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SOCIO-ECONOMIC IMPACTS OF FEMALE EDUCATION IN DEVELOPING COUNTRIES

Technical Description

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Introduction

Education has constituted the highest social sector priority in most countries of the developing world for several decades, as a vehicle for economic, institutional, and individual development. The education of girls, however, has typically had lower priority than that of boys, despite compelling evidence of an important role for female education in the pursuit of a number of social and economic development goals. Under the burden of economic adjustment that characterized the 1980's, furthermore, reductions in the overall level of spending in education have in many cases produced particular setbacks for continued growth in female educational participation in the developing world. Figure 1 depicts the persistent gender differential in primary enrollments for 80 developing countries over a period of 25 years; also discernible is a slowdown of growth in the enrollment rate from 1980 to 1985.

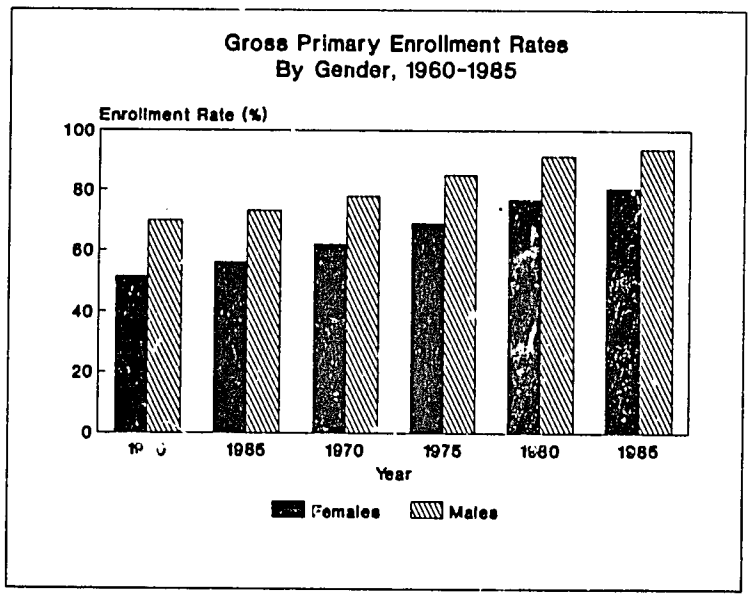

Figure 1

In this period of difficult decisions affecting the distribution of limited resources across multiple social sectors, it is more important than ever that policy makers, planners, and researchers develop well-targeted, efficient educational policies and strategies. They must, in other words, evaluate carefully the gender-specific effects of education, long-term as well as short-term outcomes, and the social and economic conditions which enable education to have positive effects or prevent it from doing so. As John Simmons (1979) has reminded us, while education may be a key to development, "the development door" may well be "locked [from] the other side" (p. 1005) in the absence of conditions which may enhance education's potential effects, such as a job market for mid- and higher-level manpower or population policy that supports the use and availability of birth control. It has also been suggested that researchers and policy makers have been unreasonably impatient for education to produce broad societal and economic changes in developing

countries, without sufficiently considering potential diffuse, long-term, or gender-specific outcomes of education (Kelly, 1987).

In response to such concerns, a number of researchers have begun to develop long-term, integrated models of the impact of education on various sectors (Hicks, 1980; Moreland, 1982; Wheeler, 1980, 1984a, 1984b). Under the USAID-supported Project BRIDGES, the Research Triangle Institute has been carrying out similar work. We are developing the Educational Impacts Model (EIM) to demonstrate long-term, interactive, direct and indirect, and gender-specific effects of education on several aspects of national development. The present paper highlights results of the modeling effort which implicate the education of females in the achievement of several important development goals: reducing fertility and infant mortality, improving life expectancy, and increasing the labor force participation of women.

