POLICY RESEARCH REPORT ON
GENDER AND DEVELOPMENT
Working Paper Series, No. 1

Gender Inequality, Income, and Growth: Are Good Times Good for Women?

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Gender differentials in education and health are not an efficient economic choice. Societies that underinvest in women pay a price for it in terms of slower growth and lower income. Furthermore, gender inequality can be explained to a significant extent by religious preference, regional factors, and civil freedom.

May 1999
The World Bank
Development Research Group/
Poverty Reduction and Economic Management Network

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Abstract

The relative status of women is poor in the developing world, compared to developed countries. Increases in per capita income lead to improvements in different measures of gender equality, suggesting that there may be market failures hindering investment in girls in developing countries, and that these are typically overcome as development proceeds. Gender inequality in education and health can also be explained to a considerable extent by religious preference, regional factors, and civil freedom. These systematic patterns in gender differentials suggest that low investment in women is not an efficient economic choice, and we can show that gender inequality in education is bad for economic growth. Thus, societies that have a preference for not investing in girls pay a price for it in terms of slower growth and reduced income.

Views expressed are those of the authors and do not necessarily reflect those of the World Bank or its member countries. We would like to thank Bill Easterly, Beth King, Aart Kraay, Andrew Mason, and participants in a seminar at the World Bank for helpful comments, and Charles Chang for excellent research assistance.

If a test of civilization be sought, none can be so sure as the condition of that half of society [women] over which the other half [men] has power.

– Harriet Martineau, "Women" (1837)

1. Introduction

Social observers have long noted that the status of women and overall socio-economic development tend to go hand-in-hand (witness the above quote from 19th-century social critic Harriet Martineau). In the poorest quartile of countries in 1990, only 5% of adult women had any secondary education, one-half of the level for men. In the richest quartile, on the other hand, 51% of adult women had at least some secondary education, 88% of the level for men. Other measures of gender inequality (in health or legal rights) paint a similar picture. In the poorest countries, women are particularly inadequately served in terms of education, health, or legal rights.

What to make of this association is not obvious, however. It is possible that income affects gender inequality; that gender inequality affects growth and hence income; or both. Or, it may simply be that common underlying factors determine both income and gender inequality. In this paper, we investigate the relationships among gender inequality, income, and growth, using data for over 100 countries over the past three decades. Our primary focus is on gender inequality in educational attainment, but it is useful to bring in other measures as well because they reinforce our basic story.

We are interested in what macroeconomic data reveal about three specific questions:

1. Is lower investment in girls' education simply an efficient economic choice for developing countries?

2. Does gender inequality reflect different social or cultural preferences about gender roles? and

3. Is there evidence of market failures that may lead to under-investment in girls, failures that may decline as countries develop?

The answers to these questions are important if one is interested in reducing gender inequality. If under-investment is efficient, then promoting girls' education is swimming upstream. If, on the other hand, it is not efficient for growth but reflects cultural preferences, then promoting girls education may raise a country's income but reduce the welfare of those who have a preference for gender inequality. Finally, to the extent that under-investment in girls may be the result of market failures, then a campaign to increase girls schooling could be truly "win-win," that is, making everyone better off.

In the next section of the paper, we develop several measures of gender inequality and preview the data. Section 3 then considers the relevant background literature and our methodology for addressing the above questions. In section 4, we attempt to explain the different measures of gender inequality in terms of exogenous variables such as religious preference, and of income (which is endogenous). Section 5 then examines the relationship in the other direction, explaining per capita income growth in terms of exogenous factors and, potentially, of gender inequality. The final section concludes.

We find several pieces of evidence suggesting that under-investment in girls schooling is not simply an efficient economic choice. To a large extent, gender inequality in education and in other areas can be explained by religious preference and underlying characteristics of societies, such as the extent of civil liberties. These systematic relationships make it highly unlikely that the observed inequality is economically efficient. We find further support for this

view in growth regressions, where an interesting and robust result is that gender inequality in secondary education is bad for growth – but only for countries at lower middle income status and above. From the point of view of growth, it may be that gender inequality in education is a minor distortion at low levels of development (largely agricultural societies) and a more significant distortion at higher levels (as societies become more industrial).

The econometric evidence suggests that societies have to pay a price for gender inequality in terms of slower growth. However, the fact that religion variables systematically explain differences in gender inequality suggests that some societies have a preference for inequality and are willing to pay a price for it. (It would perhaps be more accurate to say that those who control resources in the society have a preference for gender inequality that they are willing to pay for.)

Finally, we find that the evidence is quite strong that increases in per capita income lead to reductions in gender inequality. In the important area of secondary education, however, the relationship is convex: there is little relative improvement in female attainment as countries go from being very poor to lower middle income, and then accelerating progress as countries move to a higher stage of development. One plausible explanation of this relationship is that there are market failures that hinder investment in girls and that these failures diminish as countries develop.

The basic story that emerges is that gender equality and economic development are mutually reinforcing. Female education is a good investment that raises national income, and higher income in turn leads to more gender equality – in education and in other areas.

2. Measuring Gender Inequality

There are different dimensions to gender inequality, and we consider four different types of measures:

1. access and achievement in education (especially secondary);

2. improvement in health (as measured by gender-disaggregated life expectancy);

3. indexes of legal and economic equality of women in society and marriage; and

4. measures of women's empowerment (percentage of women in parliament, year when women earned the right to vote).

These different measures are positively, but not perfectly, correlated (Table 1, which looks across countries in 1990). For example, if we take the difference between female secondary and male secondary attainment as a measure of gender inequality, its correlation is .35 with gender differences in life expectancy, .20 with an index of women's legal rights in economic matters, .28 with women's legal rights in marriage, and -.05 with the prevalence of women in parliament. One thing that will emerge from our analysis is that some societies can be relatively egalitarian in one dimension (say, women's education) but relatively unequal in other dimensions. For this reason, it is important to look at a broad range of indicators when considering the issue of women's status in society.

One of the strongest empirical regularities is that all measures of gender equality are positively correlated with per capita income. The correlations of gender measures with income are all around .6, except for women in parliament (.43) and gender differences in secondary education, where the correlation is a much lower .28 (Table 1). If we divide countries based on their 1990 per capita income, the gender differences between the poorest quartile and the richest quartile are striking (Table 2). In the poorest group, 5.4% of adult women have some

secondary education, compared to 11.6% of adult males.[1] In the richest countries, the comparable figures are 50.8% of women and 57.9% of men, so that the gender difference in this case has been largely eliminated. Women live longer than men in virtually all societies, but the difference is small in poor countries (life expectancy of 48.3 years for men and 51.3 years for women) and large in rich countries (73.0 years for men and 79.1 years for women). In the area of legal rights, Humana (1992) ranks countries on a scale from 1-4 for different aspects of rights. For women's economic rights (equal pay for equal work), the average rating is 2 for the poorest countries and 2.9 for the richest. Differences are more striking in terms of women's rights within marriage, 2.3 in poor countries and 3.6 in rich ones. Similarly, the share of parliament seats held by women averages 7% in poor countries and 17% in rich ones. The median year in which women attained the vote was 1962 for poor countries and 1926 for rich ones. There is little doubt that women's freedom and overall economic development go hand-in-hand.

The *Human Development Report 1995* (p. 43) provides some concrete illustrations of the inequality of women and men under the law in many countries:

- *Right to nationality.* In much of West Asia and North Africa, women married to foreigners cannot transfer citizenship to their husbands, though men in similar situations can.
- *Right to manage property.* Married women are under the permanent guardianship of their husbands and have no right to manage property in Botswana, Chile, Lesotho, Namibia, and Swaziland.
- *Right to income-earning opportunities.* Husbands can restrict a wife's employment outside the home in Bolivia, Guatemala, and Syria.

- *Right to travel.* In some Arab countries, a husband's consent is necessary for a wife to obtain a passport, but not *vice versa*. Women cannot leave the country without their husband's permission in Iran.

