior to 1997. We rely on version 3.0 of the Democracy Time Series Data compiled by Pippa Norris (<http://www.pippanorris.com>) for the missing years.
- <sup>10</sup> The most commonly used aggregation procedure is to perform principal component analysis and consider the first component as institutional quality ([Knack and Keefer 1995](#); [Alesina and Perotti 1996](#); [Perotti 1996](#)).
- <sup>11</sup> Highlighting this problem for institutional variables, [Laura Langbein and Stephen Knack \(2010\)](#) undertake a confirmatory factor analysis of the World Governance Indicators and fail to confirm the hypothesis that these measures are causally related to a single variable good governance. Also, unidimensional indices of gender equality such as the GEM and GDI have been criticized on the grounds that they do not reflect gender equality per se ([A. Geske Dijkstra 2002](#); [Klasen and Lamanna 2009](#)).
- <sup>12</sup> A limitation of dynamic GMM panel estimators is that they assume that the lagged values of the endogenous regressors are strong and only test their validity, using either a Sargan or Hansen statistic. Further, the finite-sample properties of these estimators are not well known ([Bazzi and Clemens 2013](#)).
- <sup>13</sup> The unique part of the decomposed variance can be seen as a residual, consisting of a random component and measurement error. The uniqueness factor reported in Table 2 consists of the total variability of each variable minus the sum of its squared factor loadings.
- <sup>14</sup> In obtaining the underlying factors, one faces the choice between several extraction methods, including principal component, principal factor, and maximum likelihood. Of these, the principal component extraction method is inappropriate for our purpose since it seeks to explain all of the variance in the observed variables and not the common variance, and hence leads to correlated errors. Maximum likelihood extraction requires the assumption of multivariate normality. One advantage of principal factor extraction is that it requires no distributional assumption on the observed variables. With respect to rotation, one faces the choice between orthogonal and oblique methods. Orthogonal

methods, such as orthomax or quartimax, force the assumption of orthogonality onto the factors, which leads to loss of information if the factors are correlated. We have followed the prescription of [Anna B. Costello and Jason W. Osborne \(2005\)](#) in choosing the oblique promax rotation method. We have replicated our analysis using alternative extraction and rotation procedures and obtained virtually identical results, which are available on request.

- 15 It should be clarified that we have not restricted the number of factors. Rather, the process determined that two was the appropriate number of factors, based on the proportion of common variance they explain.
- 16 [Serge Coulombe and Jean-François Tremblay \(2006\)](#) address this problem by considering results from the International Adult Literacy Survey as the measure of literacy so as to standardize the definition of literacy across countries. But this survey and other cross-national initiatives, such as the Adult Literacy and Lifeskills Survey and the Programme for the International Assessment of Adult Competencies, only cover OECD countries.
- 17 As an example of the lack of clarity on the topic, while [Barro \(1991\)](#) finds a negative impact of net government consumption on growth, [Xavier Sala-i-Martin \(1997\)](#) fails to find any robust association between the variables.
- 18 Of the 101 countries in our sample, 22 have been members of the OECD over the entire sample period, 76 have been nonmembers for the entire time period, and three – Mexico, Hungary, and South Korea – joined the OECD in 1994, 1996, and 1996, respectively.
- 19 Recall that with interactions between a dummy and a continuous variable, the non-interacted coefficient on the latter represents the impact of the continuous factor on the excluded group, here non-OECD countries. The impact of the factor for the included group, here OECD countries, is the sum of the non-interacted and the interacted coefficients and its standard error is calculated as the square root of the sum of the squared standard errors and twice the covariance between them. Note also that we have excluded the non-interacted OECD dummy variable since its effects are almost perfectly correlated with country fixed effects.
- 20 This is consistent with results obtained by a number of studies on the topic ([Hill and King 1995](#); [Dollar and Gatti 1999](#); [Kristin J. Forbes 2000](#)). Given that each of our regressions includes the gender gap in the access to education, we interpret the insignificance of the male secondary completion rate for developing countries as indicating that the importance of human capital as a determinant of growth depends critically on the level of equality allowed in its acquisition ([Francesco Caselli, Gerardo Esquivel, and Fernando Lefort 1996](#); [Coulombe and Tremblay 2006](#)).
- 21 The results of these tests are available online as supplemental tables at <http://dx.doi.org/10.1080/13545701.2014.930163>.
- 22 Since it is well documented that the volume of trade is correlated with the geographical area and population of a country, we follow [Barro \(1991\)](#) in filtering our measure of openness for the impact of these variables.
- 23 Results are available online as a supplemental table at <http://dx.doi.org/10.1080/13545701.2014.930163>. It is interesting to note that both inflation and trade openness mostly fail to achieve statistical significance. The first result is consistent with [Michael Bruno and William Easterly \(1998\)](#), who also find no impact of inflation on growth from 1960 to 1992, except in extreme episodes of inflation. Also, the ratio of trade to GDP is not the only measure of openness. Despite critiques by [Francisco Rodríguez and Dani Rodrik \(2001\)](#) and others, the literature has predominantly followed [Frankel and Romer \(1999\)](#) in filtering the trade volume for the effects of geographical characteristics. Also, while our difference-GMM methodology implicitly follows the

prescription of Caselli, Esquivel, and Lefort (1996) in addressing the endogeneity between trade and growth by estimating the growth model in differences and using lags of the explanatory variables as instruments (Dollar and Kraay 2004), this is not the only way to address the endogeneity problem.

<sup>24</sup> We have also reconstructed the predicted factors for gender equality on the basis of the balanced sample. Neither the factor loadings nor the interpretations of the factors change significantly with the change in sample.

<sup>25</sup> Results are available online as a supplemental table at <http://dx.doi.org/10.1080/13545701.2014.930163>.

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