As with all cross-national aggregate-level modeling efforts, EIM results can only suggest general effects. It must be understood that the analysis of aggregate data should not properly be used to infer specific relationships at levels more minute than the level of aggregation. Thus analysis based on nationally aggregated data, for example, cannot be interpreted to provide evidence of effects at the level of the family or the individual. But as more and more gender-disaggregated national-level data is produced and reported by developing (as well as developed) countries, the analysis of such data can be extremely useful in identifying and illustrating the gender-specific nature of many effects of education on other sectors, and in directing policy attention to these important relationships.

EIM database and model development

The EIM is the result of empirical modeling efforts which employed recent national-level time-series data available on 80 developing countries for the period 1969 to 1980. The principal source of data used in EIM development was the 1984 World Tables database (World Bank, 1984), from which eighty developing countries were selected for inclusion on the basis of country size and data availability. Selected variables from the World Tables were joined with additional data from subsequent World Bank, Unesco, and other publications (Lockheed & Verspoor, et al., 1989; Komenan, 1987; Unesco Statistical Yearbook, 1986; Population Crisis Committee, 1987) to produce the EIM database. Annex 1 presents an alphabetical listing of the countries included in the database, with a selection of educational and other principal development indicators for each country. Annex 2 provides a listing of the variables employed in the analyses described in this report.

All estimation equations employed in the EIM were developed through extensive empirical modeling efforts using the EIM database. The selection of relevant predictors and their hypothesized relationship to outcome variables was guided by existing research. Specific equations were fitted empirically to the available data, predicting outcomes at both 1975 and 1980 when possible, in order to assess the stability of each equation. Stability, parsimony, and fit were considered in the selection of estimation solutions to be employed in the final model from among all equations generated.

EIM calculations began with the estimation of the impact of educational supply and demand indicators on male and female rates of primary educational participation. These participation rates, in turn, figured in the determination of secondary enrollments, fertility and infant mortality rates, life expectancy, and gender-disaggregated labor force participation rates.

Determinants of educational participation

Educational participation at the national level may be construed as a function of (1) supply-side factors, including expenditures in education and the quality and efficiency of the education provided; and (2) demand-side factors, including sociocultural attitudes toward formal education and the direct cash costs and opportunity costs of educational participation. Prior evidence suggests that while supply-side factors are implicated about equally in the educational participation of boys and girls, demand-side factors tend to weigh more heavily in the participation (or non-participation) of girls.

The supply of education is affected by government policy decisions regarding the education budget, the type and quality of education offered, and the administrative organization of the educational system; and by the prevailing costs and availability of educational materials, techniques, and personnel. These factors are implicated in per-student costs and, ultimately, in the number of student places a given education budget can provide.

As for demand-side factors in educational participation, principal considerations include cultural attitudes toward education, the private cash costs and opportunity costs of education, and potential demand produced by lagged population growth. Research indicates that cultural attitudes and cash cost factors are more likely to be implicated in the educational participation of females than of males (Smock, 1981), and that poorer families and farm families tend to have less disposable cash income than other groups and to depend on the labor contributions of children to a greater extent, thus differentially increasing the relative direct and opportunity costs for these groups. The potential effect of population growth is ambiguous, since while rapid growth might be expected to increase the press for educational participation, it also increases the supply burden, such that despite an increase in numerical enrollments, the rate of enrollment may remain the same or even decline.

Gross enrollment rates for primary and secondary education, disaggregated by gender, constitute the EIM's principal indicators of educational participation.[1] Model development for the determination of enrollment rates considered a number of variables reflecting both demand for and supply of educational opportunities and facilities. Supply-side input variables included in modeling efforts were capital and recurrent expenditures in education as a proportion of GNP; per-student expenditures as a proportion of GNP per capita; and the student-teacher ratio at time (t).[2] Demand-side input variables included percent of labor force in agriculture at time (t) as a proxy for proportion rural population; GNP per capita at time (t); the population growth rate over the previous quinquennium; and dummy grouping variables for four geographic regions (Asia, Latin America, Middle East/North Africa, and Subsaharan Africa). Modeling results are presented by educational level below.