We highlighted above that gender inequality tends to vary with income. There are also sharp differences in gender measures across regions of the world. In educational attainment, Latin America stands out as having relatively low attainment compared to East Asia or Europe and Central Asia, but strikingly low gender inequality as well (Figure 1).[2] South Asia, at the other extreme, has the largest gender differential. In general, the regional patterns are similar when it comes to gender inequality in legal rights or women in parliament (Figure 2). Europe and Central Asia rank highly in terms of gender equality, whereas South Asia is consistently at the bottom. The countries that make up these regions differ in terms of per capita income, religion, and other characteristics, and one of the main objectives of the paper is to go beneath the regional variation and understand the sources of these differences.

3. Background and Methodology

We would like to explain gender inequality across countries and over time, and also consider the possibility that gender inequality affects growth. That is, we would like to estimate the following equations

(1) $$g_{it} = a + by_{it} + Zg + e_{it}$$

(2) $$\left(\frac{\dot{y}}{y}\right)_{it} = d + yg_{it} + Xp + u_{it}$$

where g is some measure of gender inequality;

y is per capita income and $\frac{\dot{y}}{y}$ is per capita income growth;

Z are exogenous variables that affect gender inequality;

X are exogenous variables that affect growth;

ε and u are error terms with the usual properties.

According to the estimation technique, equations (1) and (2) might also include country-specific fixed effects. Some of the variables in Z and X may be the same, but as long as the variables that affect gender inequality and the variables that affect growth are not identical, we potentially have instruments that can be used to address the problem that OLS estimates of either (1) or (2) are likely to be biased.

There is a small macro literature that attempts to estimate either equation (1) or (2), but before turning to a review of this previous literature, it is useful to briefly discuss the much more extensive micro literature on gender inequality, because that literature provides some motivation for our work. The issue of gender inequality in schooling, in particular, has drawn a lot of attention from microeconomists.

Gertler and Alderman (1989) point out that there are three reasons why parents might invest more in the education and health of boys than of girls. First, it may be that the return from girls' schooling may be lower than that for boys. This is only possible if the labor of males and females are imperfect substitutes in some activities. In this case, different amounts of education for girls and boys could be an efficient economic choice. A second possibility is that the social returns to educating boys and girls are the same, but that parents expect more direct benefit from investing in sons if, for example, sons typically provide for parents in their old age, while daughters tend to leave and become part of a different household economic unit.

In this case, the wedge between private and social returns generates a market failure, and the private decision to invest in girls' schooling is likely to be sub-optimal. Third, parents may simply have a preference for educating boys over girls. A low investment in girls' education would then reflect the underlying population preference and would not imply *per se* a market failure.

The micro literature on gender can shed some light on these different possibilities, particularly on the issue of whether or not low investment in girls is economically efficient. Schultz (1993) points out that there are some difficulties in accurately estimating the returns to schooling. Nevertheless, he argues that the available evidence refutes the view that low investment in girls is economically efficient. In studies from a wide range of developing countries, it is almost never found that the return to girls' schooling is less than the return to boys' schooling (which would make less schooling for girls an efficient choice). To the contrary, there are quite a few middle-income countries in which the estimated return to girls' secondary schooling is far higher than the return for boys. In Thailand in 1980-81, for example, the female return was 20.1%, compared to 11.3% for boys. In Cote d'Ivoire in 1985, the comparable figures were 28.7% and 17.0% (Schultz, 1993, p. 41). Not only are the returns for girls higher than for boys, but the absolute value of the return is striking: the return to girls' education was far above real interest rates in these countries. For well-known reasons (such as credit market imperfections), households in developing countries may be constrained from making the optimal amount of investment in children's human capital. But those imperfections would affect schooling of both girls and boys and would not explain the persistence of large gender differentials in the face of higher returns for girls than for boys.

Macroeconomic analysis can potentially add several things to what we have learned from the micro literature. First, if under-investment in girls is a serious distortion, then it should show up in the analysis of growth. Either prejudice or market failure that works against investing in girls is analogous to a distortionary tax that reduces efficient accumulation and leads to slower growth, which is a justification for adding measures of gender inequality to the growth equation (2), above. Second, it is difficult to tell from the microeconomic evidence if under-investment in girls results from market failure or if it reflects the preferences of those who control resources and make decisions. It may be that the return to educating girls is high, but that the adults who make decisions value gender inequality and are willing to pay a price for it. In addressing this issue, cross-country analysis can be useful. If gender differentials in education and health can to some extent be systematically explained by variables such as religious preference, then it is unlikely that low investment in girls simply reflects market failure.

There are a number of previous efforts to estimate equations (1) or (2) above. Boone (1996) estimates a variant of (1), in which the gender measure is an index of women's legal rights from Humana (1992). The main finding that is relevant to our work is that religious preference variables are useful in explaining gender inequality. Our work differs from Boone's in three ways: (1) we use several different measures of gender inequality; (2) we use a panel rather than a single cross section of countries; and (3) we treat income as endogenous. Easterly (1997) estimates a variant of (1) in which the gender measure is female to male secondary school enrollment ratio and the only right-hand-side variable is per capita income. In a panel with fixed effects, he shows that there is a positive relationship between income and gender equality. Easterly's work establishes that the correlation between income and gender

equality in secondary education is not simply a cross-sectional association, but in fact is true for individual countries as they develop. Still left open, however, is the question of causality: do increases in income actually lead to more gender equality, or is the relationship spurious?

Concerning equation (2) above, there is a large literature estimating variants of this without reference to gender, beginning with Barro (1991). This literature attempts to explain income growth as a function of some initial conditions, including initial per capita income, and policies that affect the environment for accumulation. Such an equation can be derived from either neoclassical growth theory or endogenous growth theory, the main difference being that the former suggests that the coefficient on initial income will be negative. According to neoclassical growth models, growth rates exhibit conditional convergence, i.e. poor countries grow relatively rapidly after controlling for the level of steady state income. Also, in this framework, government policies can affect growth rates only in the transition towards the steady state, while long run growth prospects are determined solely by the rate of exogenous technological progress. In the endogenous growth framework, instead, growth effects of policies will be permanent. Much of the existing empirical work finds a negative coefficient on initial income (supporting the neoclassical view). However, the size of the coefficient suggests that the transition to the steady state is slow, so that in practice policies have effect over a significant period of time (Barro and Sala-i-Martin 1995).

We will be starting with a growth equation using some of the variables popular in the empirical growth literature. For our purposes, it is important to note that there is quite solid evidence that macroeconomic stability (Fischer 1993) and trade openness (Sachs and Warner 1995) positively affect growth. Furthermore, strength of property rights and rule of law are

important elements of a good incentive regime (Knack and Keefer 1995). Other variables often included in this kind of work are fertility and some measure of initial human capital.

There are only a couple of efforts to introduce measures of gender inequality into a growth equation. Barro and Lee (1994) introduce male and female secondary attainment into a cross-section growth regression: "A puzzling finding, which tends to recur, is that the initial level of female secondary education enters negatively in the growth equations... One possibility is that a high spread between male and female secondary attainment is a good measure of backwardness; hence less female attainment signifies more backwardness and accordingly higher growth potential through the convergence mechanism." This explanation is not very convincing, given that the equation already includes initial per capita income to pick up backwardness.

Klasen (1998) finds the opposite result from Barro and Lee (1994): that growth in female secondary attainment is positively related to per capita income growth. Both studies, however, work mostly with a cross-section, and neither addresses the likely endogeneity of gender differentials. Given these problems – and the fact that the two studies have opposite results – more work in this area would seem to be called for. Moreover, studying the determinants of gender inequality – equation (1) – should lead us to good instruments that can be used to overcome endogeneity problems in the estimation of the growth equation.

4. Explaining Gender Inequality

We are interested in explaining gender inequality as a function of per capita income, other characteristics such as civil liberties or economic policy, religious preference, and regional factors. We begin with inequality in education, specifically inequality in secondary

attainment (the share of the adult population for which some secondary schooling is the highest level of attainment). Table 3 presents coefficients from panel regressions where standard errors explicitly account for heteroschedasticity and for the possible correlation of errors within country clusters over the different periods. Our panel covers up to 127 countries and four five-year periods (1975-79 to 1990), but there are some missing observations so we have around 400 observations.

