

# THE IMPACT OF GENDER INEQUALITY IN EDUCATION AND EMPLOYMENT ON ECONOMIC GROWTH: NEW EVIDENCE FOR A PANEL OF COUNTRIES

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## ABSTRACT

Using cross-country and panel regressions, we investigate to what extent gender gaps in education and employment (proxied using gender gaps in labor force participation) reduce economic growth. Using the most recent data and investigating an extended time period (1960–2000), we update the results of previous studies on education gaps on growth and extend the analysis to employment gaps using panel data. We find that gender gaps in education and employment considerably reduce economic growth. The combined “costs” of education and employment gaps in the Middle East and North Africa, and South Asia amount respectively to 0.9–1.7 and 0.1–1.6 percentage point differences in growth compared to East Asia. Gender gaps in employment appear to have an increasing effect on economic growth differences between regions, with the Middle East and North Africa, and South Asia suffering from slower growth in female employment.

## KEYWORDS

Economic development, economic growth, economics of gender

JEL Codes: J7, J16, O4

## INTRODUCTION

There are many reasons to be concerned about existing gender inequalities in important well-being-related dimensions such as education, health, employment, or pay. From a well-being and equity perspective, such gender inequalities are problematic as they lower well-being and are a form of injustice in most conceptions of equity or justice.<sup>1</sup> While such a view would argue for reducing gender inequalities in these dimensions of well-being on intrinsic grounds, recently, a literature has developed that has investigated the instrumental effects of gender inequality on other important development outcomes, with a particular focus on economic growth. Without denying the importance of reducing gender inequality on intrinsic grounds, this paper is a contribution to this latter literature.

An important focus of this literature has been to examine the impact of gender inequality in education on economic growth.<sup>2</sup> A number of theoretical contributions have suggested a negative link between gender inequality and economic growth (for example, Oded Galor and David N. Weil [1996] and Nils-Petter Lagerlöf [2003]). This literature shows that, largely due to the impact of female education on fertility and the creation of human capital of the next generation, a lower gender gap will spur economic development. The next section will briefly summarize the main findings from this literature.

In parallel, an empirical literature has also examined these effects. While some earlier studies suggested that gender inequality in education might actually increase economic growth (Robert Barro and Jong-Wha Lee 1994; Robert Barro and Xavier Sala-i-Martin 1995), more recent work has shown that the opposite appears to be the case (M. Anne Hill and Elizabeth M. King 1995; David Dollar and Roberta Gatti 1999; Kristin Forbes 2000; Stephen Knowles, Paula Lorgelly, and Dorian Owen 2002; Stephan Klasen 2002; Steven Yamarik and Sucharita Ghosh 2003; Dina Abu-Ghaida and Stephan Klasen 2004). These studies not only differ from previous analyses in their findings of the impact of gender inequality on economic growth, but they also explain why earlier studies found the opposite effect and why more careful econometric techniques yield the new finding that gender inequality in education reduces economic growth.<sup>3</sup>

These macro studies are also consistent with findings using micro data showing that girls have a higher marginal return to education, which is even higher if the impact of female education on fertility and education of the next generation is included (Hill and King 1995; World Bank 2001; Elizabeth M. King, Stephan Klasen, and Maria Porter 2008).

The effects found are quite large for the regions where gender inequality is sizable, such as South Asia or the Middle East and North Africa (MENA). In fact, Klasen (2002) estimated that 0.9 percentage points of the 1.8 percentage point annual per capita growth difference between the countries in MENA and those in East Asia and the Pacific (EAP) can be attributed to higher initial gender inequality in education there as well as a slower closing of the gap vis-à-vis EAP.<sup>4</sup>

While these results are instructive, they are based on information on education and economic performance until 1990. Since new data on education achievement and economic performance that now stretch to 2000 have recently become available, one purpose of the paper is to update the findings of the impact of gender inequality on economic growth. We will do this by using an updated and extended data set and the same econometric specification that was used in Klasen (2002). For some regions (including the MENA region), an update is particularly germane, as the gender gaps in education have recently been closing more rapidly, so one would expect smaller but still remarkable costs for the existing gender gap in education.

A subject that has not been investigated in great detail is the impact of gender inequality in *employment* and *pay* on economic growth. The relatively small theoretical literature on the subject yields conflicting results (for example, Robert Blecker and Stephanie Seguino [2002], Berta Esteve-Volart [2004], and Tiago de Cavalcanti and José Tavares [2007]). While there is some empirical literature suggesting that high *earnings* gaps, combined with high female labor force participation rates, helped spur export-oriented economic growth in some Asian countries (for example, Stephanie Seguino [2000a, 2000b] and Matthias Busse and Christian Spielmann [2006]), there has not been a thorough empirical investigation of the role of gender gaps in *employment* on economic growth, and the few existing studies have to be treated with caution due to problems of endogeneity, unobserved heterogeneity, and poor data availability and quality.

These issues can best be treated in a panel framework, where one considers the impact of initial employment on subsequent economic growth, and thus can at least partly address issues of endogeneity and unobserved heterogeneity. Unfortunately, such panel data is only available for labor force participation rates by sex, not for employment by sex; we show below, however, that available data suggest that gender gaps in labor force participation and employment are closely correlated, so one can well proxy for the other. With forty years of data, an analysis of the gender gaps in labor force participation is now possible, and therefore a second aim of the paper is to investigate the impact of gender gaps in labor force participation (as a proxy for gender gaps in employment) on economic growth in such a panel framework.

#### GENDER INEQUALITY AND ECONOMIC PERFORMANCE: THEORY AND EVIDENCE

There have been a number of theoretical and empirical studies finding that gender inequality in education and employment reduces economic growth.<sup>5</sup> The main arguments from the literature, which are discussed in detail in Stephan Klasen (1999, 2002, 2006), are briefly summarized below.

Regarding gender inequality in education, the theoretical literature suggests as a first argument that such gender inequality reduces the average amount of human capital in a society and thus harms economic performance. It does so by artificially restricting the pool of talent from which to draw for education, thereby excluding highly qualified girls (and taking less qualified boys instead; see, for example, Dollar and Gatti [1999]). Moreover, if there are declining marginal returns to education, restricting the education of girls to lower levels while taking the education of boys to higher levels means that the marginal return to educating girls is higher than that of boys, and thus would boost overall economic performance (World Bank 2001; Knowles, Lorgelly, and Owen 2002).

A second argument relates to the externalities of female education. Promoting female education is known to reduce fertility levels, reduce child mortality levels, and promote the education of the next generation. Each factor in turn has a positive impact on economic growth. Thus, gender gaps in education reduce the benefits to society of high female education (see, for example, Galor and Weil [1996]; Lagerlöf [2003]; World Bank [2001]; and King, Klasen, and Porter [2008]). There is also an important timing issue involved here. Reduced fertility levels will, after some twenty years, lead to a favorable demographic constellation which David E. Bloom and Jeffrey G. Williamson (1998) refer to as a “demographic gift.” For a period of several decades, the working-age population will grow much faster than the overall population, thus lowering dependency rates with positive repercussions for per capita economic growth.<sup>6</sup>

A third argument relates to international competitiveness. Many East Asian countries have been able to be competitive in world markets through the use of women-intensive export-oriented manufacturing industries, a strategy that is now finding followers in South Asia and individual countries across the developing world (see, for example, Stephanie Seguino [2000a, 2000b]).<sup>7</sup> For such competitive export industries to emerge and grow, women need to be educated and there must be no barrier to their employment in such sectors. Gender inequality in education and employment would reduce the ability of countries to capitalize on these opportunities (World Bank 2001; Busse and Spielmann 2006).<sup>8</sup>

Regarding gender gaps in employment, there are a number of closely related arguments. First, the literature argues that it distorts the economy, as do gender gaps in education. It artificially reduces the pool of talent from which employers can draw, thereby reducing the average ability of the workforce (see, for example, Esteve-Volart [2004]). Such distortions would not only affect the dependent employed, but similar arguments could be made for the self-employed in agricultural and non-agricultural sectors where unequal access to critical inputs, technologies, and resources would reduce the average productivity of these ventures, thereby reducing economic growth (see Mark Blackden, Sudharshan Canagarajah, Stephen Klasen, and David Lawson [2007]). As self-employment (including in agriculture) is included in our empirical assessment, these arguments might have some empirical relevance in accounting for the results.

A second and also closely related argument suggests that gender inequality in employment can reduce economic growth via demographic effects. A model by Cavalcanti and Tavares (2007) suggests that gender inequality in employment would be associated with higher fertility levels, which in turn reduce economic growth.

Third, the results by Seguino (2000a, 2000b) on the impact of gender gaps in pay on international competitiveness imply that gender gaps in employment access would also reduce economic growth, as it would deprive

countries' use of (relatively cheap) women's labor as a competitive advantage in an export-oriented growth strategy.

A fourth argument relates to the importance of women's employment and earnings for their bargaining power within families. There is a sizable literature that demonstrates that women's employment and earnings increase their bargaining power in the home (for example, Amartya Sen [1990]; Lawrence James Haddad, John Hoddinott, and Harold Alderman [1997]; Duncan Thomas [1997]; World Bank [2001]; Stephan Klasen and Claudia Wink [2003]; and King, Klasen, and Porter [2008]). This greater bargaining power not only benefits the women concerned, but can also have a range of growth-enhancing effects. These could include higher savings, as women and men differ in their savings behavior (see, for example, Stephanie Seguino and Maria Sagrario Floro [2003]), more productive investments and use and repayment of credit (see Janet Stotsky [2006]), and higher investments in the health and education of their children, thus promoting the next generation's human capital, and therefore economic growth (see, for example, Thomas [1997] and World Bank [2001]).

A fifth argument relates to governance. There is a growing but still rather speculative and suggestive literature that has collated evidence that women workers, on average, appear to be less prone to corruption and nepotism than men workers (World Bank 2001; Anand Swamy, Omar Azfar, Stephen Knack and Young Lee 2001). If these findings prove to be robust, greater levels of women's employment might be beneficial for economic performance in this sense as well.<sup>9</sup>

There is a related theoretical literature that examines the impact of gender discrimination in pay on economic performance. Here, the theoretical literature is quite divided. On the one hand, studies by Galor and Weil (1996) and Cavalcanti and Tavares (2007) suggest that large gender pay gaps will reduce economic growth. Such gender pay gaps reduce female employment, increase fertility, and lower economic growth through these participation and demographic effects. In contrast, Blecker and Seguino (2002) highlight a different mechanism, leading to contrasting results. They suggest that high gender pay gaps and associated low female wages increase the competitiveness of export-oriented industrializing economies and thus boost the growth performance of these countries. The most important difference in this study, in contrast to the models considered above, is that it focuses more on short-term, demand-induced growth effects, while the other models are long-term growth models where growth is driven by supply constraints. Clearly, both effects can be relevant, depending on the time horizon considered, an issue that is also discussed briefly below.

It is important to point out that it is difficult to theoretically separate the effects between gender gaps in education, employment, and pay. In fact, in most of the models considered above, gender gaps in one dimension tend to lead to gender gaps in other dimensions, with the causality running

in both directions.<sup>10</sup> For example, gender gaps in education might automatically lead to gender gaps in employment, particularly in the formal sector, where employers will prefer educated workers and thus will not consider the applications of uneducated women. Conversely, if there are large barriers to female employment or gender gaps in pay, rational parents (and girls) might decide that the education of girls is not as lucrative, which might therefore lead to lower demands for female education and the resulting gender gaps in education.<sup>11</sup> Thus, gender gaps in education and employment are closely related.<sup>12</sup>

Gender gaps in education and employment are not measuring the same thing, however, and thus it is important to investigate them separately. For one, it might be the case that the two issues are largely driven by institutional factors that govern education and employment access and do not therefore greatly depend on each other. For example, one might think of an education policy that strives to achieve universal education and thus reduces gender gaps, while there continue to be considerable barriers to employment for women in the labor market. This might be particularly relevant to the situations in the MENA and most recently South Asia. Moreover, the externalities of female education and female employment are not the same. For example, female education is likely to lead to lower fertility and child mortality of the offspring, while the effect of female employment on these items is likely to be much smaller and more indirect (working mainly through greater women's bargaining power; and there may also be opposite effects, including that the absence of women in the home might in some cases have a negative impact on the quality of childcare). Conversely, the governance externality applies solely to female employment, not to female education.

