The Impact of Gender Inequality in Education and Employment on Economic Growth in the Middle East and North Africa

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Abstract:
Using cross-country and panel regressions, we investigate to what extent gender gaps in education and employment reduce economic growth. Using most recent data and investigating a long 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 then calculate the magnitude of the effects by comparing actual growth in the Middle East and North Africa with growth that would have taken place had they had the much smaller gender gaps in East Asia and the Pacific. Our point estimates suggest that the growth 'costs' of gender gaps in education, when considered alone, amount to about 0.7 percentage points per capita per year, and the combined 'costs' of education and employment gaps there amount to 0.7-1.5 percentage point differences in growth, based on our preferred specification. Gender gaps in employment appear to have a larger effect than gender gaps in education, although this finding should be treated as preliminary.

1. Introduction

There is a sizable literature that analyses the impact of gender inequality in education on economic growth. A number of theoretical contributions have found a negative link between gender inequality and economic growth (e.g. Galor and Weil, 1996; Lagerlöf, 1999). This literature suggests 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 that literature.

In parallel, an empirical literature has also examined these effects. While some earlier studies had suggested that gender inequality in education might actually increase economic growth (Barro, 1991; Barro and Xala-I-Marin, 1995; Barro and Lee, 1994), more recent work has shown that the opposite appears to be the case (Knowles, Lorgelly, and Owen, 2002; Forbes, 2000; Hill and King, 1995; Dollar and Gatti, 1999; Klasen, 2002; Abu-Ghaida and Klasen, 2002). These studies not only differed from previous analyses in their findings of the impact of gender inequality in economic growth, but also were able to explain why earlier

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studies had found the opposite effect and why more careful econometric techniques yielded the new finding that gender inequality in education reduces economic growth.[2]

These macro studies are consistent with findings using micro data that show that girls have a higher marginal return to education, and even more so, if the impact of female education on fertility and education of the next generation is included (World Bank, 2001).

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 can be attributed to higher initial gender inequality in education there as well as a slower closing of the gap vis-à-vis East Asia and the Pacific.[3]

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

A subject that has not been investigated in any sufficient detail is the impact of gender inequality in employment on economic growth. While there is some literature that claims that high *earnings* gaps, combined with high female labor force participation rates, helped spur economic growth in some Asian countries (e.g. Seguino, 2000), there has not been a thorough empirical investigation of the role of gender gaps in *employment* on economic growth.

Klasen (1999) included growth in female employment as a variable explaining economic growth and found a positive effect. This might have accounted for another 0.3 percentage points in the growth difference between the MENA region and East Asia and the Pacific (EAP).

But these findings have to be treated with caution as they might 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 increasing 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 rates. These issues can best be treated in a panel framework, where one considers the impact of initial female labor force participation on subsequent economic growth. With forty years of data, this is now possible and therefore a second aim of the paper is to investigate the impact of female labor force participation on economic growth in such a panel framework. The next section provides a brief summary of the theoretical and empirical literature on gender inequality and economic growth, section three an overview of education, employment, and economic performance in the MENA region compared to other developing regions. Section 4 describes the data and the estimation procedure, the fifth section presents the results, and the final section concludes.

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[2] Among the problems identified in the studies by Barro and co-authors were the absence of a dummy variable for Latin America which had low gender inequality in education and low growth (but not likely a causal connection between those two variables), 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 Klasen (2002), Dollar and Gatti (1999), Lorgelly and Owen (1999), and Forbes (2000).

[3] The reported figures in Klasen (2002) are actually slightly different, as Israel, Sudan, and Turkey were all included in the Middle East Region. For this report, they were allocated to other regions (Israel to 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.

2. Gender Inequality and Economic Performance: Theory and Evidence

There have been a number of theoretical and empirical studies that find that gender inequality in education and employment reduce economic growth. The main arguments from the literature, which are discussed in detail in Klasen (1999, 2002) are briefly summarized.

Regarding gender inequality in education, the theoretical literature suggests that such gender inequality reduces the average amount of human capital in a society and thus harms economic performance. It does so as by artificially restricting the pool of talent from which to draw for education and thereby excluding highly qualified girls (and taking less qualified boys instead). 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 (Knowles et al., 2002; World Bank 2001).

A second argument relates to 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 (e.g. Lagerlöf, 1999, Galor and Weil, 1996, World Bank, 2001).

A third argument relates to international competitiveness. Many East Asian countries have been able to be competitive on world markets through the use of female-intensive export-oriented manufacturing industries. In fact, a significant share of their high growth was based on the use of such export-oriented female-intensive manufacturing industries. In order for such competitive export industries to emerge and grow, women need to be educated and there must 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 (Seguino, 2000; World Bank, 2001).

A fourth argument is that gender gaps in employment impose a similar distortion on the economy as do gender gaps in education. It artificially reduces the pool of talent from which employers can draw upon, thereby reducing the average ability of the workforce.

A fifth argument relates to the importance of female employment for their bargaining power within families. There is a sizable literature that demonstrates that female employment and earnings increase their bargaining power in the home (e.g. Klasen and Wink, 2002; World Bank, 2001; Sen, 1990). This not only benefits the women concerned, but their greater bargaining power has been shown to lead to greater investments in the health and education of their children, thus promoting human capital of the next generation and therefore economic growth (e.g. Thomas, 1997; World Bank, 2001).

A sixth argument relates to governance. There is a growing literature that has suggested that women are less prone to corruption and nepotism than men (World Bank 2001). Improving access to women in the workforce are therefore likely to improve governance in business and government.

It is important to point out that it is theoretically (and empirically, see below) not easy to separate the effects between gender gaps in education and employment. 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 applications of uneducated women. Conversely, if there are large barriers to female employment, rational parents (and girls) might decide that education of girls is not as lucrative which might therefore lead to lower demands for female education and resulting gender gaps in education.[4] Thus gender gaps in education and employment are closely related to each other.[5]

They are not measuring the same thing, however, and thus are important to investigate 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 significant barriers to employment for females in the labour market. This might be particularly relevant to the situation in the Middle East and North Africa. 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 off-spring, while the effect of female employment on these items is likely to be much smaller and more indirect (working mainly through greater female bargaining power; and there may be also be opposite effects including that the absence of women in the home might in some cases negatively impact on the quality of child care). Conversely, the governance externality applies solely to female employment, not to female education.