Although we recognize and will explicitly deal with the endogeneity issue, we start with OLS estimates that can serve as a benchmark for useful comparison with the existing literature. The regressions tell us which characteristics are associated with high female secondary attainment, after controlling for the male level. We find that high female attainment is associated with the Protestant religions and with good civil liberties, while low achievement is weakly associated with the Muslim and Hindu religions. (The religious variables indicate the share of the population that follows a particular religion.) There are also large positive coefficients on the Shinto variable (virtually an indicator for Japan) and the indicator variable for Latin America. The Latin American variable is the only regional indicator that is significant; thus, the visible regional differences in Figure 1 can otherwise be explained by differences in country characteristics.

In the secondary female attainment regression, per capita income enters convexly, and strongly so. The shape of this relationship is quite interesting. It basically indicates that, as income increases up to a level of about $2,000 per capita (PPP adjusted), there is no tendency for female educational achievement to catch up with the superior male achievement. After that level of income, on the other hand, there is a strong tendency to catch up. (This convex relationship comes through clearly if you break the data set in half based on per capita income.

For the poorer half of the observations, there is no relationship between female attainment and income, after controlling for male attainment. For the richer half, there is a strong, positive relationship.)

We also introduced into the OLS regression a number of variables that are popular in the empirical growth literature: rule of law in the economic domain and the black market premium as a proxy for distortions in macroeconomic policy and the trade regime. Both variables had no significance, indicating that these policies that are important for growth have no direct effect on gender inequality in the education domain. Because both of these policy variables are highly correlated with per capita income, they then provide us with good instruments to address the issue of the endogeneity of per capita income. As noted, there is a convex relationship between income and educational equality. A key question is whether we can interpret this as a causal relationship: that increases in income actually lead to more gender equality.

In the second column of Table 3 we instrument for per capita income and per capita income squared, using rule of law and black market premium.[3] Because of the availability of the rule of law variable, we lose the early time periods and the number of observations is reduced to about 200. The convex relationship between female educational achievement and per capita income remains strong. The relationship is also there, but weaker, in fixed effects regressions (column 3). The fixed effects regressions reveal that this is not simply a cross-sectional effect; rather, it is fair to say that as individual countries develop, gender differences in secondary education diminish slowly as first, and then more rapidly.

The results on secondary attainment are subject to two potential criticisms. First, our specification explains female attainment controlling for the male level. One could alternatively

put the differential – female attainment minus male attainment – on the left-hand side. Second, the secondary attainment variable captures the share of the population for whom secondary is the *highest* level of attainment. One could alternatively look at the share of the population that has *at least* some secondary education (secondary plus higher attainment, which we label "superior attainment").

In Table 4, we show that addressing these concerns does not alter the main results concerning the relationship between income and gender differentials in secondary education. The table shows the coefficients on the log of per capita income and that log squared, for four different specifications and three different methodologies. In parentheses are the p-values, that is, the probability that we can reject the hypothesis that the coefficient is zero. The first specification repeats the coefficients from the regression of secondary female attainment, holding male constant. The second shifts the specification to the differential of female attainment minus male. The third changes the variable to female superior attainment. And the fourth looks at superior differential. In each case, we have the same control variables as in Table 3. The results for the control variables do not vary in any important way, so Table 4 focuses on the coefficients on per capita income and its square.

The convexity is clear and strong in OLS regressions for all of the specifications. In the 2SLS regressions, the relationship persists for superior attainment, but weakens for the specifications that use the differential. Keep in mind, though, that using instruments cuts the sample about in half because of data availability. Finally, with fixed effects, the convexity is only strong in the specification that looks at female level controlling for the male level.

A final point about the convexity is that it is visible clearly if you simply look at the data. Female secondary and superior attainment have sharp, convex relationships with income

(Figure 3). The regressions show that this is true even after controlling for male attainment. The simple relationship between male attainment and income has some convex curvature as well, but it is much less sharp than in the case of the female (Figure 4). Figure 5 plots the quadratic relationships between female superior attainment and log income and male superior attainment and log income, estimated over the whole panel (with control variables). This figure shows that there is little tendency for female attainment to catch up with male as countries move from very poor ($500 per capita) to lower middle income ($2,000), and then a strong tendency toward catch-up beyond that level.

To sum up the results on gender inequality in education: We find a convex relationship between income and female achievement, after controlling for male achievement and other variables. The fact that this relationship persists when we instrument for income provides some confidence that this is in fact a causal relationship: increases in income lead to a narrowing of gender inequality in education. However, the shape of the relationship means that this effect is minor or nonexistent as countries move from very low-income to lower middle income. The strong effect of income on educational inequality kicks in as countries move from lower middle income to higher incomes. Furthermore, policies that have been shown to be important for growth do not appear to directly affect inequality, though they indirectly affect it because other work has shown that they contribute to higher per capita income. Finally, there are differences in female achievement in education that appear to result from regional differences, religious preferences, and the extent of civil liberties in society.

The next question that we take up is whether the patterns are similar or different when we use other measures of gender inequality. We present both OLS (Table 5) and 2SLS regressions (Table 6), but will confine the discussion to the latter, since they correct for the

potential endogeneity of income. For women's economic equality under the law and for women in parliament, we find the same convex relationship with income that we found for gender differentials in education: that is, little tendency for improvement as countries go from low-income to middle-income and then rapid improvement. Although the F-test suggests a significant relationship between the life expectancy differential and income, it is difficult to make inferences on its shape. Interestingly, for women's rights in marriage we find no significant relationship between per capita income and this measure of gender equality. Moreover, civil liberties have no consistent relationship with any of the measures. The Muslim religious variable has a negative coefficient in each regression, but the relationship is only strong for equality within marriage. Shinto affiliation has a strong negative relationships with all of these gender equality measures, except female life expectancy.

The fact that the religious variables have a considerable joint explanatory power for these other measures of gender inequality increases our confidence that differences in cultural preferences really are important. In general, the explanatory variables tend to have the same sign for different measures of gender equality on the left-hand side. There are, however, some switches in sign. The percentage of affiliates to Shinto is negatively related to all four measures of gender equality in Table 6. Recall that this variable had instead a strong positive relationship with female secondary attainment. By the education measure one would conclude that Japan has relatively high status of women, whereas by these other indicators one would conclude the opposite. Thus, one must be careful about making simple generalizations about where the status of women is high or low – in some cases it depends on the particular dimension of inequality that is examined.[4]

Thus, for all of these different measures of gender equality (except marriage rights), the evidence supports the view that there is a causal relationship between per capita income and gender equality. The policies that promote growth in per capita income will generally lead to greater gender equality. In the case of educational achievement, economic equality, and women in parliament, however, the convexity in the relationship indicates that this may take a long time to play out. The other fairly robust relationship is that religious variables are good predictors of gender inequality.

5. Gender Inequality and Growth

We turn now to the question of whether gender inequality affects growth, and here the measure of inequality that we focus on is differential secondary school achievement. The reason for this choice is that in the empirical growth literature it is secondary school attainment at the beginning of a period that often is found to be a significant explainer of subsequent growth. Furthermore, there is at least one result in the literature that finds that gender inequality in secondary education is *positively* related to growth. Finally, we have from the previous section the interesting result that per capita income appears to be a determinant of gender equality and that for secondary educational achievement the relationship is strongly convex.

The fact that gender inequality to a considerable extent can be explained by religious variables, civil freedom, and regional variables, suggests that it is not simply an efficient economic choice. In an optimizing growth model, a religious preference not to educate girls is a distortion that can impede efficient accumulation and lead to slower growth. Similarly, market failure could lead to under-investment in girls: the clearest example is when families

pass up efficient investments in girls because the benefits to a large extent will accrue to another family. If the under-investment in girls is serious enough, it should lead to lower growth and be visible in the macro data. (From the point of view of welfare economics, there is an important difference between the cases of market failure and religious preference for not educating girls. To the extent that under-investment in girls reflects preferences, it would not be a distortion from the point of view of welfare. Some societies choose not to educate girls and are willing to pay a price in terms of foregone income. With market failure, on the other hand, the outcome is not Pareto optimal: public action to get girls into school could potentially make everyone better off.)