On the empirical evidence, there is a considerable literature now documenting that gender gaps in education reduce economic growth. Elizabeth M. King and M. Anne Hill (1993) as well as Knowles, Lorgelly, and Owen (2002) use a Solow-growth framework, and find that gender gaps in education have a large and statistically significant negative effect on the level of gross domestic product (GDP). Dollar and Gatti (1999), Forbes (2000), Yamarik and Ghosh (2003), Elizabeth N. Appiah and Walter W. McMahon (2002), and Klasen (2002) investigate the impact of gender gaps on economic growth, and all find that gender gaps in education have a negative impact on subsequent economic growth. They also find that the earlier results by Barro and Lee (1994), that female education might negatively impact economic growth, do not stand up to closer econometric scrutiny.

There are far fewer empirical studies on the impact of gender gaps in employment and pay on economic growth, which is largely due to the data and econometric issues discussed above. Klasen (1999) found that increases in female labor force participation and formal-sector employment were associated with higher growth in a cross-country context. Differences in

female participation and employment might have accounted for another 0.3 percentage points in the growth difference between the MENA region and EAP. But these findings have to be treated with caution as they may suffer from reverse causality. In particular, it might be the case that high growth draws women into the labor force (rather than increasing female participation promoting economic growth). There are no easy ways to correct for this econometrically, as there are unlikely to be valid instruments that can be used. Also, there are questions about the international comparability of data on labor force participation and formal-sector employment rates. To the extent that the problems of comparability affect levels but not trends over time, these problems might be avoided in a fixed effects panel setting as the one we are undertaking here.

At the sub-national level, Esteve-Volart (2004) has found statistically significant negative effects of gender gaps in employment and managerial positions on economic growth of India's states using panel data and controlling for endogeneity using instrumental variables.

There are some papers by Seguino (2000a, 2000b) that support the contention that the combination of low gender gaps in education and employment with large gender gaps in pay (and resulting low female wages) were a contributing factor to the growth experience of export-oriented, middle-income countries. A paper by Busse and Spielmann (2006), which finds for a sample of twenty-three developing countries that a combination of low gender gaps in education and employment and large gender gaps in pay helped promote exports, supports this empirical claim. Unfortunately, there are no comprehensive, standardized, and comparable data on gender pay gaps across many countries, so these analyses have been based on relatively small and rather specific samples of countries.<sup>13</sup>

Also empirically, there are some questions about the separation of the effects of gender gaps in education and labor force participation or employment. Regressions that only consider the effect of gender gaps in education might implicitly also measure the impact of gender gaps in employment, particularly if the two are highly correlated. Such high correlation might also make it difficult to separately identify the effects when both are included in a regression (due to the multicollinearity problem).<sup>14</sup> Also, it will be difficult to assess which of the two is the causal driver of the other, given the close and plausible theoretical and empirical linkage.

In sum, there is considerable theoretical support for the notion that gender gaps in education and employment are likely to reduce economic performance (while the literature on the effect of gender gaps in pay is more divided). The empirical results also point to negative effects of gender gaps in education, but there is little reliable cross-country evidence on gender gaps in employment. In the following section, we will discuss the gender gaps in education and employment by developing region before estimating the impact of these gaps on economic performance.

EDUCATION, LABOR FORCE PARTICIPATION,  
EMPLOYMENT, AND ECONOMIC PERFORMANCE

In this section, we will present data on growth, education, labor force participation, and employment in different world regions, with particular focus on MENA,<sup>15</sup> Sub-Saharan Africa, and South Asia – the areas with particularly high gender gaps in education and/or employment. The data sources and definitions are shown in Table 1.

As shown in Figure 1, the fastest-growing region in the past forty years according to our data set has been the region of EAP. The real per capita annual growth rate between 1960 and 2000 in this region was 4.05 percent. On the contrary, the region that registered least growth is the Sub-Saharan Africa region (0.57 percent). Latin American and Caribbean countries (LAC) did not experience high growth rates either: they grew 1.53 percent annually. The Middle East and the Organisation for Economic Co-operation and Development (OECD) countries' growth rates are in-between at 2.24 percent and 2.66 percent annual growth per capita respectively. To better analyze the pattern of the per capita growth rate, we will decompose it into the decades of the past forty years (1960s, 1970s, 1980s, and 1990s) and consider the different world region's growth rates in the different decades.

Considering the growth rate per decade in Figure 2 allows us to take into account the growth rates of Eastern Europe and Central Asia (ECA) because after 1990 the data available for this region increases considerably. During the nineties those countries were in transition, and their rate of per capita growth was very low (0.26 percent). But also in Sub-Saharan Africa, the annual per capita growth rate decreased in the last four decades, and actually shows negative growth in the nineties (-0.21 percent).

In other world regions, the per capita growth rate was generally higher in the 1960s and 1970s, and then it decreased in the 1980s and 1990s, with the exception of the South Asia region (SA), where the annual growth rate grew quickly in 1980s and was maintained almost at the same level in the 1990s. This result was largely driven by India and Sri Lanka. But their neighbors (EAP countries) still remain the countries that experience largely higher annual per capita growth rate in each decade. The region of MENA, together with Latin America, seems to be successfully recovering from very low growth in the 1980s. One should point out that the data for MENA included in the analysis do not consider many of the oil-exporting Arab states including Saudi Arabia, Kuwait, UAE, Oman, and Libya, for which there is no income data over time.<sup>16</sup> Nevertheless, the growth experience is, to a considerable extent, influenced by the direct and indirect impact of oil prices on oil-producing (and neighboring) countries.<sup>17</sup>

Non-economic indicators of well-being show a similar pattern, although some differences emerge (see Appendix Table 2). The three indicators

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Table 1 Variables names, definitions, and data sources<sup>a</sup>

<i>Variable name</i>	<i>Definitions</i>	<i>Data source</i>
G	Per capita annual compound growth rate in purchasing power, parity-adjusted GDP per capita	Penn World Table 6.1 (Alan Heston, Robert Summers, and Bettina Aten 2002)
GDP60(00)	Real GDP per capita in PPP-terms in 1960 (2000)	Penn World Table 6.1 (Heston, Summers, and Aten 2002)
INV	Average investment rates	Penn World Table 6.1 (Heston, Summers, and Aten 2002)
POPGRO	Growth rate of total population	Penn World Table 6.1 (Heston, Summers, and Aten 2002)
OPEN	Average of exports plus imports as a share of GDP	WDI (World Bank 2002)
LFG	Growth rate of working-age population (15–64)	WDI (World Bank 2002)
FERT60(00)	Level of fertility 1960 (2000)	WDI (World Bank 2002)
M560(00)	Under 5 mortality rate 1960 (2000)	WDI (World Bank 2002)
Life	Life expectancy measured in years	WDI (World Bank 2002)
ED	Number of years of schooling for the male population (15+ and 25+)	Robert Barro and Jong-Wha Lee (2000)
AED	Number of years of schooling for the population	Barro and Lee (2000)
GED	Absolute (annual) growth in male years of schooling	Barro and Lee (2000)
GEDF	Absolute (annual) growth in female years of schooling	
GAED	Absolute growth in total years of schooling	Barro and Lee (2000)
RED	Female–male ratio of schooling	Barro and Lee (2000)
RGED	Female–male ratio of the growth in the years of schooling	Barro and Lee (2000)
MACT	Male economic activity rate (15–64)	ILO Laborsta (ILO 2003)
FACT	Female economic activity rate (15–64)	ILO Laborsta (ILO 2003)
RACT	Female–male ratio of activity rates (15–64)	ILO Laborsta (ILO 2003)
TACT	Total economic activity rate (15–64)	ILO Laborsta (ILO 2003)
FLFT	Female share of the total labor force (15–64)	ILO Laborsta (ILO 2003)

Note: <sup>a</sup>WDI is abbreviation for the report *World Development Indicators*.

shown – under 5 mortality, fertility, and life expectancy – all show larger improvements than the income measures. But the pace of improvements is similar to the growth indicator, with EAP showing the fastest improvements on most indicators, while Sub-Saharan Africa shows the slowest. Here, the MENA region compares very favorably with rapid improvements in life expectancy and under 5 mortality, and large reductions in fertility,

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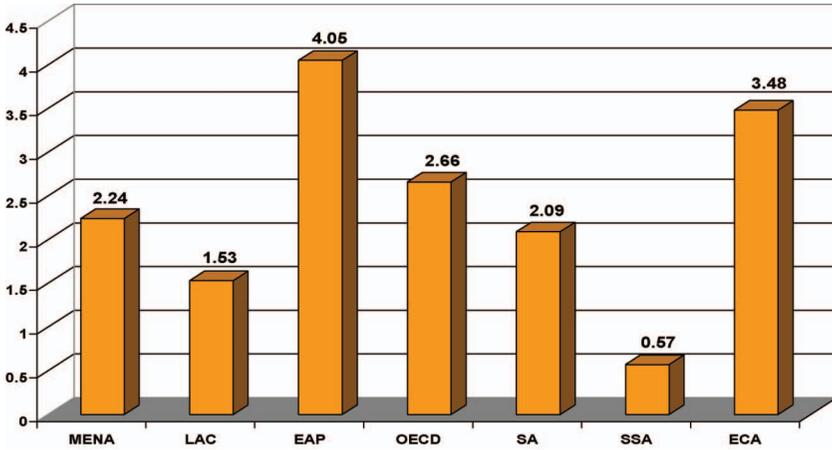


Figure 1 Real regional per capita annual growth rate 1960-2000

Source: Penn World Table 6.1 (Heston, Summers, and Aten 2002).

Notes: The sample of countries included is restricted due to data availability. See the Appendix for a detailed listing. Figures refer to unweighted averages. World regions: MENA (the Middle East and North Africa), LAC (Latin America and the Caribbean), EAP (East Asia and Pacific), OECD (industrialized countries members of the Organisation for Economic Co-operation and Development [OECD]), SA (South Asia), SSA (Sub-Saharan Africa), and ECA (Eastern Europe and Central Asia).

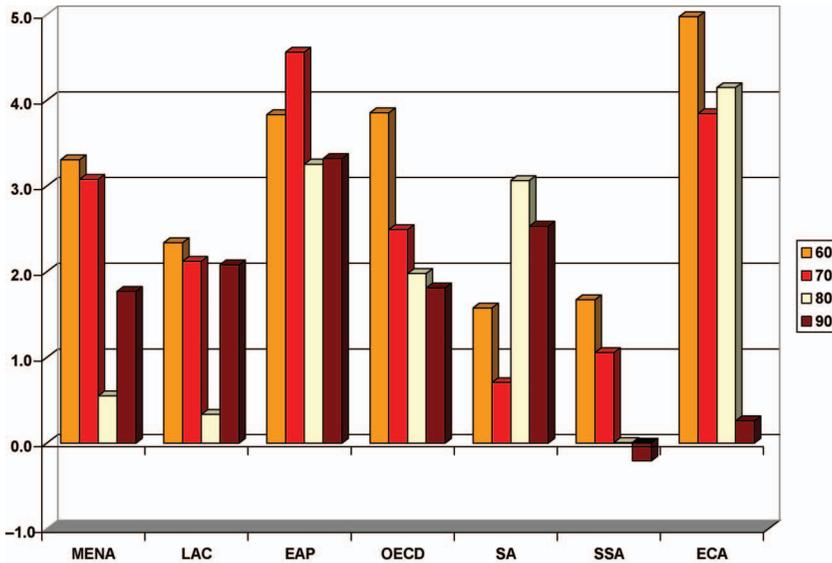


Figure 2 Real regional per capita annual growth rate by decade

Source: Penn World Table 6.1 (Heston, Summers, and Aten 2002).

particularly in the past twenty years, while in South Asia the improvement was generally smaller.