On the empirical evidence, there is a considerable literature now that documents that gender gaps in education reduce economic growth. King and Hill (1993) as well as Knowles et al. (2002) use a Solow-growth framework and find that gender gaps in education significantly reduce the level of GDP. Dollar and Gatti (1999), Forbes (2000), Appiah and 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 (1991) that female education might negatively impact economic growth, does not stand up to closer econometric scrutiny.

There are much fewer empirical studies on the impact of gender gaps in employment on economic growth, largely related to data and econometric issues discussed above. Klasen (1999) found that increases in female employment were associated with higher growth in a cross-country context. Seguino (2000) finds that growth in East Asia was heavily dependent on female-dominated export oriented light manufacturing.

Also empirically, there are some questions about separation of the effects. In regressions that only consider the effect of gender gaps in education, they 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). It turns out that in our total sample, gender gaps in education and employment are not closely correlated so that it should be possibly to separately identify the effects. But when considering individual regions, the picture changes. In particular, in MENA, Latin America and the Caribbean (LAC), and OECD, there is a positive correlation between the two, so that one has to be careful in interpreting the results.

In sum, there is considerable theoretical support for the notion that gender gaps in education and employment are likely to reduce economic performance. The empirical results point to negative effects of gender gaps in education, but there is little literature on gender gaps in employment. In the following section we will discuss gender gaps in education and employment in the MENA region before estimating the impact of these gaps on economic performance there.

[4] On these issues, see discussions in King and Hill (1993), Alderman et al. (1995, 1996), and World Bank (2001).

[5] Also, it is not obvious which factor is the prime cause of gender gaps that one should then include in a reduced form estimation. While gender gaps in education might ‘cause’ gender gaps in employment, we showed that the reverse causality is also plausible.

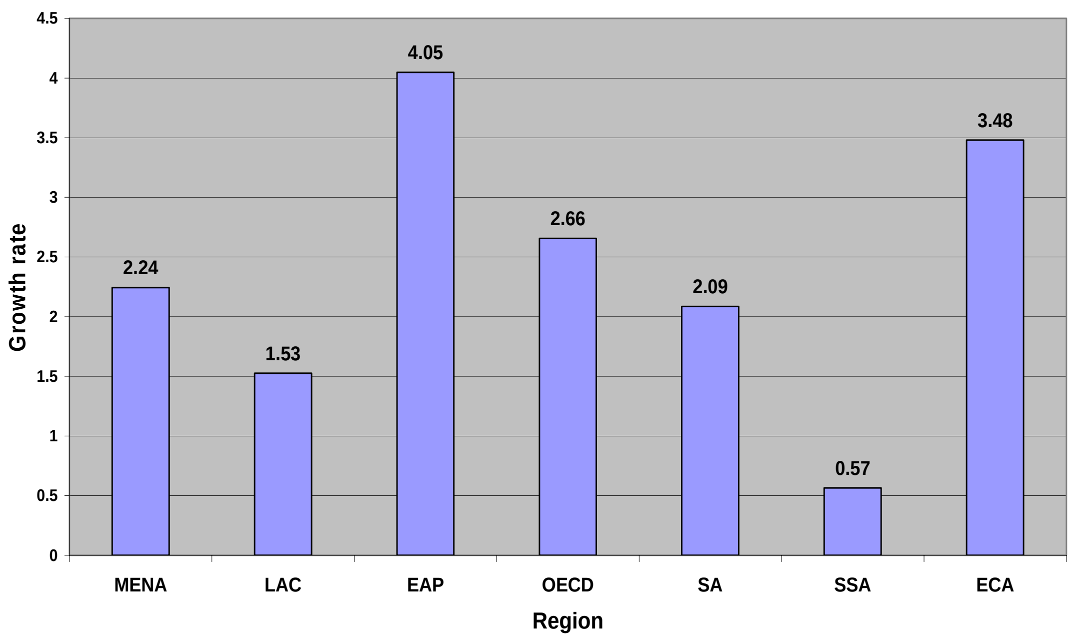
3. Education, Employment, and Economic Performance in the MENA Region

In this section we will present data on growth, education, and employment of the different world regions with particular focus on the Middle East and North Africa Region (MENA).

As shown in Graph 1, the fastest-growing region in the past forty years according to our country set and our data availability has been the region of East Asia and the Pacific (graph 1). The real per capita annual growth rate between 1960 and 2000 in this region was 4,05%. On the contrary, the region that registered least growth is the Sub-Saharan region (0,57%). Latin American and Caribbean countries (LAC) did not experience high growth rates either: they grew 1,53% annually. Middle East and OECD countries' growth rates are in-between at 2,24% and 2,66% annual growth per capita, respectively. To better analyze the pattern of the per capita growth rate we will decompose it in decades for the past forty years (1960s-1970s-1980s and 1990s) and consider the different world's regions growth rates in the different decades.

