A Cross-Country Analysis of the Economic Impacts of Female Education

Nobuhide Hatasa

< Keyword >
education gender economic growth fertility development

< Abstract >

Recent cross-country data show that there exist no peculiar gender gaps with regard to primary and secondary school enrollment rates and drop-out rates. However, these rates in lower income countries imply that female educational attainment is still behind that for males. A relatively large disparity between men and women can be seen in the averaged illiteracy rate, but this gap narrows as an economy develops, and the current favorable school enrollment rate for women continues.

The enhancement of female education has a positive impact on economic growth due to the following three consequences. First, female education has a close connection with child nutrition and health. Since women spend relatively more time taking care of children, their knowledge and behavior have considerable influence on children. If a child’s health is improved by better care in the hands of educated women, the infant or child mortality rate will decrease and healthy and educated future workers will be raised. Second, better female education is expected to increase the female labor force which helps an economy grow.

The third economic impact of female education is associated with a lower fertility rate. The most prominent roles of fertility declines in raising income per capita are to lower population growth and to increase the productivity of the labor force. If other factors are constant, population decline means an increase in per capita GDP. When parents have fewer children, they are able to spend more time and income on their children and give them higher education. This helps to generate an increase in more productive workers in the next generation. Education is assumed to be one of the important factors which determine fertility rates. In particular, female education has more influence on fertility than male education does.
Introduction

The notion that educational achievement does matter in economic development is commonly accepted and an educational variable often appears in cross-country growth regression models. A key factor to explain this strong connection between education and growth is productivity. More education creates technological progress, and literate and knowledgeable workers are able to perform their jobs efficiently. The growth regression model presented in Table 1 which includes seven explanatory variables is in line with that idea. The education variable literacy rate is significant and contributes positively to raising the per capita GDP growth rate by 0.006 per unit.

While there is no doubt that female education is positively associated with economic growth in the same way as mentioned earlier, it is not certain what are the unique characteristics which female education has in terms of its economic impact. The purpose of this paper is to identify the ways in which female education is more related to economic growth than male education. First, across-country data for education and recent trends in the attainment of female education will be examined, then the manner in which the improvement of female education positively affects economic development will be analyzed.

Female Educational Attainment

It has been acknowledged that there exists an educational gap between women and men. Table 2 depicts some educational data by gender. As the first table illustrates, the female illiteracy rate is 14 percent higher than the male. Only in six countries among 116 is the rate for females equal to or less than that for males. While the absolute gap decreases as income rises, the ratio which is calculated by female illiteracy rate over male illiteracy rate remains constant regardless of the income level (third and fourth columns of the table).

The second table presents primary and secondary school enrollment rates for men and women. While the situation is much improved, women’s enrollment rate in primary education is a little behind the men’s rate. The total average rates for female and male are 80.093% and 83.372% respectively. If the data are decomposed by level of income, it is found that the gap narrows as income increases. As the third column indicates, the enrollment rate gap measured by male rate minus female rate is as much as 7 percent in lower income countries. However, the measure for middle income countries is only 2 percent and is negative in higher income countries, meaning that women’s primary school enrollment rate is higher than that for men. The ratio in the fourth column also declines as income rises.

Regarding secondary school enrollment rates, it can be said that there is no unfavorable gap between men and women. The total average rate for females is about 1 percent higher than that for men. This disparity, in which men are now behind, is not a concern because it is considered to be attributed to the differences in characteristics between genders and not to institutional or economic factors.

As Table 2 (3) quotes, the average share of women who continue to stay in primary school until the fourth grade was 87.746 percent during 1986-95. On the other hand, that figure for men was 88.012 Even though there is a slight disparity in total, this

<table>
<thead>
<tr>
<th>Dependent Variable is GDP</th>
<th>C</th>
<th>INVEST</th>
<th>POP</th>
<th>LOG(LIT)</th>
<th>LITE</th>
<th>TNLME</th>
<th>LOG(TNLME)</th>
<th>RP</th>
<th>Adjusted R²</th>
<th>No. of Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.624</td>
<td>-1.645</td>
<td>0.275</td>
<td>-1.802</td>
<td>0.038</td>
<td>0.038</td>
<td>-0.456</td>
<td>0.611</td>
<td>0.567</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>(2.197)</td>
<td>(-3.312)</td>
<td>(6.165)</td>
<td>(2.592)</td>
<td>(2.024)</td>
<td>(4.078)</td>
<td>(-2.224)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: FGLS technique. White heteroskedasticity-consistent standard errors & covariance is used. For notations, see Appendix. *statistics are given in the parentheses. Source of the data is World Development Indicators 1996 on CD-ROM.

* significant at the 10 percent level
** significant at the 5 percent level

Table 1 A Cross-Country Growth Regression Model
situation is an ideal one. This kind of gap is narrow enough to be ignored and vanishes with income increase.