Turning to the indicators of concern here, gender inequality in education, labor force participation, and employment, Appendix Tables 3 and 4 show the development by decade in the regions between 1960 and 2000. These tables show that in all the regions, the education level of the adult population has increased considerably since 1960. Male and female adults have between 1.8 and 4.4 more years of education in 2000 than in 1960, with Sub-Saharan Africa showing the slowest progress and East Asia and the MENA region the fastest. Regarding gender inequality, the data show considerable gender inequality in education in 1960 for most regions. The worst affected were South Asia, Sub-Saharan Africa, and the MENA region, where women had about half or less the education level than men. In all regions, this gap has been reduced, but the gap remains sizable in some. In South Asia, women still only have about 60 percent of the educational achievement of men, and the gap has closed quite slowly in Sub-Saharan Africa. The gaps have been closing faster in EAP and also in the MENA region, where women (15 and older) now have about 73 percent of the education of men.

Appendix Table 4 examines the data on labor force participation rates by gender, the female share of the labor force, and the rates of formal-sector employment. The data show that inequality in labor force participation is also considerable, although the gaps have been narrowing. From these data, a consistent pattern emerges. In particular, EAP as well as Latin America show rapidly declining gender gaps in labor force participation and formal-sector employment. Sub-Saharan Africa shows declines in female labor force participation, but from a previously high level,<sup>18</sup> and the MENA region has the lowest female labor force participation rate and formal sector participation of women throughout the period. The gaps in labor force participation rates in MENA (as in other regions) have also narrowed in recent decades, but by less than most other regions.<sup>19</sup> In South Asia, the gender gap in labor force participation in the past four decades has only marginally reduced.

From our theoretical discussion, we would expect that excluding women from the pool of talent is particularly damaging to formal-sector employment, which may predominantly depend on having the best talent. Thus, using the gender gap in formal-sector employment might be most appropriate. On the other hand, these data are available from the International Labour Organization (ILO) for a much smaller pool of countries, and it appears that measurement error and international comparability is particularly problematic using these data. Therefore, we will use the gender gaps in labor force participation only for the empirical analysis that follows.

Even if formal-sector employment data are not readily available and comparable, one might still want to use the overall employment rate

(that is, employed women as a share of the working-age population) rather than labor force participation data, as the presumed theoretical effects are related to employment rather than participation. The difference between the two is, of course, the unemployment rates. While we do not have reliable employment data at the national level, the Key Indicators of the Labour Market (KILM) data of the ILO (2007) suggest that, first, unemployment rates are below 10 percent in all regions except the MENA region (where they are believed to hover around 12–14 percent), and second, the differences in male and female unemployment rates are quite low (usually less than 1 percentage point), so labor force participation data appear to be reasonable proxies for employment levels by sex.<sup>20</sup> Thus, we believe that the data on gender gaps in labor force participation rates will be reasonable proxies for gender gaps in overall employment rates.

In general, however, the quality and comparability of the ILO labor force data is also open to question. The data are estimates based sometimes on very patchy primary data. The comparability problems are likely to be larger in level differences across countries than in trends over time. Despite these problems, we are forced to rely on the available ILO labor force data as the only available cross-country panel data for our analysis. Inherent measurement error in all the labor force estimates leads to the well-known downward bias of coefficients in regression analyses. Thus, any effect that we find is likely to understate the true extent of the effect. Unfortunately, it is very difficult to econometrically control for measurement error. We know little about the structure of the measurement error, nor are there good instruments to address it. We hope that our panel analyses will at least partly reduce this problem to the extent that measurement error and comparability problems are lower across time than they are across space and can therefore be partly controlled for by using country-specific effects.

## DATA AND ESTIMATION PROCEDURE

Since the early 1990s, a good deal of empirical growth research using cross-country data was inspired by new growth theories and the availability of better data. In our estimation strategy, we make use of cross-country and panel growth regressions that were pioneered by Robert Barro (1991) and used in a large literature since. Our particular estimation strategy for the cross-section analysis follows Klasen (2002); the panel regressions will be extended to include additional employment variables. As our focus is on long-run economic growth, the most basic specification will use purely cross-country data where the period 1960–2000 will be treated as a single observation for each country. To partly control for possible endogeneity issues and unobserved heterogeneity, we will also consider panel regressions that treat each decade as one observation and use initial values of the covariates. Those panel regressions will also allow us to properly study the

impact of gender inequalities in labor force participation on economic growth.

We include a number of regressors that were found to affect economic growth in the literature, including population growth, growth in the working-age population, openness (exports plus imports as a share of GDP), the investment rate, human capital, and regional dummy variables to capture region-specific effects, which are invariably not captured in such cross-country regressions and can include common geographic, institutional, policy, trade, or conflict experiences within regions.<sup>21</sup>

To avoid some of the methodological problems of earlier studies on gender inequality and economic growth, we do not separate male and female education level in our equations. Instead, we generate four different education variables, one for the initial level of education in 1960, one for the gender gap in the level of education in 1960, one for the growth in the level of education in the period 1960–2000, and one for the growth rate of the female-male education level ratio for the period 1960–2000. For the level of education, we could use the average, the male, or the female education level. Each would make different assumptions about the possibilities to affect the gender gap. Using the male education level as a proxy for average education provides an upper-bound estimate for the effect of gender inequality in education on economic growth, as it implicitly assumes that one could improve the gender gap in education by sending more girls to school without having to take out boys (as the male education level is held constant this way).<sup>22</sup> In the alternative specification, when we use average education and the gender gap in average education in our equations, we assume that any increase in female education means an equal-sized reduction in male education and thus constitutes a lower-bound estimate of the effect of gender inequality on economic growth.

It may well be the case that gender inequality in education has a direct impact on economic growth; but gender inequality may also affect economic growth through its effects on investment rates, overall population growth, and growth in the working-age population. Our interest is in capturing both the direct and indirect effects of gender inequality on economic growth. Following Klasen (2002), we will estimate a set of regressions to capture these two effects.

The data used in this paper come from different data sources. Table 1 provides information on data sources and a description of the computation of the main variables of interest. Using the variables defined in Table 1, the equations estimated (using OLS) in the cross-country analysis are the following<sup>23</sup>:

$$g = \alpha + \beta_1 INV + \beta_2 POPGRO + \beta_3 LFG + \beta_4 ED60 + \beta_5 GED + \beta_6 RED60 + \beta_7 RGED + \beta_8 X + \epsilon \quad (1)$$

$$INV = \alpha + \beta_9 POPGRO + \beta_{10} LFG + \beta_{11} ED60 + \beta_{12} GED + \beta_{13} RED60 + \beta_{14} RGED + \beta_{15} X + \epsilon \quad (2)$$

$$POPGRO = \alpha + \beta_{16} OPEN + \beta_{17} ED60 + \beta_{18} GED + \beta_{19} RED60 + \beta_{20} RGED + \beta_{21} X + \epsilon \quad (3)$$

$$LFG = \alpha + \beta_{22} OPEN + \beta_{23} ED60 + \beta_{24} GED + \beta_{25} RED60 + \beta_{26} RGED + \beta_{27} X + \epsilon \quad (4)$$

$$G = \alpha + \beta_{28} OPEN + \beta_{29} ED + \beta_{30} GED + \beta_{31} RED60 + \beta_{32} RGED + \beta_{33} X + \epsilon \quad (5)$$

$$G = \alpha + \beta_{34} INV + \beta_{35} POPGRO + \beta_{36} LFG + \beta_{37} AED60 + \beta_{38} GAED + \beta_{39} RED60 + \beta_{40} RGED + \beta_{41} X + \epsilon \quad (6)$$

$$G = \alpha + \beta_{42} AED + \beta_{43} GAED + \beta_{44} RED60 + \beta_{45} RGED + \beta_{46} X + \epsilon \quad (7)$$

The first equation measures the direct impact of education and the gender bias in education on economic growth, as it controls for investment, population, and working-age population growth. In all regressions, we do control for regional variation.<sup>24</sup> Education and gender bias in education could, however, influence population growth, investment, and growth in the working age population in the future. Therefore, there is a need to consider the indirect impact of education and gender inequalities on economic growth via these variables (Equations 2–4). The total effect of gender inequality in education on growth is determined by the path analysis, in which we simply sum the direct effect and indirect effects of gender inequalities in education on growth (see Klasen [2002]).

The fifth equation is the so-called “reduced form” regression. In this equation, we omit investment, overall population, and working-age population growth variables. We expect the coefficients on education of this regression to measure the total effect of gender bias in education directly. The results should then be comparable to the sum of direct and indirect effects calculated using the path analysis.

Equations 6–7 consider the total number of years of schooling as a measure for the average human capital, generating a lower bound estimate of these effects.

The model is then reestimated using panel data where dependent and explanatory variables refer to the following decades: 1960–9; 1970–9;

1980–9; and 1990–2000. Using panel data would allow us to partly control for endogeneity of the education and labor force participation variables by using initial values of each decade and address unobserved heterogeneity and/or measurement error using country-specific effects.<sup>25</sup> This way, we feel we are able to generate more robust estimates, particularly regarding the labor force participation variables where endogeneity and measurement error are likely to be particularly problematic.

We will use several variables to investigate the impact of gender inequalities in employment on growth across the world. In a first specification, we will add the female share of the labor force to our equation. This specification holds the total labor force fixed and just adjusts the female share of the labor force, assuming that higher female employment could only come about through increased total employment. While this might be the best specification, it does not allow for possible influences of male labor force participation on economic growth, which might bias the results.<sup>26</sup> We use a similar technique to that used in the cross-country growth regression model for the education variables with employment. We generate upper- and lower-bound estimates. We use male activity rates together with the female–male ratio as upper bound estimates (the assumption is that the female–male ratio could be increased without reducing male activity rates, leading to basically more jobs in total) and the total activity rate together with the female–male ratio as lower bound (the assumption is that any additional female job would lead to fewer male jobs). As with the education estimates, we believe that the true effects are closer to the former than the latter specification. Using fixed effects to control for unobserved heterogeneity turns out to be the best panel specification.<sup>27</sup>

Compared with Klasen (2002), the country sample is smaller due firstly to changes in data availability from the Penn World Tables Version 6.1 (Alan Heston, Robert Summers, and Bettina Aten 2002); secondly, to the elimination of apparently inconsistent data for education in two countries; and thirdly, to the lack of data for many transition countries before 1990.<sup>28</sup>

Table 2 shows the descriptive statistic of some variables of interest for the cross-country analysis. This includes a number of variables typically used in cross-country growth models. We have already commented above on trends and regional differences in GDP growth, education, labor force, and non-income indicators of well-being by decade. One point of note is the variable *RGED*, which measures the female–male ratio of growth in education in the period 1960–2000. This variable clearly reflects the different progress made in reducing the gender gap in education in a region. While the ratio is far above 1 in EAP, suggesting that women expanded their education faster than men, the reverse is the case especially in South Asia (0.77) but also in the MENA region (0.87). The figures for SSA show that women expanded their education about as fast as men. Table 2 also includes data on other regressors, including the investment rate, population growth, and