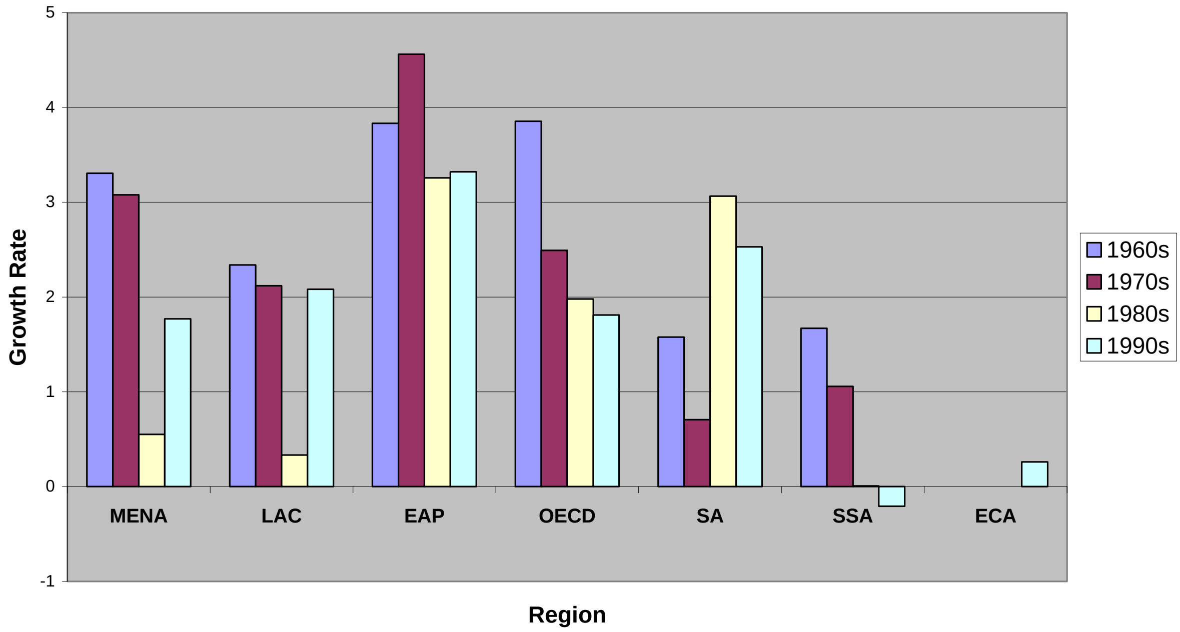
Considering the growth rate per decade allows us to take into account the growth rates of Eastern Europe (ECA), because after 1990 the quantity of data available for this region increases significantly. During the nineties those countries were experiencing a transition period and their rate of per capita growth was very low (0.26%). But those countries were not the only ones to experience a difficult period. The Sub-Saharan region annual per capita growth rate decreased in the last 4 decades and actually showing negative growth in the 1990s (-0,21).

Graph 1: Real Regional per capita annual growth rate 1960-2000



Source: PWT 6.1. Note that the sample of countries included is restricted due to data availability. Figures refer to unweighted averages and not all countries in each region are included due to data availability. In the MENA region, Algeria, Egypt, Iran, Jordan , Morocco, Syrian Arab Republic, and Tunisia are included. Yemen and Lebanon are not included because the data are available only since 1990s but these countries will be included in the MENA region in the panel analysis.

Graph 2: Real Regional per capita growth rate



Source: PWT 6.1. Note that the sample of countries included is restricted due to data availability. Figures refer unweighted averages and not all countries in each region are included due to data availability. In the MENA region, only Algeria, Egypt, Iran, Jordan, Lebanon, Morocco, Syrian, Tunisia, and Yemen are included. The data for Lebanon and Yemen are available only for the decade of 1990[6].

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 probably driven by India and Sri Lanka. But their neighbors (EAP countries) remain still the countries that experience largely higher annual per capita growth rate in each decade. The region of Middle East and North Africa (MENA) together with Latin America seems to be successfully recovering from very low growth in the 1980s. One should point out that the data included here do not consider many of the oil-exporting Arab states including Saudi Arabia, Kuwait, UAE, Oman, and Libya for which no income data is available in the new version of the Penn World Tables.[7]

Non-economic indicators of well-being show a similar pattern, although some differences emerge (Appendix Table1). The three indicators shown, under five 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 East Asia and Pacific showing the fastest improvements on most indicators, while Sub Saharan Africa showing the slowest. Here the MENA region compares very favorably with rapid improvements in life expectancy and under five mortality, and large reductions in fertility, particularly in the past 20 years.

Turning to the indicators of concern here, gender inequality in education and employment, the appendix Tables 2 and 3 show the development in the regions between 1960 and 2000. They show that in all regions, the education of the adult population has increased considerably since 1960. Male and female adults have between 1.8 and 4.4 years more

[6] If we had consider the same countries for the different decades the annual per capita growth rate in 1990s would have been higher: 1.88 percent instead of 1.77.

[7] Also note that Turkey which is sometimes considered part of the Middle East is here included in Eastern Europe and Central Asia, following the World Bank classification system. In addition to that Israel is not included in the MENA region but considered to be part of the OECD region.

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 in most developing regions. The worst affected were South Asia, Sub Saharan Africa, and the MENA region, where female adults had about half or less the education than their male peers. In all regions, this gap has been reduced, but the gap remains sizable in some. In South Asia, female adults still only have about 60% of the educational achievement of males, and the gap has closed quite slowly in Sub Saharan Africa. The gaps have been closing faster in East Asia and Pacific and also in the MENA region where female adults (15 and older) now have about 73% of the education of males.

Appendix Table 3 examines data on labor force participation rates by gender, the female share of the labor force, and the rates of formal sector employment. Inequality in labor force participation is also considerable, although also here the gaps have been narrowing (Appendix Table 3). From those data a consistent pattern emerges. In particular, East Asia and the Pacific as well as Latin America show rapidly declining gender gaps in labor force participation and formal sector employment; Sub Saharan Africa show declines in female labor force participation and employment, but from a high level[8]; and the MENA region has the lowest female labor force participation rate and formal sector participation of women. But there the gaps have also narrowed in recent decades.

From our theoretical discussion, we would expect that excluding women from the pool of talent is particularly damaging formal sector employment which may depend particularly 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 for a much smaller pool of countries and it is not clear how serious measurement error and international comparability might be. Therefore for the empirical analysis below, we will use the gender gaps in total employment only. 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.[9]

4. Data and Estimation procedure

In our estimation strategy, we make use of cross-country and panel growth regressions as have been pioneered by Barro (1991) and used in a large literature since. Our particular estimation strategy follows Klasen (2002) and compares the results to these findings. As our focus is on long-run economic growth, the basic specification will use purely cross-country and treat the 1960-2000 period as one observation. In order to control for possible endogeneity issues and unobserved heterogeneity, we will also consider panel regressions that treat each decade as one observation.