Now one may wonder why the female illiteracy rate is not similar to the school enrollment rates. This is because the recent illiteracy rate does not reflect current school enrollment rates but past trends. Since the sample range for the illiteracy rate is people aged 15 and above, the current illiteracy rate follows the past outcomes of school enrollment rates. Consequently, the illiteracy gap by gender is assumed to become almost zero by the late 21st century if the school enrollment rate maintains its current figure, and economies continue to grow.

**Economic Impacts of Female Education**

Economic development is one of the key factors for improving educational achievement and narrowing the gender gap. Higher income creates more equal opportunities for men and women to receive education. However, as mentioned earlier, education can be a driving force for further economic growth. The following focuses on how female education contributes to economic development.

Improvement of female education has, of course, the same effect on economic growth as any education does. It enhances the quality of women’s labor and positively relates to productivity. In addition, female education is considered to have a positive impact on the economy more than male education because it has a close connection to child nutrition and health. Since women spend relatively more time taking care of children, their knowledge and behavior have great influence on children. If children’s health is improved by better care in the hands of educated women, the infant or child mortality rate will decline and subsequently healthy and educated future workers will be raised.
The second effect on economy which is brought about uniquely by the improvement of female education is related to the labor force. During 1966-85, the average share of female labor was only 28 percent, while men’s share recorded 62 percent. The female labor force has a lot of potential for increase. Better female education is expected to cause higher growth in the female labor force which will eventually lead to economic development. However, this scenario requires several preconditions. First, there should be no institutional or cultural barriers in the labor market which are detrimental to women. Second, the labor market must be under-supplied and the jobs remaining should not be physically demanding. Third, women must have the will to work. It is not clear what percentages of females are voluntarily unemployed. To increase the effect of female education on the economy, governments should also pay attention to reducing discriminatory rules and customs for women and creating gender-friendly environments in the job market.

The third economic impact of female education is associated with a lower fertility rate. The fertility rate is usually determined by such elements as desire for children, income level, cost of rearing children, infant mortality, education, female labor participation, and other elements of the economic, social, political, and family environment. A couple can control how many children they are going to have as long as they have the right knowledge of contraception and a strong will. Education is a proxy of a measure which estimates the extent to which people have this knowledge and can control their behavior, and the awareness of the need to plan families, considering the present situation in the expectation of future circumstances.

In particular, female education has more influence on fertility than male education does. Female education has a close relationship with female labor participation which is one of critical factors influencing the fertility rate. Female labor participation influences women’s desire for children. If more women come to have jobs and to receive higher wages, they may prefer earning income and consuming what they want to taking care of children. Regarding the correlation between the fertility rate and the literacy rate, the female literacy rate is about 4 percent more related to the fertility rate than the literacy rate for men. How the fertility rate is associated with economic development will be discussed in detail in the following section.

Fertility and Economic Growth

Cross-country data for fertility rate and per capita GDP were plotted as in Figure 1. The concave regression line indicates that the fertility rate declines as income increases and the rate of decrease becomes smaller. A multiple regression was run by adding as many available explanatory variables as possible (Table 3). The omitted right-hand side variables among the elements listed earlier as determinants of fertility rate are desire for children and cost of rearing children. The literacy rate is used to measure educational attainment. Income level, infant mortality, and female labor participation, denoted by LOG(GDP), MRIN, and LFFE, are incorporated in the equation. All the explanatory variables are statistically significant at the 10 percent level and have the expected sign. Adjusted R² (0.765) expresses a relatively good fit.

![Figure 1: Fertility Rate and Per Capita GDP](image)

If the infant mortality rate is high, people try to have more babies in order to be assured of surviving children. Consequently this is positively related to the
Dependent Variable is FERT

<table>
<thead>
<tr>
<th>C</th>
<th>LOG(GDP)</th>
<th>LITE</th>
<th>LFE</th>
<th>MFIN</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>No. of Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.774</td>
<td>0.460</td>
<td>-0.011*</td>
<td>-0.024</td>
<td>0.023</td>
<td>0.773</td>
<td>0.765</td>
<td>114</td>
</tr>
<tr>
<td>(4.936)*</td>
<td>(1.269)*</td>
<td>(1.787)*</td>
<td>(1.142)*</td>
<td>(0.162)*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: TOL's technique (White heteroskedasticity-consistent standard errors & covariance) is used.

*significant at the 5 percent level

Table 3: Determinants of Fertility Rate

Appendix: Notations

C = constant.

FERT = the average fertility rate (births per woman) from 1986 to 1995.

LOG(GDP) = the average annual rate of per capita GDP, PPP constant 1987 international $ from 1986 to 1995.

MFIN = the average annual growth rate of per capita GDP, PPP constant 1987 international $ from 1986 to 1995.

LFE = the average female labor force (% of total) from 1986 to 1995.

LITE = the average literacy rate from 1986 to 1995.

R² = the average infant mortality rate (per 1000 live births) from 1986 to 1995.

PFC = the average annual population growth rate from 1986 to 1995.

TAXGOODS = the average rate of taxes on goods and services (% of current revenue) from 1986 to 1995.

TAXINC = the average rate of taxes on income, profits and capital gains (% of current revenue) from 1986 to 1995.