Table 2 Descriptive statistics for cross-section analysis

	<i>TOTAL</i>	<i>MENA</i>	<i>LAC</i>	<i>EAP</i>	<i>OECD</i>	<i>SA</i>	<i>SSA</i>	<i>ECA</i>
G	1.78	2.24	1.53	4.05	2.66	2.09	0.57	3.48
INV	15.48	13.18	13.96	20.53	23.92	11.21	10.45	17.31
OPEN	72.98	71.41	79.37	87.82	57.26	38.60	74.76	81.91
M560	166.65	233.75	135.50	139.56	37.45	228.00	273.08	80.78
M500	64.35	45.13	32.00	31.77	6.62	80.65	147.42	16.38
POPGRO	1.89	2.75	1.79	2.01	0.73	2.20	2.50	0.91
FERT60	5.31	7.12	6.12	5.69	2.88	6.30	6.49	3.24
FERT00	3.15	3.32	2.70	2.27	1.67	3.45	5.09	1.47
GDP60	3,377	1,971	3,299	1,813	8,473	930	1,478	2,233
GDP00	8,693	4,462	6,897	12,033	23,153	2,186	2,375	7,910
LFG	2.02	2.95	2.35	2.69	0.86	2.33	2.46	1.00
RED60	0.70	0.39	0.91	0.59	0.93	0.29	0.47	0.73
RGED	1.03	0.87	1.09	1.24	1.02	0.77	0.97	1.05
EDF60	3.41	0.65	3.26	2.74	6.56	0.89	1.19	5.24
GEDF	0.07	0.11	0.07	0.10	0.07	0.06	0.05	0.09

Sources: Authors' computations based on data from WDI (World Bank 2002), Penn World Table 6.1 (Heston, Summers, and Aten 2002), and Robert Barro and Jong-Wha Lee (2000).

Note: In addition to the dependent and explanatory variables of our cross-country model, we do report child mortality (under 5 years of life) in 1960 (M560) and in 2000 (M500), the fertility rate (FERT), and the real GDP per capita in PPP for 1960 and 2000 for each region.

working-age population growth. Here, well-known differences emerge. The region of EAP is notable for its high investment rates, high level of openness, high growth in the working-age population, and moderate population growth. The reverse is basically the case for Sub-Saharan Africa: investment rates are low and population growth rates are high. The MENA region shows very high levels of population growth but also sizable investment rates and levels of openness, while South Asia shows relatively high rates of population growth and a low level of openness and investment.<sup>29</sup>

## RESULTS

Table 3 shows the basic set of cross-country regressions using the approach from Klasen (2002) as shown above but with the new data that now stretch from 1960 to 2000. We start by considering the basic regression in column 1. Before turning to the education variables, we briefly comment on the other regressors. Compared with Klasen (2002), we observe a considerably better fit of the regression results, which might partially be due to the slightly smaller (and more homogeneous) sample. Also, all the direct and reduced-form regressions pass the omitted variable test.<sup>30</sup> The substantive results confirm many of the findings from the empirical growth literature. First, we see a strong conditional convergence effect. Second, there is a sizable positive impact of investment on economic growth and a large negative impact of population growth, while we also observe a large positive

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Table 3 Gender inequality in education and economic growth

<i>Dependent variable</i>	<i>Growth (1)</i>	<i>INV (2)</i>	<i>POPGRO (3)</i>	<i>LFG (4)</i>	<i>Growth (5)</i>	<i>Growth (6)<sup>+</sup></i>	<i>Growth (7)<sup>+</sup></i>
LOGGDP60	-2.27*** 0.50	-3.51 3.1	-0.18 0.34	-0.21 0.36	-2.47*** 0.63	-2.29*** 0.52	-2.52*** 0.65
POPGRO	-2.80*** 0.53	0.91 2.25				-2.79*** 0.53	
LFG	2.33*** 0.47	0.04 2.10				2.32*** 0.47	
OPEN	-0.001 0.003	0.041** 0.02	-0.003 0.002	-0.002 0.002	0.005* 0.004	-0.0005 0.003	0.006* 0.004
INV	0.06*** 0.02					0.06*** 0.02	
RED60	0.68 0.85	5.84** 3.08	-0.4 0.32	-0.17 0.33	1.75** 0.89	0.76 0.89	1.72** 0.91
ED60	0.01 0.07	0.92** 0.44	-0.02 0.05	0.01 0.06	0.16** 0.09	0 0.08	0.13* 0.10
GED	10.42*** 4.35	35.42 28.95	-1.01 1.94	0.85 2.14	17.33*** 4.46	10.59*** 4.78	18.31*** 4.86
RGED	0.70*** 0.29	2.07 2.19	0.001 0.25	0.05 0.25	0.95*** 0.37	0.47** 0.25	0.62** 0.34
SA	-0.07 0.59	-3.58 3.07	-0.17 0.24	-0.46** 0.24	-0.90* 0.64	-0.02 0.61	-0.85* 0.65
SSA	-0.83* 0.57	-6.92*** 2.76	0.40** 0.22	-0.06 0.22	-2.49*** 0.70	-0.81* 0.58	-2.47*** 0.71
ECA	-0.1 0.63	3.57 2.80	-0.91** 0.41	-1.32*** 0.54	-0.46 0.87	-0.1 0.63	-0.46 0.88
LAC	-0.87* 0.56	-4.87** 2.73	0.08 0.28	-0.17 0.27	-1.79*** 0.74	-0.87* 0.56	-1.81*** 0.74
MENA	-0.17 0.53	-3.77 3.77	0.72** 0.42	0.48 0.41	-1.26** 0.66	-0.12 0.52	-1.24** 0.65
OECD	0.47 0.60	4.81* 3.04	-1.07*** 0.37	-1.64*** 0.38	-0.12 0.83	0.55 0.60	0.01 0.82
CONSTANT	7.35*** 1.84	13.65 11.80	3.26*** 1.06	3.39*** 1.11	7.16*** 2.10	7.65*** 1.85	7.73*** 2.14
ADJ R2	0.76	0.66	0.64	0.62	0.63	0.76	0.64
OV Test	passed	passed	failed	passed	passed	passed	passed
OBS	93	93	93	93	93	93	93

Notes: Heteroscedasticity-adjusted standard errors reported under the coefficients. \*\*\* Refers to 1 percent, \*\* to 5 percent, and \* to 10 percent significance level using a one-tail test. <sup>+</sup> indicates regression with total education instead of male education only. OV test refers to the Ramsey Reset test for omitted variables.

impact of growth in the working-age population. These findings confirm that the timing of the demographic transition can have a powerful impact on economic growth (Bloom and Williamson 1998). The size of the effect is considerably larger now than it was in Klasen (2002). When population growth is falling due to lower fertility, but working-age population growth is still high due to past high fertility, countries are receiving a “demographic gift” of a low dependency burden (Bloom and Williamson 1998), which

allows higher savings, a higher ratio of workers to population, and higher investment demand. Given that fertility in the MENA and South Asia regions is falling rapidly, one would expect the region to enter this phase of the “demographic gift” in the coming decades. To what extent they will be able to capitalize on this opportunity will depend largely on the ability to generate employment for the large numbers of young people entering the working-age population and the labor force in coming decades.

Of the regional dummy variables, only those for Sub-Saharan Africa and Latin America have a (marginally) significant negative coefficient. The size of the coefficients are much smaller than in Klasen (2002), suggesting that the model is better able to explain the growth differences between regions than was possible in Klasen (2002).

Turning to the education variables, the initial male education and the growth of male education have the expected positive signs, although only the education growth variable is significant. The initial female–male ratio of education has the expected positive sign, but it is not significant (compared to Klasen [2002], where it was marginally significant). In contrast, the female–male ratio of growth in adult years of schooling is significant and larger in magnitude than found in Klasen (2002). As these coefficients express the direct effect of gender inequality on economic growth, it appears that the direct effect of *initial* gender inequality on economic growth is relatively small, while gender inequality in the *growth* of education has a sizable direct impact on economic growth.<sup>31</sup>

Columns 2–4 of Table 3 estimate the indirect impact of gender inequality in education on economic growth through the effects they have on investment, population growth, and labor force growth. The investment regression shows that the initial female–male ratio of education has a significant positive effect on economic growth, while the impact of gender inequality in the growth of education is also positive but not significant. In the population growth and working-age population growth regressions, the impact of gender inequality in education is in the right direction, though not significant.<sup>32</sup>

Column 5 of Table 3 shows the reduced form regression, which omits the investment, population growth, and working-age growth variables, and thus gives a direct estimate of the total effect of gender inequality in education on economic growth. The coefficients on both the initial ratio as well as the ratio of educational growth are considerably larger than in column 1, and now both are highly significant. This suggests that gender inequality in education, both initial as well as gaps in educational growth, has a significant negative impact on growth. A comparison between columns 1 and 5 shows that the initial gender gap in education has mainly an indirect impact on economic growth (it appears from column 2 to be via investment), while the female–male ratio of educational growth has mainly a direct impact.

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Regressions 6 and 7 of Table 3 use average education and thus estimate a lower bound effect of the impact of gender inequality on economic growth. The effects are generally predictably smaller and somewhat less statistically significant.

In Table 4, we calculate to what extent gender bias in education can explain growth differences between the various regions of the world. We do this for the upper and lower bound estimates. Fortunately, the difference between these two estimates is fairly small.

We also note that the sum of direct and indirect effect (regression 1–4) gives results very similar to the direct estimate from the reduced form (regression 5). As expected, the regions with the largest gender gaps in education – South Asia, Sub-Saharan Africa, and the MENA region – suffer the largest losses in terms of economic growth. But there are big differences here. In contrast to Klasen (2002), where both South Asia and the MENA region were suffering similar losses of about 0.9 percentage points in

Table 4 Gender inequality and growth differences between regions

	<i>Difference</i> SSA-EAP	<i>Difference</i> SA-EAP	<i>Difference</i> MENA- EAP	<i>Difference</i> SSA-EAP	<i>Difference</i> SA-EAP	<i>Difference</i> MENA- EAP
Total annual growth difference	3.48	1.96	1.74	3.48	1.96	1.74
	<i>Upper bound estimate</i>			<i>Lower bound estimate</i>		
Accounted for by:						
Direct effect of gender inequality in education (1)	0.26 <sup>a</sup>	0.52	0.38	0.22	0.45	0.33
Initial ratio (RED60)	0.08	0.20	0.14	0.09	0.23	0.15
Ratio of educational growth (RGED)	0.18	0.31	0.24	0.13	0.22	0.17
Indirect effects:	0.08	0.17	0.12	0.07	0.14	0.07
via investment						
via population growth (3)	0.14	0.33	0.22	0.10	0.26	0.17
via labor force growth (4)	-0.02	-0.06	-0.04	-0.01	-0.04	-0.02
Total indirect effect	0.22	0.34	0.30	0.16	0.36	0.22
Initial ratio (RED60)	0.13	0.32	0.22	0.12	0.29	0.14
Ratio of educational growth (RGED)	0.07	0.12	0.09	0.04	0.07	0.04
Total direct and indirect effect	0.46	0.95	0.69	0.38	0.81	0.55
Total effect using reduced form (5)	0.47	0.97	0.70	0.38	0.81	0.41
Of which: RED60	0.22	0.52	0.36	0.21	0.52	0.24
Of which: RGED	0.25	0.45	0.35	0.17	0.29	0.16

Note: <sup>a</sup>Sums do not add up precisely due to rounding.

annual per capita growth per year, the losses are now slightly larger for South Asia, around 1 percentage point, and very much smaller for the MENA region, about 0.7 percentage points per year. The difference for the diverging performance lies in the faster expansion of female schooling in the MENA region which has contributed to closing the gender gap in education, while progress in South Asia has been much more modest.