Primary enrollment. Modeling efforts for primary school enrollment rates of females (GER1F) and males (GER1M) produced the following equations (1975 models, N = 54):

```
GER1F(t) =   108.856 - 0.647*LAGRI(t) + 1918.839*EDSHP(t) - 202.133*XPSP(t) - 14.890*EMENA
(R2 = .705)   (t=12.16)  (t=5.09)         (t=5.00)            (t=6.80)          (t=1.90)

GER1M(t) =   107.597 - 0.383*LAGRI(t) + 1886.393*EDSHP(t) - 209.803*XPSP(t)
(R2 = .764)    (t=15.96)  (t=3.85)        (t=6.08)             (t=9.05)
```

The results support our expectation that educational supply variables play a critical role in both female and male enrollments. The share of GNP allocated to recurrent expenditures in primary education (EDSHP) had an important positive effect, while per-student expenditures as a proportion of per-capita income (XPSP) had a negative effect, demonstrating the opposing forces of the overall size of the budget and the cost of

[1] It should be noted that enrollment rates by educational level, while by far the most widely reported and accessible cross-national indicators of participation, are far from ideal. As currently reported, such figures do not reflect attendance or absenteeism and may be differentially subject to overreporting, depending on national criteria for the determination of schools' revenue base. Gross enrollment ratios aggregated across educational level are not precisely comparable for other reasons as well, such as differences in the length of each level across systems ("primary education," for example, may include from four to eight grades, depending on the system), or in repetition rates, which over time may inflate apparent enrollments without detection, especially if the gross enrollment ratio remains below 1.

[2] These variables must be understood to serve as imperfect, aggregate proxies for much important information, obscuring as they do the ratio of direct educational expenditures to administrative expenditures, and the specific costs and effectiveness of different types of educational materials, programs, and personnel.

educating an individual pupil. Capital expenditures in education and student-teacher ratio made no significant or meaningful additional contribution, and were removed from both equations.

Demand-side variables also contributed important effects. For both female and male enrollment rates, a negative effect of relatively high proportion of rural population, proxied by the proportion of the labor force in agriculture (LAGRI), supports other research findings of generally lower participation rates in rural areas. Middle East/North African cultural/regional factors (proxied by EMENA) appear to play an additional, negative role affecting female enrollments only. Per-capita income and quinquennial population growth lagged 5 years demonstrated negligible or inconsistent additional contributions, as did regional group variables for males, and were therefore removed: their exclusion does not affect the overall magnitude or significance of the remaining effects.

Secondary enrollment. At the secondary level, primary enrollment at lag-5 was added to estimation equations to represent the demand-side "press" for additional education. Best-fitting equations for secondary school enrollment rates (GER2F; GER2M) possessed the following parameters (1980 models, N=43):

```
GER2F(t) =   27.532 + 0.344*GER1F(t-5) - 0.464*LAGRI(t) + 11.248*ASIA
(R² =.818)     (t=2.82)  (t=4.91)            (t=4.60)         (t=3.11)

GER2M(t) =   35.865 + 0.268*GER1M(t-5) - 0.501*LAGRI(t) + 13.97*ASIA
(R² = .717)    (t=3.06)  (t=3.14)           (t=5.16)          (t=3.42)
```

For both males and females, best-fitting equations indicated positive impacts of primary enrollment rate (GER1F; GER1M) at lag-5 and of Asian regional factors (proxied by ASIA), and a negative effect of proportion of rural or agricultural population (LAGRI).[3] Population growth at lag-10 had no consistent significant effect for either male or female secondary enrollment rate, and was thus removed from the equations.[4] Supply-side variables exerted minimal and nonsignificant direct effects, even in the absence of primary enrollment at lag-5, and were also removed, but these factors may be interpreted to have an indirect effect through their impact on the primary enrollment rate.