We also consider the possibility that, if gender inequality is a distortion that slows growth, the impact of the distortion could vary with the stage of development. In an economy of household farms, there is likely to be a high return to having one adult member literate and a low return to having a second adult literate. In this case, a preference for educating boys or a market failure that works against girls would be a minor economic distortion (though many – like us – would still view it in and of itself as a "bad"). As the economy becomes more industrialized, more households will depend on wage labor. (In many households one adult member will continue to run the farm while other adult members work outside the home.) In this case preferences or market failures that hinder girls' education can mean passing up high-return investments in human capital, with a significant effect on growth.

We start with a basic panel growth regression, drawing on a specification that is common in the literature, and then add male secondary achievement and female secondary achievement in order to see whether gender differentials have an impact on growth. We first present results OLS, though we know there is an endogeneity issue because we have already

found that per capita income influences gender differentials. For the whole sample, there is a weak negative coefficient on male education and a weak positive coefficient on female education (Table 8). This is the opposite of what Barro and Lee (1994) found, and the difference can primarily be explained by the presence of the regional dummies. There is a strong tendency for Latin American economies to grow less rapidly than predicted by the other variables, and at the same time this region has unexpectedly high female secondary achievement. If the regional dummies are left out of the growth regression, Latin America's poor growth gets attributed to the female education variable.

What is interesting from the point of view of the discussion above is that the results are quite different if the sample is divided in half on the basis of female secondary school achievement. For less developed economies (with secondary female attainment covering less than 10.35% of the population), there are insignificant coefficients on both male and female secondary attainment. For the more developed economies in the sample, there is a modestly negative coefficient on male education and a significant positive coefficient on female secondary attainment. As in much other work, there is also a large, negative coefficient on fertility. Female education may well contribute to per capita income growth by reducing fertility and hence population growth. We, however, are interested in the direct effect of gender discrimination on growth, after controlling for fertility.

The work in the previous section provides us with good instruments for addressing the endogeneity of gender differentials. In particular, we argue that the religion variables and civil liberties belong in the gender equations but not in the growth equation, so that we can use them as instruments for male education and female education.[5] The results of the 2SLS regressions confirm the pattern highlighted by the OLS estimation (Table 9). For the more

developed half of the sample, there remains a negative coefficient on male secondary attainment and a significant positive coefficient on female attainment. The order of magnitude of the coefficient also suggests that secondary female education has an economically significant impact on growth: in the countries with higher initial education, an increase of 1 percentage point in the share of adult women with secondary school education implies an increase in per capita income growth of 0.3 percentage points.

6. Conclusions

It is a fair generalization to say that the relative status of women is poor in the developing world, compared to developed countries. In the poorest countries, as a rule, girls get less education than boys, there is less investment in women's health than in men's, legal rights of women in the economy and in marriage are weaker than men's rights, and women have less political power (as evidenced, for example, by their low representation in parliaments).

We treat gender inequality as an endogenous variable and show that it can be explained to a considerable extent by religious preference, regional factors, and civil freedom. For some of these variables, the direction of the effect depends on the particular measure of inequality. For example, the Shinto religion is associated with high female educational attainment and low status of women in other dimensions. In general, however, the same variables that predict low status of women in one dimension, do so in others. Thus, affiliations to Muslim and Hindu religions are consistently associated with high gender inequality, whereas the Protestant religion and high civil liberties are associated with low inequality. The fact that these variables

systematically explain gender differentials in education and health suggests that low investment in women's human capital is not simply an efficient economic choice for developing countries.

A second main finding is that gender inequality in education is bad for economic growth. In the more developed half of our data set, a robust result is that there is a significant positive coefficient on female secondary attainment and an insignificant negative one on male attainment. The result holds up when we instrument for education with the religion variables and civil liberties. The result suggests that an exogenous increase in girls' access to education creates a better environment for economic growth and that the result is particularly strong for middle income countries. Thus, societies that have a preference for not investing in girls pay a price for it in terms of slower growth and reduced income.

A third result is that there is strong and consistent evidence that increases in per capita income lead to improvements in different measures of gender equality. To answer the question in our subtitle, apparently good times are good for women. The implication of this finding is not that growth is all that is needed to eliminate gender inequality. The findings on religious variables, regional effects, and civil liberties suggest that there is considerable scope for direct action on gender issues. However, it is important to know that the country-wide policies that support rapid growth are also indirectly contributing to gender equality. Some literature has raised the concern that growth-enhancing policies are bad for women; the evidence quite strongly supports the opposite view. It is somewhat sobering, however, that for the important issue of female education, the relationship between income and female attainment is convex: that is, there is little relative improvement as societies move from being extremely poor to being lower-middle income, and then rapid relative improvement as societies move to a more developed stage.

Finally, we can relate these findings back to our three main questions:

1. Is lower investment in girls' education simply an efficient economic choice for developing countries? No. Countries that under-invest grow more slowly.

2. Does gender inequality reflect different social or cultural preferences about gender roles? Yes. To some extent under-investment in girls reflects societal preferences, and in these cases exogenous increases in girls schooling are likely to make some people worse off.

3. Is there evidence of market failures that may lead to under-investment in girls, failures that may decline as countries develop? This is the hardest question to answer at this point. The fact that increases in income lead to lower gender inequality suggests that there may be market failures that hinder investment in girls in developing countries and that these are typically overcome as development proceeds. In particular, as pension systems and capital markets more broadly develop, parents may not need to rely so strongly on sons' support for their retirement, which would reduce a bias in favor of male education. An important area for future research is to investigate whether the impact of income on gender inequality is partly through an effect of income on capital market development.

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Data Appendix

CIVIL LIBERTIES	Gastil index of civil liberties. Values from 1 to 7, (7=most freedom) are attributed to countries taking into consideration such issues as freedom of press, of political association and trade unions. The index is available for the years 1972-95. Source: Banks.
GDP	Real GDP per capita in constant dollars, chain Index deflated, expressed in international prices, base 1985. Source: Summers-Heston, years 1960-1990.
LIFE EXPECTANCY	Years of life expectancy at birth, female and male; indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Source: WDI, World Bank.
SECONDARY SCHOOL ATTAINMENT	Percentage of female or male population over 25 for whom primary (secondary) school education is the highest level of education attained. Source: Barro-Lee (1993).
RELIGIOUS AFFILIATION	Percentage of population who professes a religion. Source: Barrett (1982).
RULE of LAW	Law and order tradition, index ranging from 0 to 6, (worst to best) Source: International Country Risk Guide, years 1982, 1985, 1990.
WOMEN IN PARLIAMENT	Percentage of seats occupied by women in the lower and upper chamber. Source: WISTAT.
WOMEN ECONOMIC RIGHTS	Women and men are entitled to equal pay for equal work. Source: Humana (1992).
WOMEN RIGHTS WITHIN MARRIAGE	Equality of sexes within marriage and divorce proceedings. Source: Humana (1992).
VOTE TO WOMEN	Year when the right to vote was extended to women. Source: WISTAT.

Table 1
Correlations Among Gender Measures and Per Capita Income
80 Countries (1990)

	Income	*Secondary*	*Life*	*Economic*	*Marriage*
Per Capita Income					
Secondary Ed. Differential[a]	0.28				
Life Exp. Differential[b]	0.61	0.35			
Women's Economic Rights	0.60	0.20	0.58		
Women's Marriage Rights	0.64	0.28	0.71	0.66	
Women in Parliament	0.43	-0.05	0.27	0.4	0.43

[a] Female secondary attainment minus male secondary attainment
[b] Female life expectancy minus male life expectancy

Table 2
Gender Measures for the Poorest and Richest Quantiles of Countries (1990)

	Poorest (y<1182)	***Richest (y>7478)***
Female Secondary Attainment	5.0	37.7
Male Secondary Attainment	10.4	38.7
Female Superior Attainment	5.4	50.8
Male Superior Attainment	11.6	57.9
Female Life Expectancy	51.3	79.1
Male Life Expectancy	48.3	73.0
Women's Economic Rights (1-4)	2.0	2.9
Women's Marriage Rights (1-4)	2.3	3.6
Women in Parliament (% seats held in the lower chamber)	7	17
Year women were allowed to vote	1962	1926