When examining the pathways through which gender inequality in MENA, South Asia, and Sub-Saharan Africa lead to lower growth, there is a sizable direct effect that amounts to about 60 percent of the total difference. This direct effect refers mainly to the lowering of the quality of human capital as a result of gender inequalities in education. But this is actually somewhat smaller than what was found in Klasen (2002), where for MENA about 75 percent of the total effect was accounted for by the direct effect. The indirect effect via investment has become somewhat smaller, while the indirect effect via demographic variables it has become more important. Clearly, all pathways investigated contribute to the resulting growth difference, and the magnitudes have shifted toward a greater importance of the demographic pathway, which suggests that higher female education lowers population growth, which in turn helps improve economic growth.

Table 5 shows the result of panel regressions using fixed effects, which was found to be the preferred specification based on the Hausman test. Also here, the empirical findings in these regressions are consistent with the empirical and theoretical literature: we find conditional convergence; a positive effect on growth of the working-age population; and a negative effect of population growth, though the latter two effects are statistically significant in only some specifications.<sup>33</sup> Investment rates statistically significantly promote growth, and openness has a small positive but rarely significant impact.

The specification in regression 8 of Table 5 only examines the impact of gender gaps in education on economic growth. In contrast to the panel results in Klasen (2002) and the cross-section results shown here, the positive effect of a high female–male years of schooling ratio among the adult population (the female–male ratio of education of adults 25 or older) is relatively small and not statistically significant. Further investigations show that this is not driven by a slightly different composition of sample but by the addition of the 1990s. If the 1990s are dropped, a higher female–male ratio of years of schooling has a large and significant effect (not shown here). In fact, it is due to the two regions Latin America and Sub-Saharan Africa in the 1990s. If we exclude these regions for that time period, regression 9 shows that then the positive effect of higher gender equality in education is again sizable and statistically significant.<sup>34</sup> It appears that the moderate to poor growth performance in these two regions, despite falling gender gaps in education, is important enough to reduce the overall effect of educational

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Table 5 Gender inequality and economic growth

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
LOGGDP	-5.54*** 1.42	-7.82*** 1.33	-10.37*** 1.31	-6.08*** 1.43	-10.81*** 1.32	-6.99*** 1.28	-6.14*** 1.48	-8.48*** 1.41	-11.09*** 1.28
POPGRO	-0.57* 0.42	-0.44 0.35	-0.22 0.40	-0.47 0.40	-0.23 0.39	-0.47* 0.37	-0.59* 0.42	-0.45 0.37	-0.20 0.39
LFG	0.31 0.27	0.46* 0.31	0.32 0.40	0.38 0.31	0.34 0.40	0.48* 0.30	0.45* 0.31	0.54** 0.31	0.29 0.37
FLFT	-	-	-	7.86** 3.49	4.17 3.36	-	-	-	-
OPEN	0.002 0.004	0.005 0.005	0.006 0.008	0.000 0.005	0.006 0.007	0.001 0.005	0.001 0.004	0.003 0.005	0.007 0.007
INV	0.09*** 0.03	0.10*** 0.03	0.13*** 0.02	0.10*** 0.03	0.14*** 0.02	0.12*** 0.03	0.10*** 0.03	0.10*** 0.03	0.14*** 0.02
OED25+	0.00 0.16	0.08 0.17	-	0.00 0.16	-	-	0.00 0.16	0.05 0.16	-
ORED25+	0.43 1.45	2.30** 1.28	-	1.01 1.43	-	-	1.14 1.51	3.09** 1.41	-
YED15+	-	-	0.31** 0.13	-	0.31*** 0.12	-	-	-	0.29*** 0.12
YRED15+	-	-	3.33** 1.65	-	3.66** 1.70	-	-	-	4.42*** 1.76
RACT	-	-	-	-	-	5.41***	3.72**	2.97**	1.93*
MACT	-	-	-	-	-	1.48	1.51	1.37	1.49
	-	-	-	-	-	-0.70	3.85	-0.91	-6.60
	-	-	-	-	-	6.69	6.90	7.03	5.73

(continued)

Table 5 (Continued)

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1960S	0.12	-0.65	-1.32***	0.59	-0.97*	0.61	0.40	-0.21	-0.49
	0.57	0.59	0.51	0.61	0.59	0.58	0.70	0.76	0.74
1970S	0.04	-0.52	-1.04***	0.37	-0.80**	0.30	0.28	-0.18	-0.47
	0.38	0.41	0.38	0.41	0.44	0.37	0.46	0.51	0.54
1980S	-0.60**	-1.07***	-0.62***	-0.44*	-0.52**	-0.31	-0.46	-0.86***	-0.33
	0.26	0.29	0.25	0.27	0.26	0.26	0.29	0.33	0.30
Constant	20.20***	26.79***	34.93***	18.53***	34.58***	21.45***	16.04**	27.53***	40.98***
	4.87	4.78	4.73	4.89	4.55	7.80	8.03	7.51	6.32
R2	0.32	0.43	0.60	0.34	0.61	0.36	0.34	0.44	0.62
OBS	341	296	143	341	307	441	341	296	143

Notes: Heteroscedasticity-adjusted standard errors reported under the coefficient. \*\*\* Refers to 1 percent, \*\* to 5 percent, and \* to 10 percent significance level using a one-tail test. In regressions 9 and 15, the sample excludes Sub-Saharan Africa and Latin America for the 1990s. In regressions 10, 12, and 16, only the OECD, East Asian, and South Asian countries are included.

gender gaps to insignificance. It seems plausible to assume that the poor growth performance, particularly of Sub-Saharan Africa, was not related to the reduced gender gaps in education but to many other factors that have been analyzed in the literature (for example, Paul Collier and Jan Willem Gunning [1999] and World Bank [2006]). Conversely, regression 9 suggests that in all other regions, the impact of gender gaps in education on growth remains as strong in the 1990s as before (in fact, slightly stronger).

In Table 5, regression 10, we replace the education variable with the education of adults 15 or older. This is to also capture the effects of high employment rates of educated women in the young age group 15–24, which might have a particularly large impact on growth. It turns out that in this specification the effect of gender gaps in education on growth are only significant if we limit the analysis to OECD, East Asian, and South Asian countries. But there, the effect is very large and highly significant. This appears plausible, as these are the regions where young, educated women have been particularly active in the labor market.

In Table 5, regressions 11–16, we consider the full sample again and include various labor force participation variables.<sup>35</sup> We consider two different explanatory variables for the labor force participation: the female share of the total labor force (FLFT) and the ratio of female–male economic activity rates ( $RACT = FACT/MACT$ ). In regression 11, the female share of the labor force (FLFT) has a positive, large significant coefficient on economic growth; that is, countries where the (initial) female share increased from decade to decade were able to achieve higher rates of subsequent economic growth. The effect of gender gaps in education (ORED 25+) in this specification is considerable but not statistically significant. If we exclude Sub-Saharan Africa and Latin America in the 1990s, the effect becomes much larger and highly significant.<sup>36</sup> In regression 12, we use the other education variable (YRED 15+), which shows a large impact of education gaps on growth, and a smaller and no longer significant impact of female shares of the labor force, again reduced to OECD, East Asia, and South Asia.

In regression 13, we use the male labor force participation rate (MACT) and the ratio of the female–male labor force participation rates (RACT) as an alternative way to capture the gender gap in employment. This female–male ratio is highly significant and positive, while the male economic activity rate has a non-significant negative sign. If we add the education gap in regression 14, the coefficient on the gender gap in labor force participation is still positive and significant but smaller, while the coefficient on the male activity rate is now positive but still insignificant. The coefficient on educational gaps is not significant. In the reduced sample (excluding Sub Saharan Africa and Latin America for the 1990s), it also becomes significant in this specification, while the impact of activity rates becomes slightly smaller but remains significant (see regression 15). Lastly, we limit our sample to the OECD countries, East Asia, and South Asia, and

use the alternative education variable. We find that then education gaps have a very large impact on growth, while gaps in activity rates have a smaller (and only marginally significant) impact on growth.

Since the coefficient on MACT is small and insignificant, altering MACT when one increases FACT would not have a significant impact on growth. Thus, in contrast to the education regressions in Table 3, it is not necessary to calculate an upper- and lower-bound regression, as the male activity rate seems to be immaterial for growth.<sup>37</sup>

On the whole, these results suggest that gender gaps in labor force participation have a negative impact on economic growth; since these gaps proxy for gaps in employment (see discussion above), gender gaps in employment similarly negatively affect economic growth. For the MENA and South Asia regions, where female employment is still very low, this could have a significant impact on economic growth. The results also give some interesting insights into the relative importance of education and employment gaps in different time periods. In the full sample of countries, educational gender gaps are not so important, while employment gaps have a particularly large impact on economic performance. This is largely due to the experience of the 1990s, when gender gaps in employment appear to be more consequential than those in education. Once Sub-Saharan Africa and Latin America in the 1990s are excluded, however, education and employment gaps have a similar impact on economic growth. If we change to an education variable that includes young people, the results indeed suggest that education gaps are more important than employment gaps, at least in the OECD, East Asia, and South Asia. This suggests that previous studies that only examined gender gaps in education were partly implicitly capturing the effects of gender gaps in employment, and it is indeed useful to consider the two jointly as we have done here. It also suggests, however, that it is not easy to clearly answer the question which one of the two is of more relative importance, as the answer appears to be quite sensitive to the sample, time period, and education variable used. This will become more apparent below.

In further analyses, we also considered some interaction terms. Of particular interest is to interact the effect of openness with gender gaps in labor force participation to see whether the effects of gender gaps in labor force participation rates are different in countries that are more exposed to international trade. The results (not shown here) show a positive (but not significant) interaction term, while the coefficient on RACT is now smaller and still highly significant in all specifications. This provides some supporting evidence that in countries that are strongly exposed to international trade, lower gender gaps in labor force participation are particularly beneficial to economic growth, in line with some of the arguments made above.

Once again, we simulate the impact of gender inequality in education and employment (using gender gaps in labor force participation as our

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Table 6 Gender inequality in education and employment and growth impact (EAP-MENA) by decades

	1960s	1970s	1980s	1990s
Growth difference EAP-MENA	0.53	1.48	2.71	1.55
Regression 9				
Education effect (ORED)	0.41	0.65	0.61	0.54
Regression 11				
Education effect (ORED)	0.18	0.29	0.27	0.24
Employment effect (FLFT)	0.75	0.86	0.96	1.06
Total effect	0.93	1.15	1.23	1.30
Regression 13				
Employment effect (RACT)	1.15	1.36	1.62	1.73
Regression 14				
Education effect (ORED)	0.20	0.32	0.30	0.27
Employment effect (RACT)	0.79	0.94	1.11	1.19
Total effect	0.99	1.26	1.41	1.45
Regression 15				
Education effect (ORED)	0.55	0.88	0.82	0.72
Employment effect (RACT)	0.63	0.75	0.89	0.95
Total effect	1.18	1.62	1.71	1.67

Notes: Computations are based on Table 5. Since regressions 10, 12, and 16 did not include data from the MENA region, they are not included in the simulations.

proxy) based on these panel regressions. In Table 6, we show to what extent the difference in economic growth between EAP and MENA can be accounted for by differences in gender inequality in education and employment. Estimates based on regression 9 already show that gender gaps in education can account for a sizable portion of growth differences, but this difference is declining, due to a shrinking difference in gender gaps in education between the two regions. Once gender gaps in employment are included, the share of growth differences explained by these combined gaps increases significantly; in fact, in the 1960s, 1970s, and 1990s, the gaps can account for all of the growth differences, or even more than that in some specifications, suggesting that the MENA region would have grown faster than East Asia in the absence of the gaps. The growth costs, compared with East Asia, of gender gaps in employment, are increasing over time as the gender gaps in employment are shrinking much faster in East Asia than in MENA. In most specifications, the gender gaps in employment explain a larger share of the growth differences with East Asia, suggesting that MENA is particularly held back by its low female labor force participation rates, a subject much discussed in the literature (see, for example, World Bank [2004]).