We include a number of regressors that have been found to effect economic growth in the literature, including population growth, labor force growth, openness (exports plus imports as a share of GDP), the investment rate, human capital, and regional dummy variables to capture region-specific effects.[10]

In order to avoid some of the problems in the earlier literature on gender inequality and economic growth, we do not include male and female education levels separately, but

[8] 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.

[9] Unfortunately, it is very difficult to econometrically control for measurement error. We know little about its structure, nor are there good instruments to address it.

[10] In future work, we plan to do a thorough robustness check using many more variables used in standard growth regression analysis.

instead have a variable for the average level of education and a second one for the gender gap in education. We do this for initial levels and the subsequent growth in education, generating four different education variables. In the basic specification, we use male education as the proxy for average education and then add the female-male gap in male education (initial level and the gender gap in growth of education). This presents a upper-bound estimate of the effect of gender inequality in education on growth as it implicitly assumes that one could improve the gender gap by sending more girls to school without having to take out boys (as the male education levels is held constant this way).[11] In an alternative specification, we will also use average education and the gender gap in average education. This implicitly assumes 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 it may also affect economic growth through effects it has on investment rates, population growth, and labor force growth. The 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 equations estimated are the following[12]:

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

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

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

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

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

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

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

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 labor force growth. Education and gender bias in education could, however, influence population growth, investment and labor force growth in the future. Therefore there is a need in taking into account the indirect impact of education and gender inequalities via these variables on economic growth (regression 2-4) which is done in regressions 2-4. The total effect is determined by the path analysis, in which we simply sum the direct effect to the indirect effect (see Klasen, 2002). The fifth regression is the so called "reduced form" regression. In this regression, investment, population and labor force growth variables are omitted. Therefore we expect the coefficients of this regression to measure the total effect of gender bias in education directly and can compare them to the sum of effects calculated using the path analysis.

As discussed above, in regressions 1-5 the education and the growth of education refer to the male years of schooling while in regressions 6-7 we consider the total number of years of schooling as a measure for the average human capital, which will therefore generate a lower bound estimate of the effects.

[11] Knowles et al. (2002) suggest that this is the most suitable specification for analyzing gender gaps in education. This specification was also used in Klasen (2002).
[12] Note: regression 3 and 4 contain an additional explanatory variable with respect to Klasen (2002)

The model has been re-estimated using a panel data set where the dependent and the explanatory variables are divided into four time periods (1960-69, 1970-79, 1980-89, 1990-2000). This is done in order to control for endogeneity of the education variables and also include the labor force variables: In order to avoid reverse causality we only considered the initial values of education and labor force participation, as well as the gender gaps in these variables. The explanatory variables are the following: annual population growth, annual labor force growth, initial GDP/capita (log), mean openness, average investment rate, initial years of schooling for males, the initial female-male ratio of years of schooling[13], and alternatively, various indicators of initial gender gaps in employment. Here we try several specifications. In one, we just use the female share of the labor force as our variable of the employment gap. This specification holds the total labor force fixed and just adjusts the female share, so that it does not assume 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 total labor force participation on economic growth, which might bias the results.[14] Therefore we also use a similar technique to that employed above for the education variables, where we generate upper and lower bound estimates and use a male activity rate together with the female-male ratio as an upper bound estimate (since it presumes that the female-male ratio could be increased without reducing the male activity rate, thus assuming more total jobs) and the total activity rate together with the female-male ratio as a lower bound (since it presumes that any additional female job would mean one fewer male job). As with the education estimates, we believe that the true effects are closer to the former than the latter.

It turns out that the best panel specification is to use fixed effects to control for unobserved heterogeneity. We have run the regressions for random effect but specification tests (Hausman tests) suggested that the fixed effect specification is superior.

The data that have been used in the empirical part of the paper come from the following different data sets:

- Penn World table (6.1)
- Barro & Lee (2000)[15]
- World Development Indicators (WDI 2001-2)
- Wistat (version 3)
- LABORSTA, ILO Bureau of Statistics

Per capita GDP in PPP, population, investment and the openness data come from the Penn tables. From the Wistat (1996) and the ILO Laborsta data base we derived the variables on the labor market: the share of adult females and males employed in the formal sector, the share of females in the labor force and the percentage of people economically active by sex and age. The number of years of schooling for the population 15+ and 25+ are taken from the Barro-Lee database. Fertility, life expectancy and children mortality rate come from the WDI.

The construction of the explanatory and dependent variables require further explanations. The dependent variable is the annual (compound) rate of growth of GDP per capita for the period 1960-2000 (g). The explanatory variables for the education are the following: the male or total education in 1960 (ED60 and AED60 respectively), the absolute

[13] We now use the total years of schooling of the population 25 and above. This we do as in the panel analysis only have a ten-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).

[14] To the extent that changes in total labor force participation are positively correlated with changes in the female share of the labor force, this specification might overestimate the impact of employment gaps by gender.

[15] For a few countries (Bulgaria, Cuba, Gambia, China, Egypt, Romania, Russia), we relied on the earlier Barro-Lee data as the new ones were not available.

growth in male or total years of schooling (GED and GAED), the female-male ratio of schooling in 1960 (RED60) and the female-male ratio of the annual growth in the years of schooling (RGED). Investment (INV) and openness (OPEN) are mean values while the labor force and population is considered as a growth rate (POPGRO and LFG). The labor market explanatory variables are the following: the share of females in the total labor force (FLFT), the male economic active rate (MACT), the total economic activity rate (TACT) and the female-male ratio of the economic active rate (RACT)[16].

Compared to Klasen (2002), the sample is smaller due firstly to a change in the number of countries for which the Penn World table provides data, secondly to elimination of suspiciously data for education and thirdly to the lack of data for many Transition countries before 1990[17].