Female education and fertility

Population research has consistently provided compelling evidence of an effect of women's schooling and literacy on overall reductions in fertility (Caldwell, 1986; Cochrane, 1979, 1983; Kasarda, Billy, & West, 1986; LeVine, 1987; Moreland, 1982; Tan & Haines, 1984). In explanation of such findings, it has been argued that female education improves understanding of biology, enhances acceptance and correct application of birth control methods, and delays marriage, all of which may be expected to reduce fertility rates. In addition, because educational participation in general tends to extend the length of the child's economic dependency on the family, it may result in an attitude shift toward reduced family size (Cochrane, 1979; Gomes, 1984). On the other hand, educated working women are more likely to breastfeed each child for fewer months, a practice which may contribute to shorter spacing between births and a potential increase in fertility.

The balance between the positive and negative effects of education on fertility and population growth appears to be tempered by level of economic and educational development. In the early stages of development, developing countries first tend to exhibit education's effects on improved health and life

[3] The Asia dummy had significant impact in both 1975 and 1980 equations for both genders. For females, no other specific region had a significant effect on secondary enrollments, while for males, Latin America showed a significant negative effect, and Middle East/North Africa a trend-level negative effect in 1975 equations, but these results were not replicated for 1980.

[4] A significant, negative effect of population growth at lag-10 (t=2.31) was apparent for female secondary enrollment in 1975, suggesting that when the supply burden increases female enrollment is the first to suffer, but this effect was not replicated for 1980 or for male secondary enrollment in either year.

expectancy, and therefore may in fact experience an increase in population growth; the fertility decline associated with education appears to occur only at later stages of economic development and with more than a few years of education (Kasarda, et al., 1986; Wheeler, 1984a).

EIM modeling efforts included estimations of the impact of female education, in the presence of other theoretically relevant factors. These other factors included average female age of marriage (circa 1975), GNP per capita, level of urbanization, female labor force participation rate, male enrollment rates, and government support for family planning (circa 1975); and geographic region. Female enrollment rates were lagged in all modeling attempts, to approximate the period from time of schooling to child-bearing age. The best-fitting equation employed a linear specification and the following parameters (1980 model; N=65):

$$\hat{TFR}(t) = 5.89624 - 0.00027 * [GER1F(t-20) + GER2F(t-20)] * BCSCORE + 0.7888*REGION$$
$$(R^2=.635) \quad (t=19.00) \quad (t=5.17) \quad (t=2.62)$$

The combined effect of primary and secondary female enrollments (GER1F and GER2F) was stronger than that of either level alone, and most pronounced in interaction with level of government family planning support (BCSCORE). That is, increasing female educational enrollments alone, or family planning efforts alone, appears to be less effective in reducing fertility than if both female educational participation and family planning services are augmented. This result supports the conclusion of previous research (Wheeler, 1984b) that female education has its greatest negative impact on fertility when combined with governmental support for family planning. African and Middle Eastern cultural factors (proxied by REGION) appear to exert an opposing, positive effect. GNP per capita, age of marriage, female labor force participation, and male education had negligible additional impact. The superiority of linear over log-linear specifications suggests that for the levels of development represented in the sample, the effect of increasing female educational participation on fertility remains just as important in countries with relatively high female enrollment rates to begin with, as in countries with low rates.

Figure 2 depicts the effect of increasing female enrollment rates on fertility, with family planning support held constant at the mid-1970's average of countries sampled, and the effect of geographic region controlled. As shown, growth in the female gross primary enrollment rate from 20 percent to 70 percent, accompanied by parallel growth in the female secondary enrollment rate (specified at the conservative 1960 ratio of 15.34 percent of the primary rate) is estimated to result in a total fertility reduction of 0.5 births per woman twenty years later. If family planning support efforts were doubled, the same increase in gross enrollment rates would result in a fertility reduction of one birth per woman.