Table 7 shows to what extent the growth differences between South Asia and East Asia can be explained by gender gaps in education and employment. Here, the impact of larger educational gender gaps in South Asia plays a particularly large role. Depending on the specification, it can

*Table 7* Gender inequality in education and employment and growth impact (EAP-SA) by decades

	<i>1960s</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s</i>
Growth difference EAP-SA	2.26	3.86	0.19	0.79
Regression 9				
Education effect (ORED)	0.57	0.50	0.67	0.73
Regression 10				
Education effect (YRED)	0.69	0.88	0.95	0.78
Regression 11				
Education effect (ORED)	0.25	0.22	0.29	0.32
Employment effect (FLFT)	-0.17	0.09	0.34	0.45
Total effect	0.08	0.31	0.63	0.77
Regression 12				
Education effect (YRED)	1.08	1.11	1.19	1.00
Employment effect (FLFT)	-0.09	0.05	0.18	0.24
Total effect	0.98	1.15	1.37	1.24
Regression 13				
Employment effect (RACT)	-0.37	-0.02	0.43	0.60
Regression 14				
Education effect (ORED)	0.28	0.25	0.33	0.36
Employment effect (RACT)	-0.26	-0.01	0.29	0.42
Total effect	0.03	0.24	0.63	0.78
Regression 15				
Education effect (ORED)	0.77	0.67	0.90	0.99
Employment effect (RACT)	-0.20	-0.01	0.24	0.33
Total effect	0.56	0.66	1.14	1.32
Regression 16				
Education effect (YRED)	1.30	1.34	1.44	1.21
Employment effect (RACT)	-0.13	-0.01	0.15	0.22
Total effect	1.17	1.33	1.59	1.43

*Notes:* Computations are based on Table 5.

account for a growth difference between 0.2 and 1.4 percentage points. In contrast, the impact of employment effects is generally smaller but is increasing over time. In fact, the ILO data we used shows smaller gender gaps in labor force participation in South Asia than in East Asia in the 1960s and 1970s. If these level differences are to be believed, then South Asia's main problem has been, apart from their stubbornly high gender gaps in education, that female participation and employment has expanded much more slowly than in East Asia, and this is exacting rising growth costs compared to East Asia. This is also consistent with country studies showing that East Asian economies such as China, Vietnam, and Indonesia have benefited particularly from integrating women into the labor market; in South Asia, only Bangladesh has followed such a route and appears to have profited from it.<sup>38</sup>

While these calculations neatly show the particular constraints in different regions, they cannot give clear answers to the question of whether

gender gaps in education or employment lead to higher growth costs. This depends to a large degree on the education variable, the time period, and the sample. But we can say with more certainty that, in relative terms, MENA's problems are more on the employment front, while in South Asia they are more on the education front (though rising on the employment front).

### CONCLUSIONS AND CAVEATS

The challenge of increasing the economic growth of a country is, as suggested here, to a considerable extent linked to the role played by women in the society. The costs of discrimination toward women in education and employment not only harm the women concerned but also impose a cost for the entire society.

In South Asia, women are still, in the twenty-first century, very much discriminated against in both education level and economic participation. In MENA, the gender gap in education has been reduced from high levels, but gender gaps in employment remain pervasive. In contrast to some Asian countries, where export-oriented industries have led to a reduction of the gender gap in the labor market in the last decades, increased female education in MENA has not translated into higher labor market participation in most countries of that region. Women in this region are encountering structural barriers in employment,<sup>39</sup> but those barriers may also be social, cultural, and ideological (World Bank 2004).

Regarding the growth costs of gender inequality, we find the following. First, gender inequality in education reduced economic growth in the 1990s. The findings from earlier studies that used data until 1990 are largely confirmed through this expanded analysis, although the impact of gender gaps in education in the 1990s in the panel specification is sensitive to the inclusion of specific regions in the 1990s.

Second, gender inequality in education in MENA and the South Asia region continues to harm growth in that region but by decreasing amounts. This is due to the fact that gender gaps in education have been sharply reduced there over the past two decades, with much faster progress in MENA than in South Asia. As a result, we expect the shrinking gender inequality in education to play a decreasing role in harming growth prospects in MENA and South Asia. While this is true in an absolute sense, it is not always true in a relative sense. As East Asia has closed its gender gaps in education much faster than South Asia, the growth differences accounted for by differences in gender gaps between the two regions mounted in past decades.

Third, the panel analysis suggests that gender inequality in labor force participation (as a proxy for gender gaps in employment) has a sizable negative impact on economic growth. Simulations suggest that MENA's and

South Asia's growth prospects, when compared with other regions, are significantly reduced through this effect, as the impact of gender inequality in employment is large and has been falling much more slowly than in other regions.

Thus, an important constraint to higher economic growth in those regions appears to be the substantial gender inequality persisting in education and employment. While these results are suggestive, we want to emphasize that the assessment of the impact of employment gaps is based on data for labor force participation rates that are measured with error and are often not fully comparable internationally. It is highly lamentable that comparable labor force participation and employment data are not available for most developing countries. Despite the fact that increasing numbers of household and labor force surveys are undertaken in these countries, the results are not used by the ILO to generate and publish consistent and comparable data on employment, labor force participation, and pay.<sup>40</sup> This remains a major challenge for the ILO and other international organizations charged with providing such data.

Also, the usual caveats of cross-country regressions apply, including omitted variable bias, model uncertainty, and endogeneity, among others. We have tried to control for some of these issues, but more work will be needed to solidify the findings. In particular, we were only partly able to control for endogeneity in the panel regressions, and further work on identifying suitable instruments is clearly an important area for further research. Lastly, we need to acknowledge that our results concern the impact of gender gaps in education and employment on measured national output. To the extent that higher female labor force participation comes at the expense of reduced household labor, the economic and well-being losses of such a reduction are not included in our assessment.<sup>41</sup> The extent to which this might be a problem is clearly an area of further research.

If our results are confirmed by further studies, this points to an urgent need of increasing women's education level and their participation in the labor force. While our results suggest that changing the composition of the labor force to include more women (and thus fewer men) would have a positive effect on growth, a more realistic policy recommendation would be to develop an employment-intensive growth strategy that makes particular use of women. At the least, the results suggest that current barriers to female employment are not only disadvantageous to women, but also appear to reduce economic growth in developing countries, particularly in MENA and South Asia.

One should also bear in mind the findings from a large literature suggesting that gender inequality in education and employment also have a significant negative impact on other development goals such as reductions in fertility, child mortality, and under-nutrition. Thus, reducing existing

gender inequality in education and employment will not only promote growth but also further these other valuable development goals.<sup>42</sup>

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### NOTES

- <sup>1</sup> See Stephan Klasen and Claudia Wink (2003) and Stephan Klasen (2002, 2007) for a discussion of these issues.
- <sup>2</sup> This literature can be seen as part of a larger literature on the impact of inequality on growth. See, for example, Klaus Deininger and Lyn Squire (1998) and Christiano Perugini and Gaetano Martino (2008).
- <sup>3</sup> Among the problems in their findings, Barro and Lee (1994) and Barro and Sala-i-Martin (1995) identify the absence of regional dummy variables, particularly for Latin America and East Asia. In the former, low initial gender gaps were accompanied by low growth, while in the latter, relatively high initial gender gaps were accompanied by high subsequent growth. In the absence of regional dummy variables, a causal link is made between these associations. It is quite likely, however, that the growth experiences of these regions were also influenced by other region-specific factors that are largely unrelated to gender gaps. The fact that these regional dummies are (at least jointly) statistically significant and that then the negative effect of female education reverses itself once regional (or country fixed) effects are considered supports this view. Further problems with these studies are the use of initial period education variables, the high collinearity between male and female education, and the endogeneity of these variables. For a discussion of these issues see Dollar and Gatti (1999), Paula Lorgelly and Dorian Owen (1999), Forbes (2000), and Klasen (2002).
- <sup>4</sup> The reported figures in Klasen (2002) are actually slightly different, as Israel, Sudan, and Turkey were all included in the Middle East region. For the report in the present

study, they were allocated to other regions (Israel to the OECD, Turkey to Eastern Europe, Central Asia and Sudan to Sub-Saharan Africa) and therefore the analysis in Klasen (2002) was redone to reflect this. The figures reported above are based on that analysis.

- <sup>5</sup> See, for example, Abu-Ghaida and Klasen (2004), Stephan Klasen (2006), Janet Stotsky (2006), and Mark Blackden, Sudharshan Canagarajah, Stephen Klasen, and David Lawson (2007) for a review.
- <sup>6</sup> See Bloom and Williamson (1998) and Klasen (2002) for a full exposition of these arguments.
- <sup>7</sup> Klasen (2006) reviews the literature, and also notes that such strategies have now been extended with some success to countries such as Tunisia, Bangladesh, China, and Vietnam.
- <sup>8</sup> There is also some empirical support for the claim by Seguino (2000a, 2000b) that higher gender wage gaps were a further pre-condition of these export-oriented strategies. There is a related debate as to whether growth has reduced these gender wage gaps, which appears to be the case in many but not all countries; also, they remain large, particularly when controlling for education. For a discussion, see Seguino (2000a, 2000b), Klasen (2002), Busse and Spielmann (2006), and Stotsky (2006), among others.
- <sup>9</sup> See a related discussion in King, Klasen, and Porter (2008) about the growth and welfare effects of women as policy-makers. The “causes” of these differences in behavior may well be related to the different socialization of girls and boys, a subject that leads beyond the scope of this paper.
- <sup>10</sup> The exceptions are again the two short-term structuralist models of Blecker and Seguino (2002) where large gender gaps in pay, implicitly combined with no gender gaps in education and employment, can deliver income-enhancing effects.
- <sup>11</sup> On these issues, see the discussions in Elizabeth M. King and M. Anne Hill (1993), Harold Alderman, Jere R. Behrman, Shahrugh Khan, David R. Ross, and Richard Sabot (1995), Harold Alderman, Jere R. Behrman, David R. Ross, and Richard Sabot (1996), and the World Bank (2001).
- <sup>12</sup> Also, it is not obvious which factor is the prime cause of gender gaps to be included in a reduced-form estimation.
- <sup>13</sup> In the case of these papers, the focus on semi-industrialized, export-oriented countries was intended. But therefore, the findings of these papers cannot address the question of whether there is a more general relationship between pay gaps and growth in developing countries that do not belong to this small group.
- <sup>14</sup> It turns out that, in our total sample, gender gaps in education and employment are not very closely correlated, so it should be possible to separately identify the effects. This overall low correlation is largely driven by a negative correlation between gender gaps in education and employment in Sub-Saharan Africa, and to a lesser extent South Asia, while in the other regions the correlation is positive and usually large and statistically significant. This negative correlation in Sub-Saharan Africa is related to the high female employment in agriculture despite low levels of female education; in this case, low education is not a barrier to high female employment as is the case elsewhere. For Africa’s formal sector, see Klasen (2006) and Blackden et al. (2007).
- <sup>15</sup> See Appendix Table 1 for a list of countries in each region for which we have data availability.
- <sup>16</sup> Also note that following the World Bank country classification system, Turkey is considered to belong to the Eastern Europe and Central Asia region, and Israel belongs to the OECD.
- <sup>17</sup> Iran is the only major oil producer included in the sample, but Egypt, Algeria, and Yemen also depend, directly or indirectly (via migration and remittances), on oil production.