Table 1: Descriptive statistic for Cross-Section Analysis

	TOTAL	MENA	LAC	EAP	OECD	SA	SSA	ECA
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	3377	1971	3299	1813	8473	930	1478	2233
GDP00	8693	4462	6897	12033	23153	2186	2375	7910
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

Source: WDI 2002,Penn World Table 6.1, Barro & Lee (2000).
Note: World region: SA (South Asia), SSA (Sub-Saharan Africa), ECA (Eastern Europe), EAP (East Asia and Pacific), LAC (Latin America and Caribbean, MENA (Middle East and North Africa), OECD (industrialized countries members of OECD). The dependent variable (g) is the compound growth rate of the real GDP per capita (constant price chain series). The explanatory variables are the following: average investment and openness during the last 4 decades (INV, OPEN), compound growth rate of population (POPGRO) and the labor force (LFG), child mortality (under 5 years of life) in 1960 (M560) and in 2000 (M500), fertility rate (FERT), gross domestic product per capita (GDP) in 1960 and in 2000, ratio of female-male education in 1960 (RED60), the female-male ratio of the growth of education (RGED), female education in 1960 (EDF60) and the annual growth of female education of the adult population in the period 1960-2000 (GEDF).

Table 1 shows the descriptive statistic we use for the cross-country analysis. They include a number of variables typically used in cross-country regressions. We already commented above on trends and regional differences in growth, education, labor force, and

[16] All these rates refer to the population aged 15-64.

[17] The previous version of the Penn Table (5.6) provided data for the following additional countries: Belize, Djibouti, Malta, Oman, Puerto Rico, Saudi, Somalia, Surinam, Iraq, Liberia, Myanmar, Reunion, Sudan, Swaziland, Yemen and Yugoslavia. For the last 9 countries Barro-Lee data on education were available. In addition to that the data for Eastern Europe countries were not limited to the 1990s. Penn 6.1 provides data for the entire sample set only for two Eastern Europe countries (Romania and Cyprus). Barro-Lee education data are suspicious for Austria and Bolivia, as they suggest stagnating or declining educational attainment despite substantial increases in enrolments. Hence we erased these two countries from the analysis.

non-income indicators of well-being. One point of note is the variable RGED which measures the female-male ratio of growth in education. Here we clearly see the different progress made in reducing the gender gap in education. While the ratio is far above 1 in East Asia and the Pacific, suggesting that females expanded their education faster than males, the reverse is the case especially in South Asia (0.77) but also in MENA region (0.87). The figures for SSA shows that female expanded their education about as fast as men. Table 1 also includes data on other regressors including the investment rate, population growth, labor force growth. Here well-known differences emerge. The region of East Asia and the Pacific is notable for its high investment rates, its high level of openness, and its moderate population growth. The reverse is the case for Sub Saharan Africa. The MENA region shows very high levels of population growth, but sizable investment rates and levels of openness.

5. Results

In this section we present the results from the updated cross-sectional analysis as well as the panel regressions. Table 2 shows the basic set of regressions from Klasen (2002) but with the new data that now stretch from 1960-2000. We start considering the basic regression in column 1. Before turning to the education variables, we briefly comment on the other regressors. Compared to 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.[18] The substantive results confirm many of the findings from the empirical growth literature. First, we see a strong conditional convergence effect, there is a sizable positive impact of investment on economic growth, a large negative impact of population growth, while we also observe a large positive impact of labour force growth. 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 labour force growth is still high due to past high fertility, countries are receiving a 'demographic gift' of a low dependency burden (Bloom and Williamson, 1998) that allows higher savings, a higher ratio of workers to population, and higher investment demand. Given that fertility in the MENA region is falling rapidly, one would expect the region to enter this phase of the 'demographic gift' in 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 labour force in coming decades.

Openness now has an even smaller positive effect on economic growth than in Klasen (2002). But the variable used, the sum of exports and imports as a share of GDP, is partly dependent on country size and may not fully capture the effect of trade policy on growth.[19] 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 (in contrast to Klasen, 2002 where it was marginally significant). In contrast,

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[18] The population growth regression does not pass the test, suggesting that omitted variables and/or non-linearities in these regressions might be a problem. This does not affect out main (including the size of the direct, indirect and total effects) results and could only have a possible (and likely minor) influence on the relative importance of these two indirect effects.

[19] There is a lively debate about the impact of trade policy on growth. For a discussion, see Sachs and Warner (1995) and Rodrik and Rodriguez (2000).

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 the impact of the gender inequality in the growth of education has a sizable direct impact on growth.

Columns 2-4 estimate the indirect impact of gender inequality in education on economic growth through the effects they have on investment, population growth, and labour force growth. The investment regression shows that the initial female male ratio of education has a significant positive effect on growth, while the impact of gender inequality in the growth of education is also positive but not significant. In the population growth and labour force growth regressions, the impact of gender inequality in education is in the right direction, though not significant.[20]

Column 5 shows the reduced form regression, which omits the investment, population growth, and labour force 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, have a significant negative impact on growth. A comparison between column 1 and 5 show that the initial ratio of education has mainly an indirect impact on economic growth while the ratio of educational growth has mainly a direct impact.

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

In Table 3 we calculate to what extent gender bias in education can explain growth differences between the various regions of the world. We do this for both the upper as well as the 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 very similar results as 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 MENA 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 annual per capita growth per year, the losses are now slightly larger for South Asia, around 1 percentage point, and quite a bit smaller for the MENA region, at 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 was much more modest.

[20] While there is a large and conclusive literature that shows that female education reduces fertility (e.g. see Klasen, 1999, Schultz, 1997, and World Bank 2001 for a survey), the link between female education and population growth rates is less strong as population growth is also affected by the age structure of the population. In a population with a large share of women in child-bearing age, even a low total fertility rate for each of them can generate considerable population growth compared to 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 regression 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.