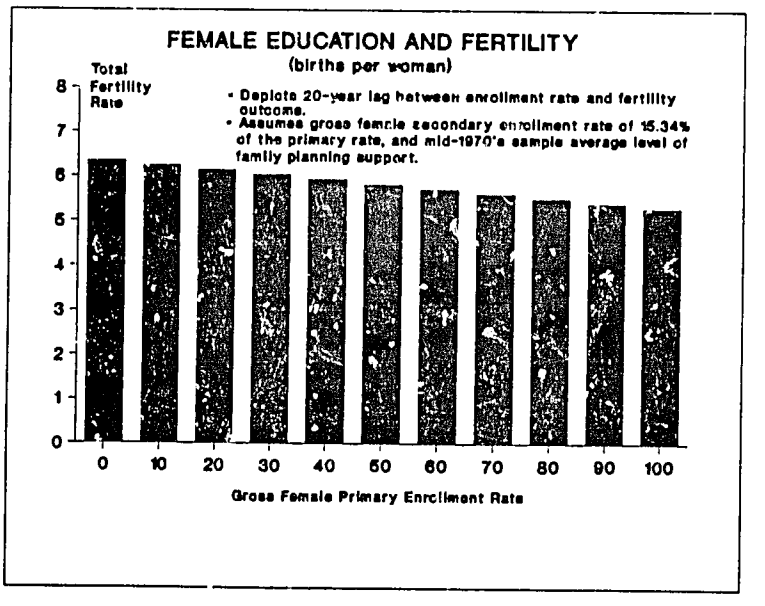

Figure 2

Female education and infant mortality

Positive effects of education, particularly female education, on infant and child survival have been documented for a number of developing countries (Caldwell, 1986; Cochrane, Leslie, and O'Hara, 1982; Cochrane, O'Hara, & Leslie, 1980; D'Souza & Bhuiya, 1982; Hobcraft, McDonald, and Rutstein, 1984; LeVine, 1987). It has been hypothesized that both the knowledge imparted and the increased earnings potential gained through education enable parents to provide a health-enhancing environment for their families, although the processes or mechanisms by which school-learned knowledge is translated into better health behaviors are still unclear (Eisemon, 1988; LeVine, 1987). Education may also have a more direct effect on child health and survival, to the extent that schools provide children with informal health care, immunizations, and dietary supplements (Caldwell & Caldwell, 1985; Eisemon, 1988).

In the EIM model, female education was represented by female primary and secondary enrollment rates, lagged to approximate the period from time of schooling to child-bearing age. Its impact on infant mortality was considered in the presence of other potentially relevant development factors including GNP per capita, average female age at marriage, level of urbanization, population per physician, male enrollment rates, and geographic region. The best-fitting equation is presented below (1980 model; N = 72):

$$IMR(t) = 145.992 - 0.696*GER1F(t-20) - 1.676*GER2F(t-20)$$
$$(R^2=.679) \quad (t=26.31) \quad (t=5.01) \quad (t=3.12)$$

Thus, both primary and secondary female enrollment rates at lag-20, a rough proxy for level of maternal education, appear to exert important negative effects on the infant mortality rate. Average female age at marriage, level of urbanization, geographic region, population per physician, and GNP per capita made negligible additional contributions to the equation, and thus were removed. Linear specification of the model, furthermore, produced a fit superior to log specification, suggesting that the effect of increasing female enrollments remains as important for developing countries with relatively high initial rates of female educational participation as for those with very low rates.

The effect of lagged male enrollment rates, as a proxy for the contribution of father's education, was also examined. Male enrollment rates made a small contribution to reduced infant mortality when replacing female enrollment information in the equation, but the effects were much weaker than for female enrollment rates alone, and became negligible and nonsignificant when both male and female rates were included in the equation.