Table 3
Explaining female secondary attainment

	(1) OLS	*(2) 2SLS*	*(3) Fixed Effects*
Male level	0.70	0.73	0.69
	(11)	(8.95)	(26.24)
Ln (GNP p.c.)	-21.3	-77.8	-10.28
	(2.52)	(2.19)	(1.35)
[Ln (GNP p.c.)]^2	1.54	4.93	0.73
	(2.78)	(2.31)	(1.54)
Civil Liberties	0.31	0.52	0.07
	(1.64)	(1.00)	(0.42)
Muslim	-0.02	-0.04	-0.70
	(1.46)	(1.42)	(2.05)
Roman Catholic	0.00	-0.04	-0.07
	(0.20)	(1.21)	(0.51)
Other Christian	0.19	0.06	0.12
	(2.84)	(0.41)	(0.40)
Hindu	-0.02	-0.14	0.29
	(1.10)	(2.37)	(0.54)
Shinto	2.51	2.44	-0.64
	(5.47)	(2.91)	(0.25)
Latin America	4.37	6.79	--
	(2.78)	(2.66)	
Sub-Saharan Africa	1.04	-7.49	--
	(0.78)	(1.36)	
East Asia	0.31	0.25	--
	(0.20)	(0.10)	
OECD	1.79	-2.93	--
	(1.05)	(1.04)	
N	392	211	392
R^2	0.91	*	0.82

*R^2 is not a good measure of fitness in 2SLS estimation. Instruments are rule of law index and black market premium, each entered linearly and quadratically. P-value for test of over-identifying restriction is 0.63. t-statistics in parentheses.

Table 4
Different Specifications for Education Differentials

	OLS	*2SLS*	*Fixed Effects*
Secondary Female Attainment[a]			
(log) per capita GDP	-21.3	-77.8	-10.3
	(0.01)	(0.02)	(0.18)
(log) per capita GDP squared	1.55	4.93	0.73
	(0.01)	(0.02)	(0.13)
Secondary Differential[b]			
(log) per capita income	-17.0	-42.3	-2.22
	(0.03)	(0.26)	(0.81)
(log) per capita income squared	1.14	2.68	0.15
	(0.02)	(0.23)	(0.80)
Superior Female Attainment[a]			
(log) per capita income	-24.5	-56.7	-11.2
	(0.00)	(0.14)	(0.16)
(log) per capita income squared	1.68	3.6	0.75
	(0.00)	(0.13)	(0.13)
Superior Differential[b]			
(log) per capita income	-17.6	-22.0	-3.69
	(0.02)	(0.56)	(0.67)
(log) per capita income squared	1.11	1.42	0.21
	(0.02)	(0.53)	(0.70)

[a] Controlling for the male level
[b] Female level minus the male level
Note: P-values in parentheses.

Table 5
Other Measures of Gender Inequality
(OLS Regressions)

	Life Expectancy	***Economic Equality***	***Equality in Marriage***	***Women in Parliament***
Male Level	1.02 (40)	--	--	--
Ln (GNP p.c.)	0.99 (5.16)	0.23 (2.3)	0.84 (0.67)	-0.16 (1.3)
[Ln (GNP p.c.)]^2	--	--	-0.04 (0.59)	0.01 (1.36)
Civil Liberties	-0.08 (1.07)	0.013 (0.33)	-0.06 (1.12)	-0.009 (2.23)
Muslim	-0.01 (3.46)	-0.006 (3.13)	-0.01 (5.14)	-0.0008 (3.18)
Roman Catholic	0.001 (0.39)	-0.001 (0.55)	-0.005 (1.61)	-0.0006 (2.25)
Other Christian	-0.01 (1.47)	0.0007 (0.50)	-0.0004 (0.08)	-0.001 (1.42)
Hindu	-0.02 (1.97)	-0.005 (1.83)	-0.009 (2.09)	0.0001 (0.25)
Shinto	-0.2 (2.22)	-0.34 (15.58)	-0.30 (6.85)	-0.031 (3.58)
N	495	159	159	266
R^2	0.99	0.59	0.51	0.28

Table 6
Other measures of gender inequality
(2SLS regressions)

	Life Expectancy	*Economic Equality*	*Equality in Marriage*	*Women in Parliament*
Male Level	1.02 (8.8)	--	--	--
Ln (GNP p.c.)	-6.61 (0.42)	-3.36 (2.06)	-0.66 (0.16)	-1.38 (2.49)
[Ln (GNP p.c.)]^2	0.46 (0.53)	0.24 (2.23)	0.04 (0.20)	0.08 (2.5)
Civil Liberties	-0.05 (0.31)	0.01 (0.21)	-0.02 (0.26)	-0.003 (0.34)
Muslim	-0.006 (0.87)	0.001 (0.72)	-0.008 (2.57)	-0.0002 (0.56)
Roman Catholic	-0.001 (0.31)	0.001 (0.67)	-0.004 (1.39)	-0.001 (2.12)
Other Christian	-0.002 (0.03)	-0.0005 (0.04)	0.008 (0.45)	-0.003 (1.52)
Hindu	-0.02 (1.43)	0.002 (0.55)	-0.002 (0.41)	0.0002 (0.17)
Shinto	-0.32 (1.87)	-0.35 (6.89)	-0.32 (6.16)	-0.05 (3.5)
N	235	130	129	129
P-value for F test on income	0.01	0.02	0.79	0.04
P-value for OIR test	0.33	0.71	0.13	0.32

Table 7
Other Measures of Gender Inequality
(Fixed Effects Regressions)

	Life Expectancy	*Economic Equality*	*Equality in Marriage*	*Women in Parliament*
Male Level	0.99 (32.1)	--	--	--
Ln (GNP p.c.)	0.67 (0.2)	3.42 (1.18)	-2.96 (0.49)	-0.54 (3.27)
[Ln (GNP p.c.)]^2	-0.03 (0.14)	-0.18 (-1.09)	0.22 (0.62)	0.03 (3.52)
Civil Liberties	0.12 (1.57)	0.009 (0.22)	-0.05 (0.63)	-0.009 (2.31)
Muslim	-0.18 (0.17)	--	--	0.02 (2.47)
Roman Catholic	-0.86 (0.82)	--	--	-0.005 (1.65)
Other Christian	-4.89 (0.67)	--	--	-0.015 (2.52)
Hindu	-0.47 (0.27)	--	--	0.02 (2.07)
Shinto	-0.53 (0.54)	--	--	-0.031 (3.58)
N	495	159	159	266
R^2 within	0.99	0.04	0.17	0.32

Table 8
Growth of Per Capita Income
(OLS Regressions)

	Full Sample	Less Developed (SECF<10.35)	More Developed (SECF>10.35)
Ln (GNP p.c.)	1.83 (0.36)	3.62 (0.32)	22.75 (2.94)
[Ln (GNP p.c.)]^2	-0.22 (0.70)	-0.36 (0.47)	-1.46 (3.10)
Rule of law	0.39 (1.64)	0.55 (1.41)	0.40 (1.37)
Fertility	-0.74 (3.70)	-0.79 (2.52)	-0.89 (2.98)
Revolutions	-1.15 (2.10)	-0.76 (1.06)	-1.38 (2.21)
Black market premium	-0.0008 (1.07)	-0.001 (1.22)	-0.0003 (0.33)
(Log) life expectancy	1.78 (0.73)	4.18 (1.44)	0.23 (0.05)
Male secondary	-0.04 (1.24)	0.03 (0.31)	-0.02 (0.92)
Female Secondary	0.04 (1.52)	-0.38 (1.43)	0.07 (2.30)
Latin America	-2.86 (6.24)	-1.70 (1.41)	-2.87 (3.93)
Sub-saharan Africa	-2.44 (3.87)	2.83 (3.53)	-3.68 (3.44)
East Asia	1.17 (1.58)	1.47 (1.92)	1.01 (1.29)
OECD	-1.82 (2.89)	-1.73 (0.83)	-1.72 (1.77)
N	213	98	115
R^2	0.40	0.44	0.49

Table 9
Growth of Per Capita Income
(2SLS Regressions)