Table 2: Gender Inequality in Education and Economic Growth

Dependent variable	Growth (1)	INV (2)	POPGRO (3)	LFG (4)	Growth (5)	Growth a (6)	Growth a (7)
LOGGDP60	-2.27***	-3.51	-0.18	-0.21	-2.47***	-2.29***	-2.52***
	-4.54	-1.13	-0.55	-0.57	-3.90	-4.44	-3.87
POPGRO	-2.80***	0.91				-2.79***	
	-5.27	0.41				-5.22	
LFG	2.33***	0.04				2.32***	
	5.01	0.02				4.96	
OPEN	-0.001	0.041***	-0.003	-0.002	0.005*	-0.0005	0.006*
	-0.20	2.03	-1.25	-0.75	1.37	-0.14	1.42
INV	0.06***					0.06***	
	2.93					2.74	
RED60	0.68	5.84**	-0.40	-0.17	1.75**	0.76	1.72**
	0.81	1.89	-1.26	-0.51	1.98	0.86	1.89
ED60	0.01	0.92***	-0.02	0.01	0.16**	0.00	0.13*
	0.18	2.10	-0.46	0.15	1.68	-0.06	1.31
GED	10.42***	35.42	-1.01	0.85	17.33***	10.59***	18.31***
	2.39	1.22	-0.52	0.40	3.88	2.21	3.77
RGED	0.70***	2.07	0.00	0.05	0.95***	0.47**	0.62**
	2.43	0.95	0.00	0.20	2.55	1.87	1.85
SA	-0.07	-3.58	-0.17	-0.46**	-0.90*	-0.02	-0.85*
	-0.12	-1.16	-0.71	-1.90	-1.39	-0.03	-1.30
SSA	-0.83*	-6.92***	0.40**	-0.06	-2.49***	-0.81*	-2.47***
	-1.44	-2.51	1.83	-0.28	-3.53	-1.41	-3.49
ECA	-0.10	3.57	-0.91***	-1.32***	-0.46	-0.10	-0.46
	-0.15	1.27	-2.23	-2.45	-0.53	-0.16	-0.52
LAC	-0.87*	-4.87**	0.08	-0.17	-1.79***	-0.87*	-1.81***
	-1.55	-1.78	0.29	-0.63	-2.40	-1.57	-2.44
MENA	-0.17	-3.77	0.72**	0.48	-1.26**	-0.12	-1.24**
	-0.33	-1.00	1.70	1.15	-1.92	-0.24	-1.91
OECD	0.47	4.81*	-1.07***	-1.64***	-0.12	0.55	0.01
	0.78	1.58	-2.88	-4.37	-0.14	0.91	0.02
CONSTANT	7.35***	13.65	3.26***	3.39***	7.16***	7.65***	7.73***
	3.99	1.16	3.09	3.04	3.41	4.13	3.61
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

t-statistics are shown below the coefficients. *** Refers to 99%; ** to 95%; and * to 90% significance level using a one-tail test.
a: regression with total education instead of male education only. OV test refers to the Ramsey Reset test for omitted variables.

When examining the pathways through which gender inequality in the MENA region leads to lower growth, there is a sizable direct effect which amounts to about 60% of the total effect. 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 found in Klasen (2002) where about 75% of the total effect was accounted for by the direct effect. The indirect effect via demographic effects have become much more important, accounting for about 25% of the growth differences between MENA and EAP. The effect via investment has become somewhat smaller, accounting for about 15% of the total growth difference between MENA and East Asia. 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 3: Gender inequality and growth differences between Regions

	Difference SSA-EAP	**Difference SA-EAP**	**Difference MENA-EAP**	**Difference SSA-EAP**	**Difference SA-EAP**	**Difference MENA-EAP**
Total annual growth difference	**3.48**	**1.96**	**1.74**	**3.48**	**1.96**	**1.74**
	Upper bound estimate			**Lower bound estimate**		
Accounted for by:						
Direct effect of gender inequality in education (1)	0.26	0.52	0.38	0.22	0.45	0.33
Of which: 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: via investment	0.08	0.17	0.12	0.07	0.14	0.07
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
Of which: 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

Table 4 shows the result of panel regressions using fixed effects. Also here, the empirical findings in those 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. In this regression the female-male ratio of education has the expected positive sign, which means that decreasing inequality in education will increase growth, but it is not significant. The male education coefficient is not significant in all the specifications and in equation 10 it has a negative sign.[21]

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 to male economic activity rates. In regression 8 the female share of the labor force has a positive and significant coefficient. The effect of gender-gaps in education in this specification is considerable but not significant. In regression 9 we use the male economic active rate and the ratio of the female to male economic active rates to capture the gender gap in employment. This ratio is highly significant and positive, while the male economic active rate has a non-significant negative sign. If we add the education gap in regression 10 the coefficient on the gender gap in employment is still positive and significant (equation10) but smaller, while the coefficient on the male activity rate is now positive but still insignificant. Since the coefficient on the male activity rate is insignificant, altering the male activity rate when one increases the female activity rate would not have an significant impact on growth. Thus, in contrast to the education regressions in Table 2, it is not necessary to calculate an upper and lower bound regression as the male activity rate seems to be immaterial for growth. This is confirmed by regressions 11 and 12 where we did replace the male activity rate with the total activity rate and now find that the impact of the gender gap is larger while the impact of the total activity rate is now negative.

These results suggest that gender gaps in employment have an impact on economic growth. For the MENA region, where female labor force participation is still very low, this could have a significant impact on economic growth.

Once again, we simulate the impact of gender inequality in education and employment based on these panel regressions. Here we simply show to what extent the difference in economic growth between East Asia and the Pacific and the MENA region can be accounted for by differences in gender inequality in education and employment. Table 5 suggests that differences in employment chances can have a substantial impact on economic growth. In fact, they often can account for most of the growth differences between East Asia and the Pacific and the MENA region. Depending on the specification, between 0.9 and 1.7 percentage points of the growth difference between the two regions can be accounted for by gender gaps in education and employment. Most of the growth differences appear to be increasing in time which shows that while East Asia increased female employment rapidly, the MENA region was falling increasingly behind and this appears to have held down economic growth. This is also, though to a lesser extent, true for education gaps in the 1970s and 1980s. During those decades, MENA was closing the gender gap in education not as fast as East Asia and thus an increasing amount of the growth difference was due to the rising difference in these gaps. In the 1990s, MENA actually reduced the gender gap faster than East Asia and thus the resulting growth costs were falling. In Table 6 we run the simulation comparing the MENA region to Morocco, the country in MENA with the highest female labor force participation rate and the lowest gender gaps in employment.[22] We notice that the per capita growth rate of the MENA region could have been much higher in the last four decades, by about 0.5-0.8% per year, if the other MENA countries had had Morocco's record in employment equity.