TRADE = the average share of trade in GDP from 1986 to 1995.

The reasons why education and female labor participation are negatively associated with fertility have been described above. The negative relationship between fertility rate and income level is sometimes difficult to understand since it can be acknowledged that if a person earns a higher income, he or she is able to afford the cost of rearing children and therefore becomes able to have more children. However, as the empirical data show, this may not be the common case.

Three main factors may be cited which explain this negative relationship between per capita GDP and the fertility rate. First, an increase in income implies better accessibility and quality of health and educational services. This environment helps to improve educational achievement and health conditions and lower infant mortality. Through these impacts on other determinants of fertility, the rise in income level eventually leads to the reduction of the fertility rate.

Second, income rise is positively associated with the cost of education. As school enrollment rates go up with economic growth, a parent's burden of educational costs also increases. It is expected that the share of spending an education in family income will grow at the same rate as income growth rate or even more rapidly than income grows. Since it is usually the case that parents want their children to have the best education they can, they will prefer fewer children and higher education rather than more children and less education. Even though people's income increases, the rise in educational costs prevents them from having more children.

Finally, income level is influential on people's desire for children. People can obtain more variety of goods and services when their income rises. Due to the stronger demand for goods and services which make their life very convenient and higher child-rearing costs, the relative preference for having children rather than consuming goods and services declines. Some people even think that their life becomes valuable without a partner or a child if they...
have enough money to spend on goods and services which they want.

As discussed above, the fertility rate is indirectly affected by the level of income. However, it also has a simultaneous effect on economic growth. Gao and Well examined this mechanism linking fertility and growth. The most prominent roles of fertility decline in raising income per capita are to lower population growth and to increase the productivity of the labor force. Supposing that life expectancy is constant, then a decrease in fertility rate is apparently the only source of population decline. If other things are constant, the population decline means an increase in per capita GDP. This is why, as seen in Table 1, population growth has a negative impact on economic growth. When parents have fewer children, they are able to spend more time and income on their children and give them higher education. This helps to generate an increase in more productive workers in the next generation.

While it cannot be denied that the fertility rate does negatively influence the level of per capita GDP, we should keep in mind the following scenario. A lower fertility rate will eventually depress labor force growth; therefore, a current fertility decline does not necessarily mean future economic growth. Careful examination concerning demographic transitions, including economically active population rate, life expectancy, and fertility rate are needed to assess long-term growth expectations. The influence of the fertility decline on demographic changes and the effects of demographic changes on economic development are left as a further research theme which is needed to clarify those uncertainties with regard to the economic impact of fertility changes.

Concluding Remarks

The enhancement of female education has a positive impact on economic growth due to the following three consequences. First, female education is closely associated with child nutrition and health. Women tend to spend more time taking care of children than men do, and women are considered to have strong influence on children. Better care for children by educated women improves the status of children's health, and then healthy and educated future workers are raised. Second, better female education is expected to increase the female labor force and helps an economy to grow.

The third economic impact of female education is a decrease in the fertility rate. Fertility decline contributes to lowering population growth and increasing the productivity of the labor force. As the cross-country growth model suggests, the population decline leads to an increase in per capita GDP. The fewer children parents have, the more time and income they allocate for their children. This helps children receive higher education and become more productive workers in the future. Education is one of the important factors which determine fertility rates. In particular, female education has more influence on fertility than male education does.

In order to examine the validity of the above inferences regarding the economic impacts of female education, further research is encouraged on a country or regional basis. There are many kinds of cases in which the above scenarios are not at all appropriate, depending on the country or region. The relationship between female schooling and fertility may not be negative and female education does not necessarily contribute to boosting the number of female laborers and raising the status of child health. How education and labor force participation affect economic growth is also completely different in countries or regions. Micro-level research is significant in the sense that it can provide more explicit information peculiar to a certain area, considering its culture and political and economic structure.

To improve the cross-country analysis incorporated in this paper, the following two obstacles have to be overcome. First, more sophisticated statistical analysis is essential to enhance the quality of data and to reduce missing observations and explanatory variables even though this sort of data problem which everyone faces is very hard and costly to solve. Second, finding a more efficient estimation technique and better specifications
is needed to produce statistical outcomes which reflect reality more closely.

Even though these economic impacts of female education leave much room for further consideration, it is likely that female education has more potential to be influential on economic development than male education does. To eliminate the gender gap in educational achievement is essential not only from the perspective of human rights but also in the economic sense. Particularly in developing countries which need economic growth and whose educational achievement for women is worse than that for men, policymakers are urged to implement policies which improve conditions for female education.

< Note >
2) These six nations are Costa Rica, Qatar, Uruguay United Arab Emirates, Nicaragua, and Jamaica.
4) See Rosenzweig 1985 pp962-1015.
5) The empirical analysis can be seen in Olsen 1993 pp721-749.
6) According to Brocker et al., this situation is in the second development equilibrium. See Becker 1990 S12-S37.
9) For example, see Jeffery 1996 pp245-253.

< References >