	Full Sample	*Less Developed (SECF<10.35)*	*More Developed (SECF>10.35)*
Ln (GNP p.c.)	-6.59	22.77	24.63
	(0.48)	(1.02)	(1.15)
[Ln (GNP p.c.)]^2	0.35	-1.89	-1.56
	(0.37)	(1.19)	(1.17)
Rule of law	0.15	-0.20	0.54
	(0.39)	(0.22)	(1.04)
Fertility	-1.18	-0.58	-1.72
	(1.81)	(0.75)	(1.62)
Revolutions	-1.56	-1.43	-3.07
	(2.34)	(0.91)	(1.91)
Black market premium	-0.0009	-0.002	-0.0002
	(1.07)	(2.55)	(0.22)
Life expectancy	2.79	7.29	-16.46
	(0.75)	(0.71)	(1.09)
Male secondary	-0.27	-1.06	-0.40
	(1.42)	(1.85)	(1.41)
Female Secondary	0.15	1.73	0.30
	(1.51)	(1.18)	(2.21)
Latin America	-5.06	-12.60	-7.67
	(2.53)	(1.96)	(1.90)
Sub-saharan Africa	-3.36	-6.63	-8.10
	(2.66)	(1.71)	(2.26)
East Asia	0.60	-2.33	-0.07
	(0.37)	(0.52)	(0.03)
OECD	-2.97	-4.27	-3.38
	(1.87)	(1.46)	(1.23)
N	213	98	115

Figure 1. Educational Attainment - Secondary and Higher by Region (%)

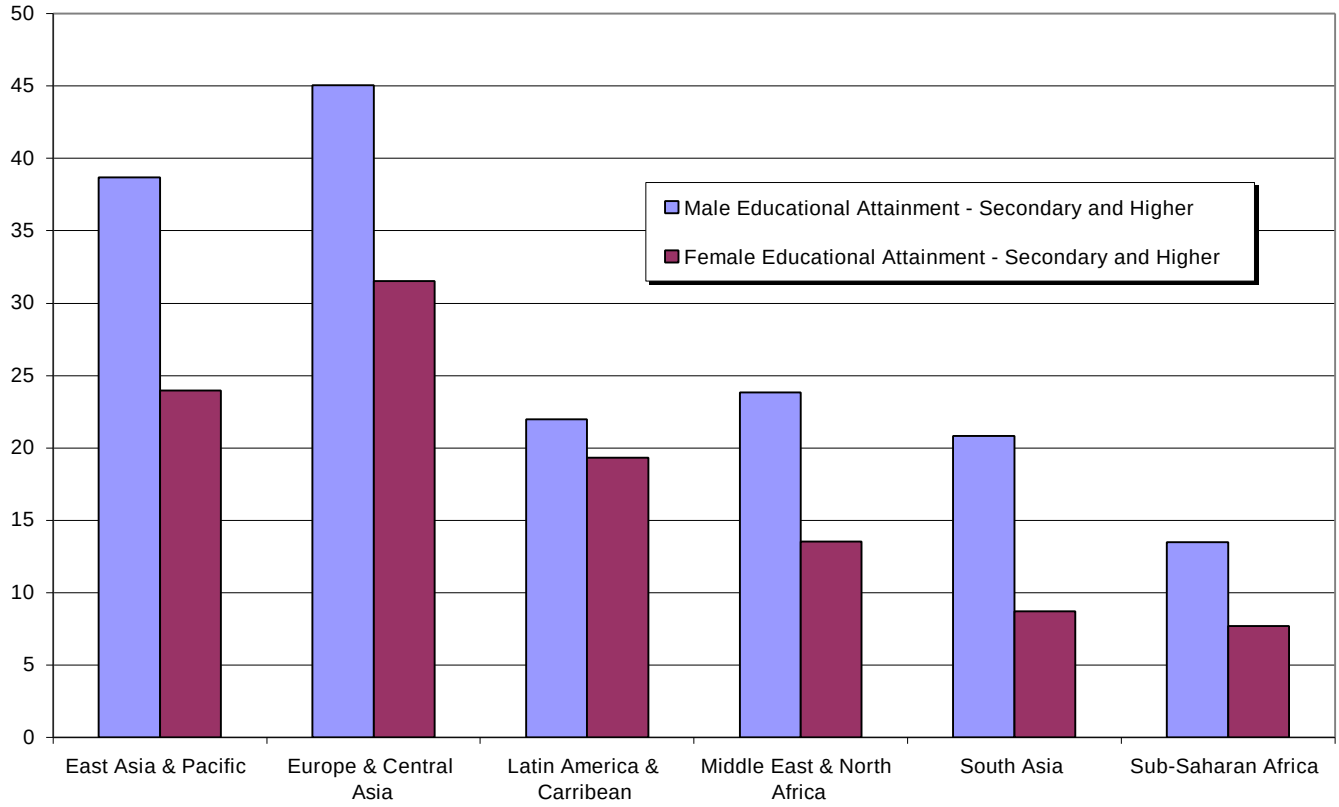
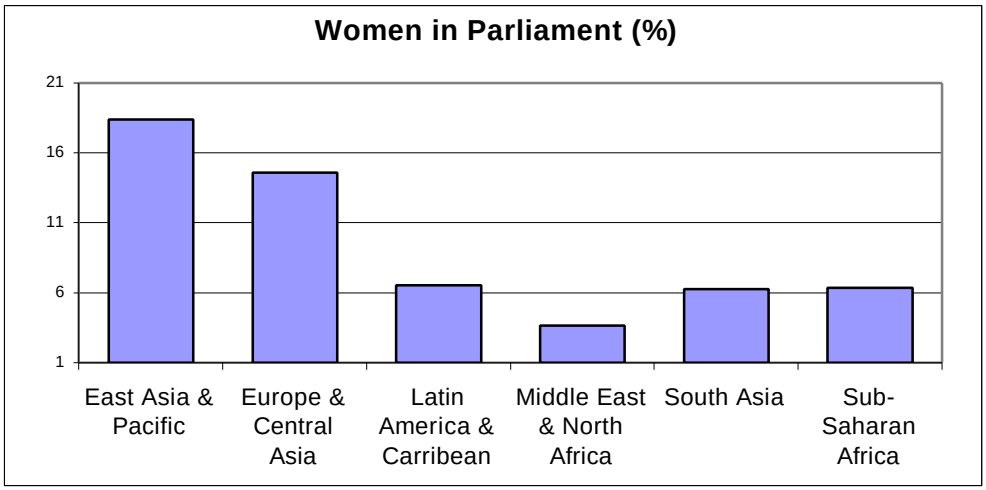
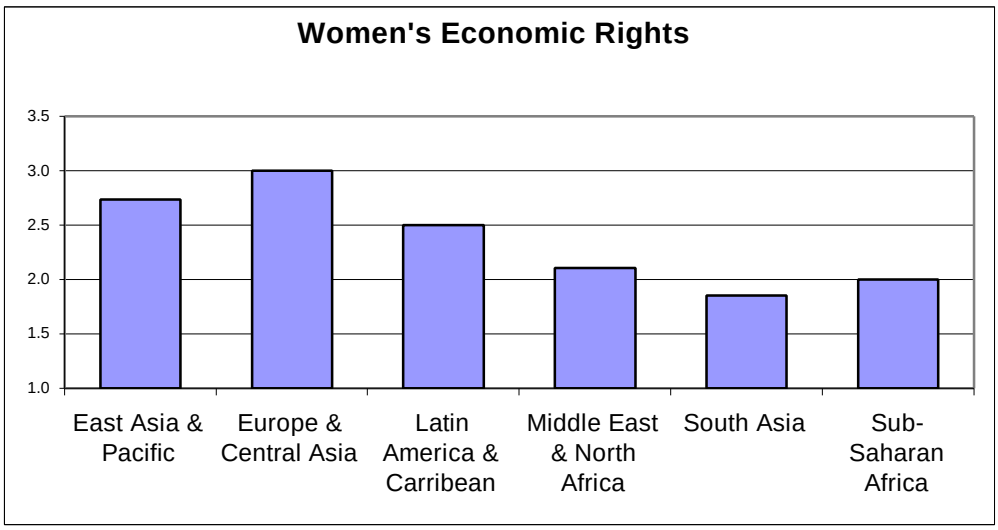


Figure 2


Women in Parliament (%)
21
16
11
6
1
East Asia & Pacific
Europe & Central Asia
Latin America & Carribean
Middle East & North Africa
South Asia
Sub-Saharan Africa