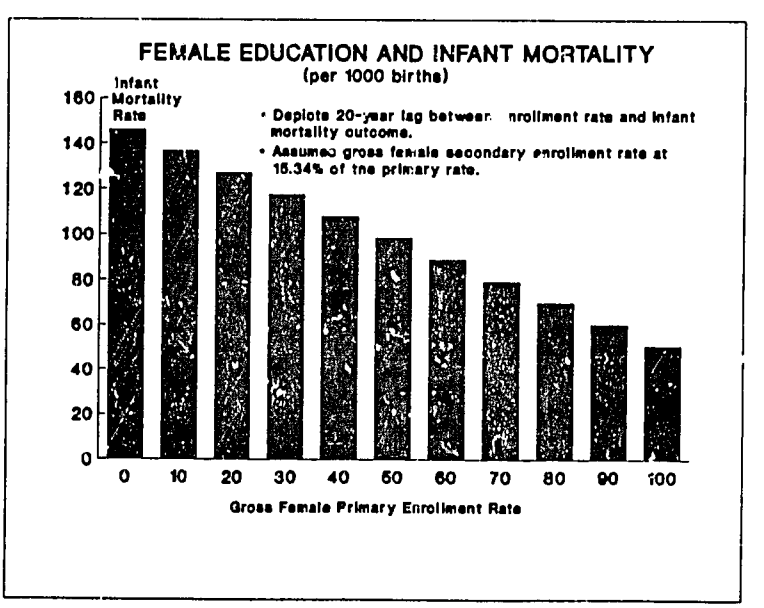

Figure 3

Figure 3 depicts graphically the estimated effect of increasing female enrollment rates on infant mortality. As shown, growth in the female gross primary enrollment rate from 20 percent to 70 percent, accompanied by parallel growth in the female secondary enrollment rate (specified conservatively at the average 1960 ratio of 15.34 percent of the primary rate), would result in a total infant mortality reduction of 48 per 1000 births, or nearly 38 percent, twenty years later.

Female education and life expectancy

Life expectancy can be regarded as a useful indicator of the overall health status of a population, summarizing as it does estimations of survival through infancy, childhood, and adulthood. Cross-national and intra-country findings in a number of developing countries have consistently shown evidence of an important relationship of education or literacy to the life expectancy of the next generation (Cochrane, O'Hara, & Leslie, 1980). Many studies, however, have neglected to examine effects of education disaggregated by gender, despite the likelihood of differential contributions of maternal and paternal education to the life expectancy of offspring. Paternal education has been hypothesized to have a positive effect principally through increased income and the "market" value of education, allowing improvements in living standards and the acquisition and use of health-promoting goods and services. Female or maternal education may have both market effects (which may be negative as well as positive, since formal labor is likely to take mothers away from childrearing activities), and nonmarket effects, through the influence of education on childrearing and household management behaviors (O'Hara, 1980).

EIM estimations of life expectancy therefore included gender-disaggregated gross enrollment rates, lagged 20 years to represent maternal and paternal education; GNP per capita as a proxy for living standards; population per physician as an indicator of availability of health care; and geographic region, which may reflect variation not only in culture but also in health services, sanitation, and disease prevalence. Modeling efforts produced the following best-fitting equation (1980 model, N = 55):

```
LEXP(t) =   46.761  + 0.002*GNPPC(t) + 0.119*GER1F(t-20) + 0.192*GER2M(t-20) - 0.0001*PPP(t)
(R²=.858)   (t=33.00)  (t=3.62)         (t=5.54)              (t=3.45)              (t=2.62)
```

The results suggest that maternal primary-level education (GER1F) is the most critical factor in improving life expectancy, exhibiting the highest elasticity of all significant contributors. Paternal secondary-level (GER2M) education also makes an important positive contribution, independent of general economic prosperity as represented by GNP per capita (GNPPC) and the sparsity of health care as represented by population per physician (PPP), which contribute additional significant effects in the expected direction. Male primary and female secondary education made no additional contribution to R-square when added to the above equation. Linear specification of the relationship among variables was superior to log specification, suggesting that for the levels of development represented in the sample, increases in female educational participation remain important even for countries with relatively high female enrollment rates.

The independent impact of the lagged female primary enrollment rate on life expectancy is depicted in Figure 4. With other significant contributors held constant at their average levels for the sample, the results indicate that the impact of female primary enrollment on life expectancy is dramatic, with a life expectancy increase of over 1 year for every 10 percent increment in the enrollment rate, above and beyond the effects of per capita income, male educational participation, and available health care.