- <sup>18</sup> Sub-Saharan Africa's high female labor-participation rate is largely confined to the agricultural sector, which still employs the majority of workers in most Sub-Saharan African countries. The international comparability of labor force participation data in own-account agriculture is particularly problematic. In formal-sector employment, female employment rates are much lower and the gender gap is significant; but these data are, as discussed, missing for many countries and show consistency and comparability problems.
- <sup>19</sup> The combination of rapidly shrinking gender gaps in education and large and persistent gender gaps in employment in the MENA region constitutes a major puzzle. See World Bank (2004) for a careful discussion.
- <sup>20</sup> Unemployment rates for women in Latin America and MENA are several points higher than for men. Thus in these regions, the gender gap in employment is actually slightly larger than in labor force participation. But, as this gender gap in unemployment rates is rather stable over time, it would be absorbed by the country-specific effects in our panel estimation. We also tried to use sectoral employment data available for some countries since the 1980s to adjust our labor force participation data to focus on non-agricultural employment. But there were so many data gaps and measurement errors and the comparability problems were so severe that these data turned out to be unusable.
- <sup>21</sup> We have also undertaken some further robustness checks with more variables used in standard growth regression analysis. The results are available on request. While the use of regional dummy variables is invariably a measure of our ignorance, in many cross-country regressions they turn out to be significant, pointing to region-specific left-out variables that are hard to capture in standard cross-country regressions.
- <sup>22</sup> Knowles, Lorgelly, and Owen (2002) suggest that this is the most suitable specification for analyzing gender gaps in education. This specification was also used in Klasen (2002).
- <sup>23</sup> Note that Equations 3 and 4 contain an additional explanatory variable with respect to Klasen (2002): openness.
- <sup>24</sup> We use dummy variables for all regions, where the region left out is EAP.
- <sup>25</sup> In the panel, we use the total years of schooling of the population over 25. We do so because in the panel analysis we only have a 10-year window in which human capital (and gender differences) can have an effect, and thus we want to focus our attention on the human capital of the labor force (rather than also including the 15–24-year-olds, only some of whom are in the labor force). In robustness checks, we also include the years of education of adults 15 or older to particularly capture the effects of young, educated women, who make up a large share of female employment in many developing countries.
- <sup>26</sup> On the other hand, empirically, male labor force participation rates do not differ much across space and over time, so the growth effects observed are probably due to increased female employment.
- <sup>27</sup> We have run the regressions for random effect but specification tests (Hausman tests) suggest that the fixed effect specification is superior.
- <sup>28</sup> The previous version of the Penn World Table 5.6 (Alan Heston, Robert Summers, and Bettina Aten 1998) provided data for the following additional countries: Djibouti; Malta; Oman; Puerto Rico; Saudi Arabia; Somalia; Surinam; Iraq; Liberia; Myanmar; Reunion; Sudan; Swaziland; and Yugoslavia. For the last nine countries, Barro and Lee (2000) data on education were available. In addition, the data for Eastern European countries were not limited to the 1990s. Penn 6.1 (Heston, Summers, and Aten 2002) provides data for the entire sample set only for two Eastern European countries (Romania and Cyprus). Barro and Lee education data are suspicious for Austria and Bolivia, as they suggest stagnating or declining educational attainment despite

- substantial increases in enrollment. Hence, we dropped these two countries from our analysis.
- <sup>29</sup> It is quite difficult to adequately measure trade openness, and the variables we use, export plus imports as a share of GDP, are not free from problems, as these ratios are systematically lower in larger economies despite identical trade policies. Other proxies have different problems. For a discussion, see Jeffrey A. Frankel and David Roemer (1999) and Dani Rodrik and Francisco Rodriguez (2000).
- <sup>30</sup> The population growth regression does not pass the RESET test, suggesting that omitted variables and/or non-linearities in these regressions might be a problem. This does not affect our main results (including the size of the direct, indirect, and total effects), and could only have a possible (and likely minor) influence on the relative importance of these two indirect effects.
- <sup>31</sup> But here, endogeneity might be a problem, which will be partially addressed in the panel regressions.
- <sup>32</sup> While there is a large and conclusive literature that shows that female education reduces fertility (for example, see T. Paul Schultz [1997], Klasen [1999], and World Bank [2001] for a survey), the link between female education and population growth rates is weaker, as population growth is also affected by the age structure of the population. In a population with a large share of women of child-bearing age, even a low total fertility rate for each of them can generate considerable population growth compared with a population where the share of women is lower. Therefore, it is not surprising that the link here is weaker than if one used the total fertility rate as the dependent variable. When we include labor force growth in the population equation to proxy for the effect of the age structure, the effects of the initial female-male ratio of schooling and the ratio of the growth become significant, as expected.
- <sup>33</sup> This may be related to the fact that the impact of population growth and working-age population growth materializes with some delay and may therefore not be captured well in the 10-year periods considered.
- <sup>34</sup> It is even larger if we consider the reduced form estimate – that is, if we leave out the investment rate, labor force growth, and population growth. In both cases, they are larger than identical panel regressions in Klasen (2002).
- <sup>35</sup> We also analyzed the sample where we dropped Sub-Saharan Africa and Latin America in the 1990s and report on the results where appropriate.
- <sup>36</sup> The regression is not shown but is available on request.
- <sup>37</sup> This is confirmed by regressions (not shown here) where we replaced the MACT with the total activity rate (TACT) and now find that the impact of the gender gap is larger, while the impact of the total activity rate is now negative. These regressions are available on request.
- <sup>38</sup> See Klasen (2006) for further discussions on these country studies.
- <sup>39</sup> Structural barriers, here, are related to the economic reconstruction, recession, and limited domestic and foreign investment.
- <sup>40</sup> Nevertheless, the World Bank has used these household surveys to generate roughly consistent, comparable, and publicly available poverty statistics for developing countries. With these surveys, one could generate consistent and comparable statistics on labor force participation, employment, unemployment, and pay. The currently available ILO estimates are a poor substitute for such consistently generated survey-based estimates.
- <sup>41</sup> To the extent that such increased labor force participation would come in addition to non-market work, the double burden this implies for the women concerned is also not considered here but is clearly an issue that is under investigation in the literature.
- <sup>42</sup> Abu-Ghaida and Klasen (2004) and King, Klasen, and Porter (2008) estimate the magnitude of these effects.

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## ARTICLES

## APPENDIX

*Appendix Table 1* List of countries for our analysis by region

<i>Middle East and North Africa (MENA)</i>	<i>Sub-Saharan Africa (SSA)</i>	<i>Organisation for Economic Co-operation and Development (OECD)</i>	<i>Latin American and Caribbean (LAC)</i>	<i>Eastern Europe and Central Asia (ECA)</i>
Algeria	Angola	Australia	Antigua and Barbuda	Albania
Egypt	Benin	Austria	Argentina	Armenia
Iran	Botswana	Belgium	Belize	Belarus
Jordan	Burkina Faso	Canada	Bolivia	Bulgaria
Lebanon	Burundi	Czech Republic	Brazil	Cyprus
Morocco	Cameroon	Denmark	Chile	Estonia
Syria	Cape Verde	Finland	Colombia	Latvia
Tunisia	Central African Republic	France	Costa Rica	Macedonia <sup>+</sup>
Yemen	Chad	Germany	Cuba	Poland
	Comoros	Greece	Dominica	Romania
<i>East Asia and Pacific (EAP)</i>	Congo, Dem. Rep.	Hungary	Dominican Republic	Russian Federation <sup>+</sup>
China	Congo, Republic	Iceland	Ecuador	Slovak Republic
Fiji	Cote d'Ivoire	Ireland	El Salvador	Slovenia
Hong Kong	Equatorial Guinea	Israel	Grenada	Turkey
Indonesia	Ethiopia	Italy	Guatemala	Ukraine
Korea	Gabon	Japan	Guyana	
Macao, China	Gambia, The	Luxembourg	Haiti	
Malaysia	Ghana	Netherlands	Honduras	
Papua New Guinea	Guinea	New Zealand	Jamaica	
Philippines	Guinea-Bissau	Norway	Mexico	
Singapore	Kenya	Portugal	Nicaragua	
Taiwan	Lesotho	Spain	Panama	
Thailand	Madagascar	Sweden	Paraguay	
<i>South Asia (SA)</i>	Malawi	Switzerland	Peru	
Bangladesh	Mali	United Kingdom	St. Kitts and Nevis	
India	Mauritania	United States	St. Lucia	
Nepal	Mauritius		St. Vincent and Gren.	
Pakistan	Mozambique		Trinidad and Tobago	
Sri Lanka	Namibia		Uruguay	
	Niger		Venezuela, RB	
	Nigeria			
	Rwanda			
	Sao Tome and Principe			
	Senegal			
	Seychelles			
	Sierra Leone			

*(continued)*

GENDER INEQUALITY AND GROWTH

Appendix Table 1 (Continued)

<i>Middle East and North Africa (MENA)</i>	<i>Sub-Saharan Africa (SSA)</i>	<i>Organisation for Economic Co-operation and Development (OECD)</i>	<i>Latin American and Caribbean (LAC)</i>	<i>Eastern Europe and Central Asia (ECA)</i>
	South Africa			
	Tanzania			
	Togo			
	Uganda			
	Zambia			
	Zimbabwe			

Note: + Indicates data were not available for the entire period of analysis.

Appendix Table 2 Annual per capita income and other non-economic indicators by region, 1960–1990

	1960	1970	1980	1990	2000
<i>EAP</i>					
Under 5 mortality	138.50	89.63	56.43	42.00	31.59
Total fertility	5.62	4.65	3.39	2.83	2.31
Life expectancy	52.57	59.87	64.94	68.76	71.55
Income per capita	1,813	2,963	5,117	8,930	11,755
<i>SA</i>					
Under 5 mortality	228.00	192.00	154.60	109.40	80.64
Total fertility	6.30	6.02	5.54	4.31	3.45
Life expectancy	45.32	50.02	54.70	59.36	63.80
Income per capita	930	1,099	1,187	1,660	2,186
<i>SSA</i>					
Under 5 mortality	273.89	233.86	182.47	148.96	146.15
Total fertility	6.49	6.53	6.49	5.98	5.13
Life expectancy	40.40	44.30	48.08	51.18	49.06
Income per capita	1,488	1,868	2,087	2,182	2,400
<i>MENA</i>					
Under 5 mortality	233.75	188.13	137.57	68.88	45.14
Total fertility	7.12	6.78	6.13	4.68	3.32
Life expectancy	47.89	53.08	58.55	64.86	68.37
Income per capita	1,968	2,762	3,660	3,499	4,462
<i>ECA</i>					
Under 5 mortality	80.78	55.11	43.20	25.05	16.40
Total fertility	3.24	2.78	2.40	2.14	1.47
Life expectancy	66.15	68.77	69.59	70.79	71.59
Income per capita	2,233	3,650	5,300	9,323	7,346

(continued)

## ARTICLES

*Appendix Table 2 (Continued)*

	1960	1970	1980	1990	2000
<i>LAC</i>					
Under 5 mortality	135.58	109.00	70.91	42.65	30.85
Total fertility	6.13	5.37	4.10	3.29	2.69
Life expectancy	57.25	61.64	65.72	69.14	71.56
Income per capita	3,362	4,270	5,072	5,471	7,086
<i>OECD</i>					
Under 5 mortality	37.67	26.05	15.14	9.73	6.61
Total fertility	2.87	2.46	1.93	1.79	1.65
Life expectancy	70.19	71.72	73.80	75.76	77.73
Income per capita	8,386	12,024	15,420	18,875	23,173

Source: Penn World Table 6.1 (Heston, Summers, and Aten 2002) and World Bank (2002).