Women's Economic Rights
3.5
3.0
2.5
2.0
1.5
1.0
East Asia & Pacific
Europe & Central Asia
Latin America & Carribean
Middle East & North Africa
South Asia
Sub-Saharan Africa

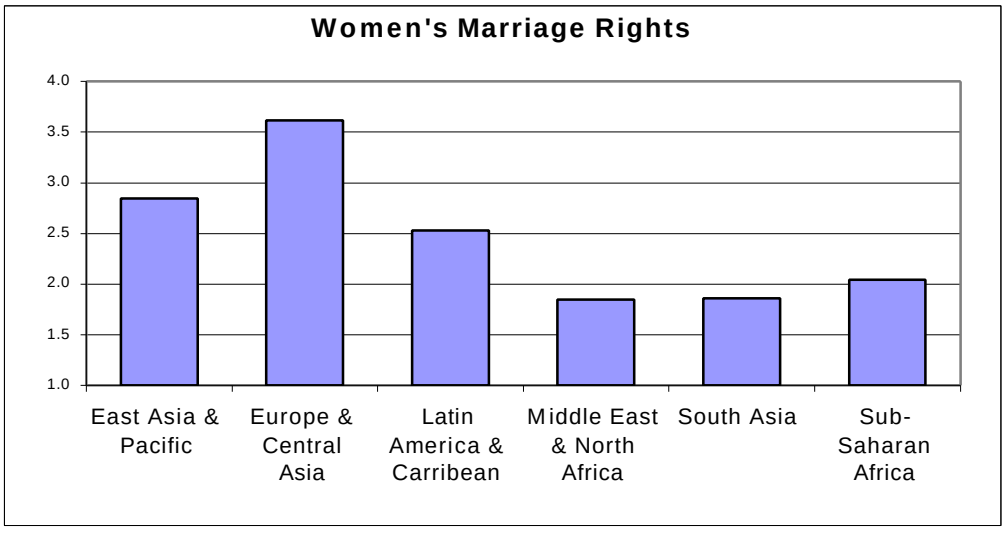
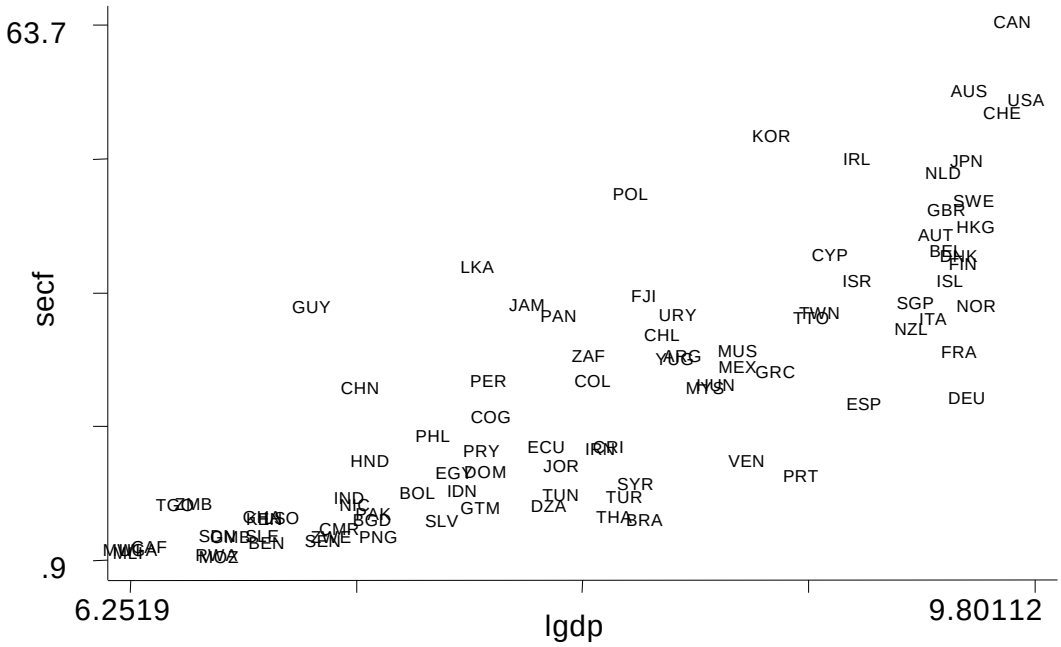
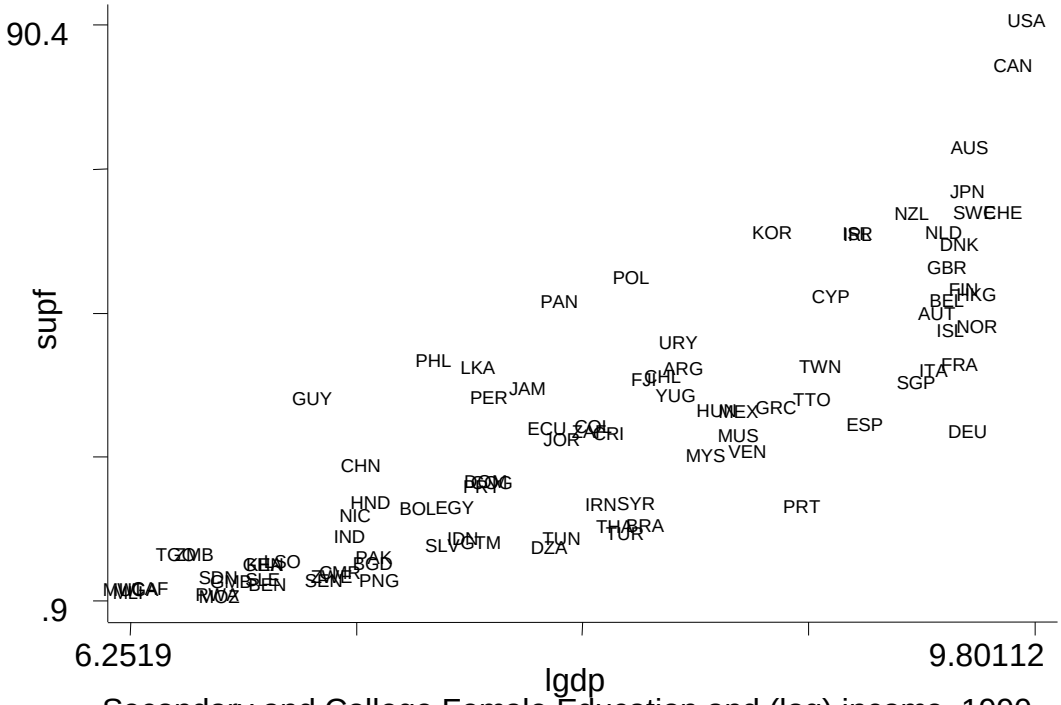

Women's Marriage Rights
4.0
3.5
3.0
2.5
2.0
1.5
1.0
East Asia & Pacific
Europe & Central Asia
Latin America & Carribean
Middle East & North Africa
South Asia
Sub-Saharan Africa