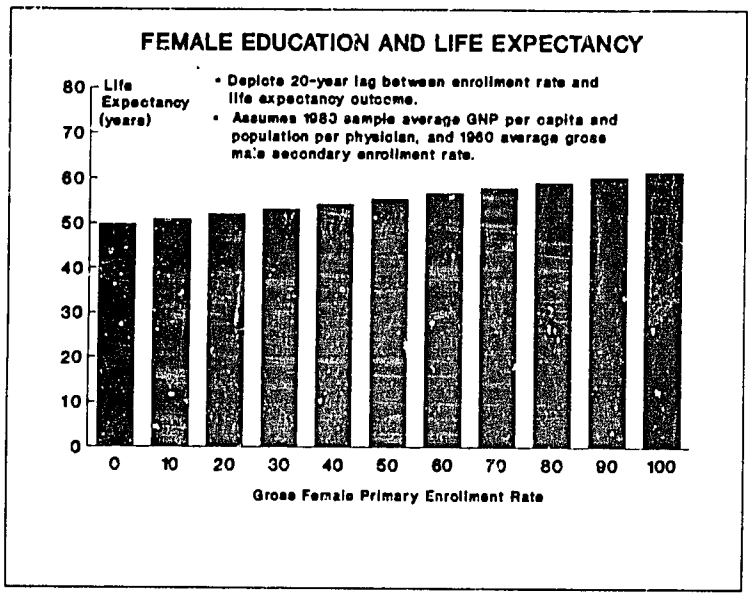

Figure 4

Education and labor force participation

Research results on the relationship of education to labor force participation are ambiguous at best, and require special attention to gender-specific patterns. Formal education has been found to be positively associated with women's participation in wage-labor or salaried labor, typically the only "labor" represented in published figures. To the extent that it exposes students to nontraditional attitudes, values, and information and to a bureaucratic, work-like public institution, in addition to imparting specific marketable skills such as literacy or bilingulism, the education of females in particular affects not only earnings but their chances of formal labor participation to begin with (Eisemon, 1988; Psacharopoulos, 1984).

These considerations have underscored the importance of a gender-disaggregated approach to examining the relationship of educational participation to labor force participation. Input variables considered in attempts to model female labor force participation included female primary and secondary enrollment rates, lagged 20 years to approximate the period from time of schooling to potential establishment in the adult labor force; GNP per capita; average age of marriage; fertility rate; proportion of the labor force in agriculture; and geographic/cultural regions. Estimation efforts resulted in the following best-fitting equations employing female primary and female secondary enrollment rates, respectively (1980 models; N = 36):

```
LFPRF(t) = exp(8.488) * pwr(AGEMARR, - 2.083) * pwr(GER1F(t-20), 0.259) - exp(0.428*LATIN)
(R2=.529)   (t=2.47)      (t=1.70)                (t=2.32)                    (t=1.79)

           - exp(1.390*EMENA)
             (t=4.97)

LFPRF(t) =  exp(11.132) * pwr(AGEMARR, - 2.771) * pwr(GER2F(t-20), 0.306) - exp(0.602*LATIN)
(R2=.558)     (t=3.39)      (t=2.49)                (t=3.34)                    (t=2.52)

           - exp(1.505*EMENA)
             (t=5.64)
```

These results suggest that female educational participation, age of marriage, and regional/cultural factors make substantial contributions to female labor force participation. As expected, the female labor force participation rate was significantly, positively related to gender-specific primary educational participation (GER1F) at lag-20. The impact of secondary enrollments (GER2F) appears to surpass that of primary enrollments, and eclipses it when both levels of education are considered simultaneously. The role of female

primary education should not be dismissed, however, given its likely indirect impact through secondary education, as well as its direct effects evident in the first equation immediately above. Age at marriage (AGEMARR) also had a significant but negative effect, running counter to our expectations that single women would tend to be self-supportive and therefore more likely to enter the labor force. While this result demands further investigation, it may tentatively be posited that in traditional societies never-married women tend to remain dependents in the family of origin. Latin America (LATIN) and Middle East/North African (EMENA) societies, furthermore, appear to suppress female labor force participation below the level that their female enrollment rates and average marital age would predict. Economic prosperity, proxied by GNP per capita, was removed from both equations as its contribution was negligible.[5]