Interestingly, the gender gaps in employment appear to have hurt the MENA region more than the gender gaps in education. As discussed at the beginning, this distinction has to

[21] We will investigate this matter further and particularly try to reconcile the findings with the cross-section results. We would expect a smaller effect in the panel regressions as they consider only a relatively short time interval (10 years) for the human capital effects to take effect. Also, in contrast to the cross-section, they do not consider the impact of changes in education after 1990.

[22] We limit the assessment to differences in labor force participation rates, as we do not have education data for Morocco. When comparing the MENA average to Morocco, Morocco is included in that MENA average.

be treated with some caution as the two are conceptually and empirically quite closely related. Also, it might be the case that the education gaps take more than 10 years to have an effect while the employment gaps have more immediate effects. Since the panel regression is based on 10 year growth spells, this might lead to a higher measured employment effect. But clearly, the employment gap is particularly important.

Table 4: Gender inequality and Economic growth

	Growth (8)	Growth (9)	Growth (10)	Growth a (11)	Growth a (12)
LOGGDP	-6.08***	-6.97***	-6.14***	-7.05***	-6.25***
	(-6.02)	(-7.62)	(-5.92)	(-7.71)	(-6.04)
POPGRO	-0.47*	-0.47**	-0.59**	-0.44*	-0.56*
	(-1.32)	(-1.68)	(-1.65)	(-1.61)	(-1.58)
LFG	0.38*	0.48**	0.45*	0.46**	0.40*
	(1.40)	(1.81)	(1.59)	(1.72)	(1.44)
FLFT	7.86***				
	(2.37)				
OPEN	0.000	0.001	0.001	0.001	0.000
	(0.08)	(0.27)	(0.18)	(0.21)	(0.09)
INV	0.10***	0.12***	0.10***	0.13***	0.10***
	(3.80)	(5.43)	(3.85)	(5.49)	(3.87)
OED25+	0.003		-0.005		-0.02
	(0.02)		(-0.03)		(-0.11)
ORED25+[23]	1.01		1.14		1.35
	(0.75)		(0.81)		(0.97)
RACT		5.41***	3.72***	7.66***	4.68
		(3.67)	(2.41)	(2.11)	(1.15)
MACT		-0.80	3.85		
		(-0.12)	(0.50)		
TACT				-5.46	-2.71
				(-0.66)	(-0.29)
1960S	0.58	0.61*	0.40	0.77*	0.68
	(1.02)	(1.30)	(0.60)	(1.64)	(1.01)
1970S	0.37	0.32	0.28	0.42	0.45
	(0.83)	(0.96)	(0.58)	(1.24)	(0.90)
1980S	-0.44*	-0.32	-0.46*	-0.27	-0.39
	(-1.45)	(-1.27)	(-1.44)	(-1.05)	(-1.18)
Constant	18.53***	21.48***	16.04***	23.46***	21.00***
	(4.95)	(2.97)	(1.97)	(4.46)	(3.63)
OBS	341	449	341	449	341

t-statistic in parentheses. *** Refers to 99%; ** to 95%; and * to 90% significance level.
a: regression with total education instead of male education.

In order to get a sense of the magnitude of these effects, we use the point estimates from these regressions to calculate by how much GDP would be higher in the MENA Region if they had East Asia's record of gender bias in education and employment. We do this based on the growth differences calculated in Table 3 for gender gaps in education and regression 10

[23] Where OED25+ corresponds to the years of schooling of the male population 25 or older and ORED25+ is the female-male ratio of years of schooling. We use this education variable (rather than the one used in Table 2 where we relied on the years of schooling of the population 15 and above) since we expect that this variable better captures the human capital of the current workforce (many of those 15-25 might still be out of the workforce).

in Table 5 for gender gaps in employment. In the year 2000 alone, the point estimate suggests that having East Asia's record in gender inequality in education (in the previous year) would have boosted GDP by $5.8-7.4 billion (1996 prices) in the MENA region.[24] Having East Asia's record in gender gaps in employment in the previous year is estimated to have boosted GDP in the MENA region in 2000 by $12.8 billion (1996 prices).[25]

Table 5: Gender Inequality in Education and Employment and Growth Differences

	1960s	1970s	1980s	1990s
Growth difference EAP-MENA by decades	**0.53**	**1.48**	**2.71**	**1.55**
Regression 8				
Employment effect	0.75	0.86	0.96	1.07
Education effect	0.18	0.28	0.26	0.24
Total effect	**0.93**	**1.15**	**1.23**	**1.31**
Regression 9				
Employment effect (ract)	1.13	1.35	1.63	1.74
Regression 10				
Education effect	0.20	0.32	0.30	0.27
Employment effect (ract)	0.77	0.93	1.12	1.20
Total effect	**0.98**	**1.25**	**1.42**	**1.47**

Table 6: Gender Inequality in Education and Employment and Growth Differences (Morocco-MENA)

	1960s	1970s	1980s	1990s
Growth difference MENA-Morocco	**2.30**	**-0.32**	**0.98**	**-1.35**
Regression 8				
Employment Effect	0.59	0.63	0.62	0.64
Regression 9				
Employment Effect	0.64	0.68	0.76	0.81
Regression 10				
Employment Effect	0.44	0.47	0.52	0.55

[24] Where the first number corresponds to the calculation computed on the lower bound estimate and the second one considering the upper bound estimate.