Figure 3

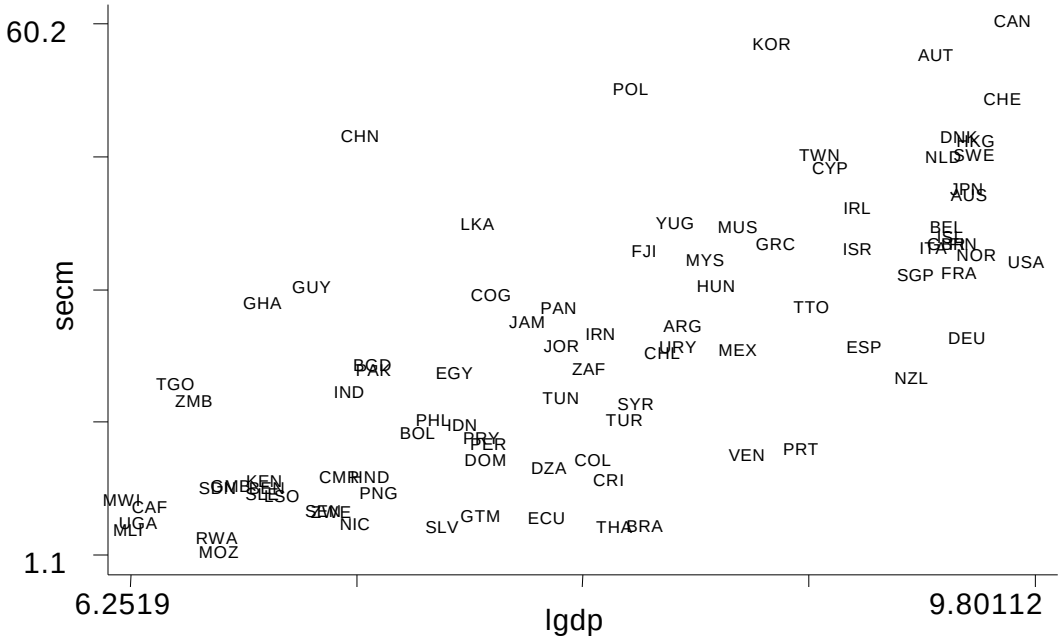


Secondary Female Education and (log) income, 1990

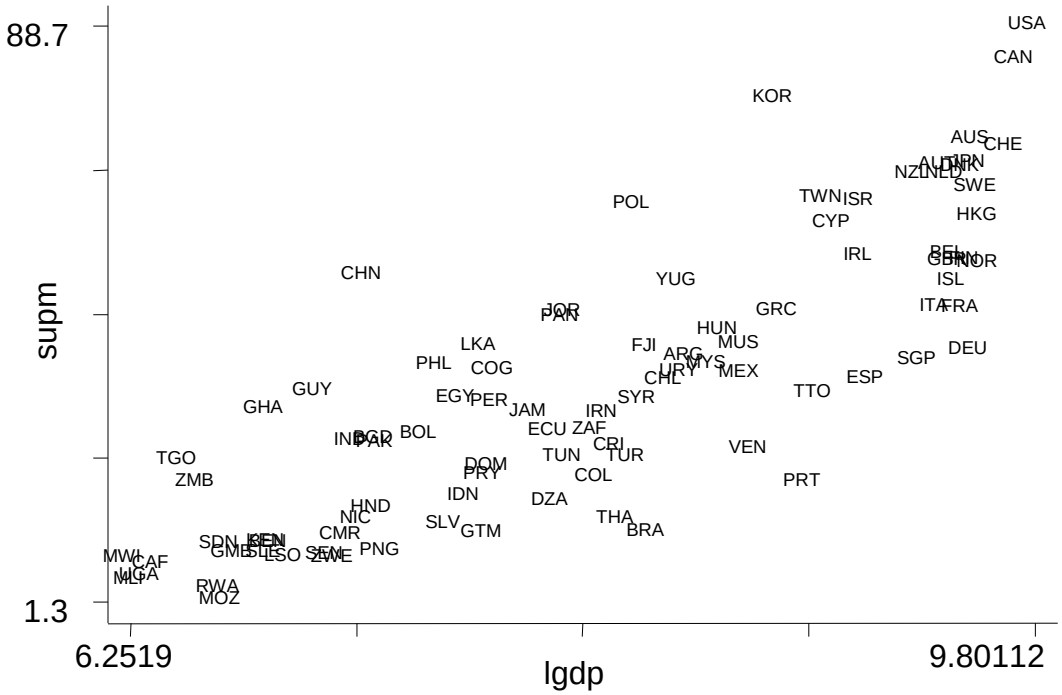


Secondary and College Female Education and (log) income, 1990

Figure 4

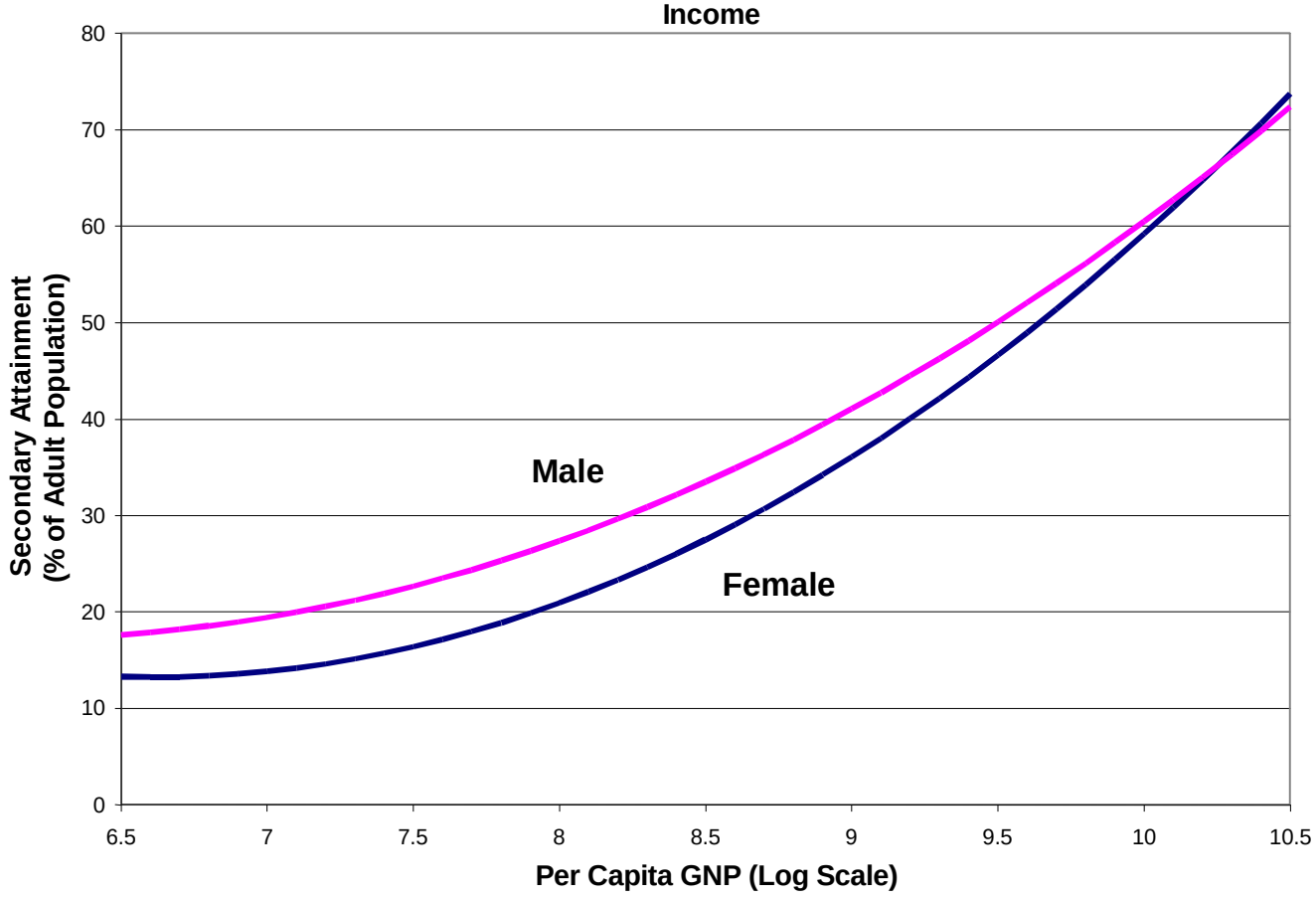


Secondary Male Education and (log) income, 1990



Secondary and College Male Education and (log) income, 1990

Figure 5. Educational Attainment (Secondary and Higher) and Per Capita Income



[1] We are going to work with two education variables. Secondary attainment is the share of the adult population for whom some secondary education is the highest level of attainment. Secondary or higher attainment adds to this the share of the population for whom some higher education is the highest level of attainment.
[2] The regional classification of countries is that used by the World Bank. The OECD countries have been excluded from the figure, so that the focus is on developing countries of different regions.
[3] The test of over-identifying restrictions indicates that these are valid instruments.
[4] In Table 7 we present fixed-effects regressions. The convex relationship with income remains strong for women in parliament. That it disappears for life expectancy differential and economic equality indicates that the results for those measures come primarily from the cross-section information. Nevertheless, because we have good and valid instruments we feel confident making inferences from the 2SLS regressions.
[5] The test of over-identifying restrictions indicates that these are valid instruments.