Notes: The data for ECA refer to only two observations before the 1990s (Cyprus and Romania). All are unweighted averages and might in some cases be affected by compositional changes. The income per capita refers to real GDP per capita in PPP.

*Appendix Table 3 Education Indicators by Region, 1960–99*

	1960	1970	1980	1990	1999
<i>EAP</i>					
Female education 25+ (OFED25+)	2.11	2.71	3.75	5.22	6.55
Male education 25+ (OED25+)	4.11	4.74	5.59	6.81	7.8
Total education 25+ (OTED25+)	3.13	3.73	4.68	6.02	7.18
Ratio female–male education 25+ (ORED25+)	0.5	0.56	0.65	0.75	0.83
Female education 15+ (FED)	2.74	3.53	4.46	5.46	6.7
Male education 15+ (ED)	4.6	5.21	5.9	6.77	7.85
Total education 15+ (TED)	3.68	4.38	5.19	6.12	7.28
Ratio female–male education 15+ (RED)	0.59	0.67	0.7	0.76	0.84
<i>SA</i>					
Female education 25+ (OFED25+)	0.7	1.24	1.51	1.9	2.55
Male education 25+ (OED25+)	1.77	2.37	3.2	3.83	4.49
Total education 25+ (OTED25+)	1.27	1.72	2.39	2.89	3.54
Ratio female–male education 25+ (ORED25+)	0.25	0.34	0.36	0.43	0.51
Female education 15+ (FED)	0.89	1.3	1.86	2.68	3.23
Male education 15+ (ED)	1.9	2.48	3.58	4.5	5.05
Total education 15+ (TED)	1.42	1.91	2.75	3.62	4.16
Ratio female–male education 15+ (RED)	0.29	0.37	0.43	0.54	0.6

(continued)

GENDER INEQUALITY AND GROWTH

Appendix Table 3 (Continued)

	1960	1970	1980	1990	1999
<i>SSA</i>					
Female education 25+ (OFED25+)	0.92	0.97	1.37	1.92	2.63
Male education 25+ (OED25+)	1.67	1.80	2.54	3.21	3.92
Total education 25+ (OTED25+)	1.28	1.37	1.93	2.54	3.25
Ratio female-male education 25+ (ORED25+)	0.43	0.45	0.47	0.55	0.62
Female education 15+ (FED)	1.23	1.39	1.73	2.34	2.87
Male education 15+ (ED)	2.05	2.32	2.76	3.52	3.92
Total education 15+ (TED)	1.63	1.84	2.23	2.92	3.38
Ratio female-male education 15+ (RED)	0.48	0.52	0.60	0.62	0.70
<i>MENA</i>					
Female education 25+ (OFED25+)	0.44	0.60	1.25	2.57	4.18
Male education 25+ (OED25+)	1.36	2.10	3.23	4.99	6.39
Total education 25+ (OTED25+)	0.91	1.34	2.24	3.78	5.29
Ratio female-male education 25+ (ORED25+)	0.32	0.28	0.39	0.51	0.65
Female education 15+ (FED)	0.65	1.17	1.86	3.17	4.77
Male education 15+ (ED)	1.76	2.85	3.58	5.11	6.52
Total education 15+ (TED)	1.21	2.01	2.72	4.14	5.65
Ratio female-male education 15+ (RED)	0.38	0.41	0.47	0.58	0.73
<i>ECA</i>					
Female education 25+ (OFED25+)	3.48	4.12	5.20	6.62	7.33
Male education 25+ (OED25+)	5.28	5.66	6.82	8.02	8.32
Total education 25+ (OTED25+)	4.34	4.87	5.99	7.32	7.82
Ratio female-male education 25+ (ORED25+)	0.59	0.66	0.70	0.78	0.85
Female education 15+ (FED)	5.24	5.90	6.56	8.24	7.57
Male education 15+ (ED)	6.13	6.71	7.82	8.92	8.61
Total education 15+ (TED)	5.66	6.29	7.18	8.57	8.09
Ratio female-male education 15+ (RED)	0.82	0.85	0.83	0.91	0.86
<i>LAC</i>					
Female education 25+ (OFED25+)	2.91	3.35	4.2	5.08	5.87
Male education 25+ (OED25+)	3.42	3.93	4.65	5.42	6
Total education 25+ (OTED25+)	3.16	3.63	4.42	5.25	5.94

(continued)

## ARTICLES

*Appendix Table 3 (Continued)*

	1960	1970	1980	1990	1999
Ratio female–male education 25+ (ORED25+)	0.83	0.83	0.89	0.93	0.98
Female education 15+ (FED)	3.3	3.88	4.81	5.52	6.08
Male education 15+ (ED)	3.69	4.3	5.09	5.73	6.27
Total education 15+ (TED)	3.49	4.09	4.95	5.62	6.18
Ratio female–male education 15+ (RED)	0.9	0.89	0.94	0.96	0.96
<i>OECD</i>					
Female education 25+ (OFED25+)	6.39	6.91	7.84	8.40	9.12
Male education 25+ (OED25+)	6.98	7.62	8.68	9.30	9.82
Total education 25+ (OTED25+)	6.66	7.25	8.24	8.83	9.46
Ratio female–male education 25+ (ORED25+)	0.91	0.90	0.90	0.90	0.93
Female education 15+ (FED)	6.54	7.13	8.06	8.69	9.30
Male education 15+ (ED)	7.11	7.70	8.66	9.27	9.85
Total education 15+ (TED)	6.81	7.40	8.35	8.97	9.57
Ratio female–male education 15+ (RED)	0.91	0.92	0.93	0.93	0.94

Source: Barro and Lee (2000).

Note: All refer to unweighted averages.

*Appendix Table 4 Labor market indicators by region, 1960–2000*

	1960	1970	1980	1990	2000
<i>EAP</i>					
Male economic activity rate, 15–64 (MACT)	90.69	87.82	86.41	85.71	84.94
Total economic activity rate, 15–64 (TACT)	66.43	67.25	69.84	71.07	72.47
Ratio female–male economic activity rate, 15–64 (RACT)	0.45	0.52	0.61	0.66	0.7
Female economic activity rate, 15–64 (FACT)	41.33	46.25	52.85	56.47	59.67
Female share of labor force, 15–64 (FLFT)	28.52	32.41	36.13	38.66	40.31
Female employee rate (EMPLF)		0.17	0.22	0.29	0.3
Male employee rate (EMPLM)		0.39	0.43	0.46	0.45
Ratio female–male employees (REMPLE)		0.4	0.49	0.6	0.66
<i>SA</i>					
Male economic activity rate, 15–64 (MACT)	92.5	90.4	88.6	87.61	86.22
Total economic activity rate, 15–64 (TACT)	71.99	70.31	68.91	68.62	69.1
Ratio female–male economic activity rate, 15–64 (RACT)	0.52	0.53	0.53	0.55	0.59
Female economic activity rate, 15–64 (FACT)	48.61	47.84	47.22	47.88	50.87
Female share of labor force, 15–64 (FLFT)	30.71	31.28	31.82	32.9	35.28

(continued)

GENDER INEQUALITY AND GROWTH

Appendix Table 4 (Continued)

	1960	1970	1980	1990	2000
Female employee rate (EMPLF)		0.05	0.06	0.1	0.08
Male employee rate (EMPLM)		0.27	0.3	0.34	0.27
Ratio female-male employees (REMP)		0.15	0.18	0.27	0.26
<i>SSA</i>					
Male economic activity rate, 15-64 (MACT)	92.65	91.34	89.75	88.59	87.49
Total economic activity rate, 15-64 (TACT)	80.81	79.49	78.13	77.17	76.57
Ratio female-male economic activity rate, 15-64 (RACT)	0.75	0.75	0.75	0.75	0.75
Female economic activity rate, 15-64 (FACT)	69.62	68.59	67.2	66.44	66.1
Female share of labor force, 15-64 (FLFT)	43.45	43.59	43.53	43.56	43.48
Female employee rate (EMPLF)		0.12	0.09	0.09	0.03
Male employee rate (EMPLM)		0.46	0.27	0.26	0.08
Ratio female-male employees (REMP)		0.2	0.26	0.28	0.34
<i>MENA</i>					
Male economic activity rate, 15-64 (MACT)	88.84	85.39	82.03	81.02	81.21
Total economic activity rate, 15-64 (TACT)	55.44	54.04	53.49	54.34	57.62
Ratio female-male economic activity rate, 15-64 (RACT)	0.24	0.27	0.31	0.34	0.41
Female economic activity rate, 15-64 (FACT)	21.56	23.21	25.54	27.50	33.70
Female share of labor force, 15-64 (FLFT)	19.01	21.45	23.89	25.09	28.94
Female employee rate (EMPLF)		0.07	0.07	0.09	0.11
Male employee rate (EMPLM)		0.56	0.53	0.56	0.58
Ratio female-male employees (REMP)		0.12	0.13	0.18	0.25
<i>ECA</i>					
Male economic activity rate, 15-64 (MACT)	88.67	84.83	83.76	81.47	80.31
Total economic activity rate, 15-64 (TACT)	73.22	73.12	74.97	73.66	73.65
Ratio female-male economic activity rate, 15-64 (RACT)	0.67	0.73	0.79	0.81	0.84
Female economic activity rate, 15-64 (FACT)	59.42	62.18	66.24	65.85	66.97
Female share of labor force, 15-64 (FLFT)	42.49	43.46	44.74	45.13	46
Female employee rate (EMPLF)		0.25	0.38	0.41	0.31
Male employee rate (EMPLM)		0.51	0.62	0.55	0.44
Ratio female-male employees (REMP)		0.45	0.57	0.68	0.6
<i>LAC</i>					
Male economic activity rate, 15-64 (MACT)	91.64	88.57	86.34	85.41	84.63
Total economic activity rate, 15-64 (TACT)	59.55	59.45	61.12	63.43	65.78
Ratio female-male economic activity rate, 15-64 (RACT)	0.3	0.34	0.41	0.49	0.56
Female economic activity rate, 15-64 (FACT)	27.91	30.51	35.73	41.77	46.88
Female share of labor force, 15-64 (FLFT)	22.93	25.24	28.87	32.77	35.63
Female employee rate (EMPLF)		0.18	0.21	0.22	0.24
Male employee rate (EMPLM)		0.51	0.48	0.4	0.42
Ratio female-male employees (REMP)		0.37	0.45	0.56	0.56
<i>OECD</i>					
Male economic activity rate, 15-64 (MACT)	90.28	86.80	84.66	81.55	81.12
Total economic activity rate, 15-64 (TACT)	63.35	64.99	68.64	70.57	72.00

(continued)

## ARTICLES

*Appendix Table 4 (Continued)*

	1960	1970	1980	1990	2000
Ratio female–male economic activity rate, 15–64 (RACT)	0.41	0.50	0.62	0.73	0.77
Female economic activity rate, 15–64 (FACT)	37.32	43.16	52.72	59.36	62.82
Female share of labor force, 15–64 (FLFT)	29.45	33.11	37.96	41.48	43.06
Female employee rate (EMPLF)		0.32	0.41	0.48	0.48
Male employee rate (EMPLM)		0.65	0.64	0.62	0.59
Ratio female–male employees (REMPLE)		0.48	0.62	0.75	0.79

*Source:* WISTAT 3 (United Nations 1997) and ILO LABORSTA (ILO 2007).

*Note:* All refer to unweighted averages. Employee data only until 1995. The male and female employee rates refer to the numbers of dependently employed as a share of the working-age population. As it excludes self-employment and own-account agriculture, it is therefore an indicator of the formal sector employment rate and has been referred to as such in the text. The female, male, and total economic activity rates refer to the population aged 15–64 and come from the ILO dataset online.

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