[25] We also calculate how much higher MENA's GDP would be had they had East Asia's record in gender bias in education and employment already since 1960. Since this would have added between 0.5-1.5 percent higher growth each year, the compound effect of this leads to very large figures. In year 2000, MENA's GDP would be between $280-363 billion higher when EAP's gender gaps in education are used since 1960 (or 1137-1477 dollars per capita). It would have been $520b. higher ($2173 in per capita terms) if EAP's gender gaps in employment had been used since 1960 (based on regression 10). If, in addition, they had had East Asia's education gap since 1960, total gdp would have been 719$ bn. bigger (in per capita terms $2929). We also estimated the impact on GDP in 2000 if MENA had eadopted East Asia's education and employment gaps in 1990 only. Using the cross-section regression, had MENA adopted East Asia's gap in 1990, its GDP per capita would have been 239-304$ higher in 2000, which in total GDP corresponds to a loss of 58,7-74,6 bn. Using the panel we consider how much higher GDP per capita been in 2000 if MENA had had the same female-male economic activity as EAP since 1990: 518$ per capita if we consider East Asia's employment gap only (and $ 631 if we also consider East Asia's education gap; in total GDP in 2000 this amounts to: $127 bn (East Asia's employment gap since 1990) and $155bn. (East Asia's gender gap in employment and education since 1990).

6. Conclusions and Caveats

The challenge of increasing the economic growth of a country is, to a considerable extent, linked to the role played by women in the society. The cost of discrimination toward women in fundamental rights, education, access to credit, participation in the public life and employment not only harm the women concerned, but impose a cost on the entire society.

While gender gaps in education in the Middle East and North Africa region have been reduced from high levels in the past, 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 labour market in the last decades, increased female education in MENA has not translated into higher labour market participation. Women in this region are encountering structural barriers[26] in employment but those barriers may also be social, cultural, and ideological.

The results resented in our paper suggest that gender equity in education and employment is not only an equity issue, but also a growth issue. In particular, we find the following:

Firstly, gender inequality in education reduces economic growth also in the 1990s. The findings from earlier studies that used data up until 1990 are largely confirmed through this expanded analysis.

Secondly, gender inequality in education in the MENA region continues to hurt growth in that region, but by decreasing amounts. This is due to the fact that gender gaps in education have been sharply reduced over the past two decades there. As a result, we expect gender inequality in education to play a decreasing role in hurting MENA's growth prospects. 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 even faster than MENA, particularly in the 1970s and 1980s, the growth differences accounted for by differences in gender gaps between the two regions mounted during that time period.

Thirdly, the panel analysis suggests that gender inequality in employment has a sizable negative impact on economic growth. Simulations suggest that MENA's growth prospects, particularly when compared to other regions, are significantly reduced through this effect as the impact of gender inequality in employment is large and has been increasing over recent decades, particularly as other regions have been expanding female employment at much faster rates than MENA. Thus a significant constraint to higher economic growth in the region appears to be the substantial gender inequality persisting there. If this is confirmed through further analysis, this points to an urgent need of increasing the female participation in the labour force. While our results suggests that changing the composition of the labour force to include more females (and thus fewer males) 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 females. At the least, the results suggest that current barriers to female employment are not only disadvantageous to females, but also appear to reduce economic growth in the MENA region

The GDP loss related to the reduced access to women especially in the labour market are remarkably high. Our estimates suggest that opening access for females in education and employment would increase GDP in the MENA region to the level enjoyed in East Asia and the Pacific by $5,8-12,8 b in year 2000.

[26] Structural barriers related to the economic reconstruction, recession and limited domestic and foreign investment.

One should also bear in mind the findings from a large literature that suggest that gender inequality in education and employment also has a significant negative impact on other development goals such as reductions in fertility, child mortality, and undernutrition. Thus reducing existing gender inequality in education and employment will not only promote growth, but also further these other effects.[27]

It is important to end this study with some caveats. While these results appear robust to different specifications and use the appropriate econometric techniques, it is important to further assess the robustness of the findings by including further variables that might affect economic growth. Also, further specification tests, controls for endogeneity, and panel techniques will need to be undertaken to assess the sensitivity of the findings. Moreover, the correlation between the different variables need to carefully investigated as they affect the size of the point estimates. Third, we need to solidify the results of gender gaps in employment by carefully assessing the reliability and comparability of the data sources we use and compare the relative merits of the different indicators that can be used. Given particularly the problematic nature of the employment data, further work should also include micro data analyses that consider the economic losses associated with gender inequality in employment.

[27] Abu-Ghaida and Klasen (2002) estimate the magnitude of these effects.

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Appendix

Table A1: Annual per capita growth and other Indicators by Region, 1960-1990

EAP	1960	1970	1980	1990	2000
Under five 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	1813	2963	5117	8930	11755
SA					
Under five 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	1099	1187	1660	2186
SSA					
Under five 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	1488	1868	2087	2182	2400
MENA					
Under five 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	1968	2762	3660	3499	4462
ECA					
Under five 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	2233	3650	5300	9323	7346
LAC					
Under five 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	3362	4270	5072	5471	7086
OECD					
Under five 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	8386	12024	15420	18875	23173

Source: Penn World Table 6.4 and WDI 2002. Please note that 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.

Table A2: Education Indicators by Region, 1960-1999

EAP	1960	1970	1980	1990	1999
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
SA					
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
SSA					
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
MENA					
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
ECA					
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
LAC					
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
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
OECD					
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-Lee (2000). All refer to unweighted averages.

Table A3: Labor market Indicators by Region, 1960-2000

EAP	**1960**	**1970**	**1980**	**1990**	**2000**
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 (REMPL)		0.4	0.49	0.6	0.66
SA					
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
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 (REMPL)		0.15	0.18	0.27	0.26
SSA					
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 (REMPL)		0.2	0.26	0.28	0.34
MENA					
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 (REMPL)		0.12	0.13	0.18	0.25
ECA					
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 (REMPL)		0.45	0.57	0.68	0.6
LAC					
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 (REMPL)		0.37	0.45	0.56	0.56
OECD					
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
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 (REMPL)		0.48	0.62	0.75	0.79

Source: WISTAT 3, LABORSTA (ILO Bureau of Statistics).
Note: All refer to unweighted averages. Employees data only until 1995. The male and female employee rate refers 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 on line.