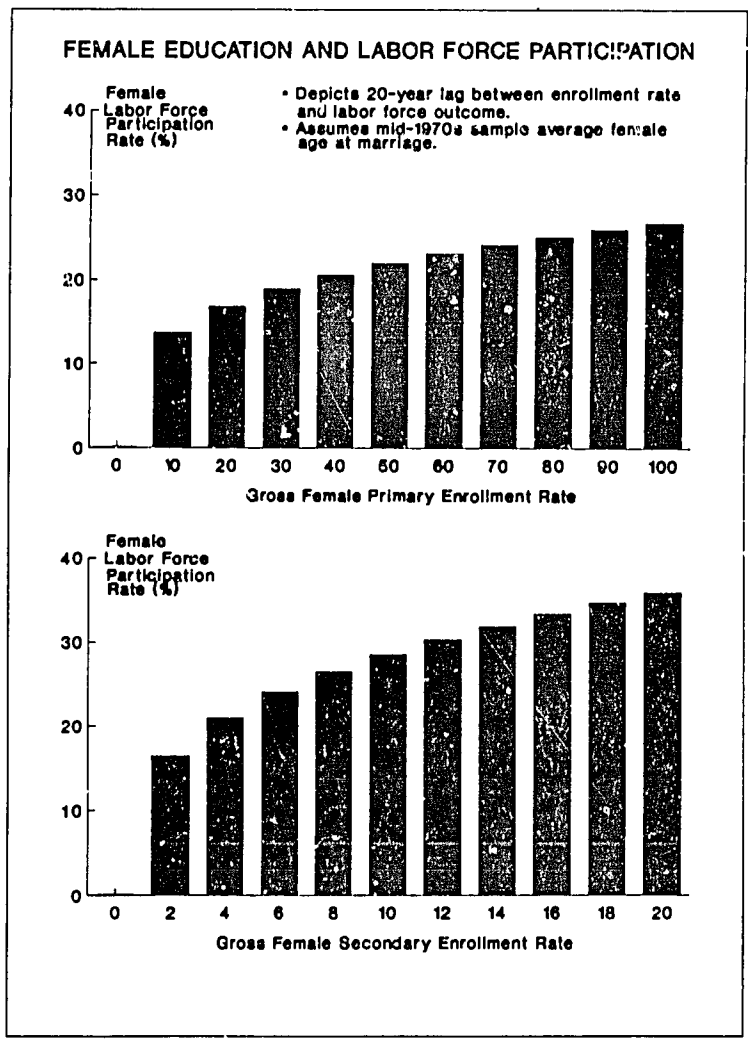

Figure 5

[5] This non-effect may in fact obscure a curvilinear relationship in need of further examination: While women in the poorest countries may be forced by economic necessity to work, those in the relatively most prosperous countries may encounter less resistance to their participation in the labor force for other reasons, as they do not pose as great a "threat" to male employment.

Figure 5 depicts the estimated impacts of female primary and secondary school enrollments on subsequent labor force participation, with age of marriage held at the sample average and Middle East and Latin American regions held to their proportions in the sample. Even controlling for other factors implicated in female labor force participation, our estimates suggest that an increase in the female primary enrollment rate from 20 percent to 70 percent will produce an increase of 7.3 percent in the labor force participation of women twenty years later. Increasing the female secondary rate from just 4 percent to 16 percent appears to have an even greater effect, producing an increase in labor force participation of over 12 percent after twenty years. The curvilinear nature of the relationships, evident in the figures, suggest still important but diminishing effects as higher levels of female enrollments are achieved.

The special importance of education for the labor force participation of females is highlighted when one considers the best-fitting estimation of male labor force participation (LFPRM):[6]

$$LFPRM(t) = 39.228 + 0.165*LAGRI(t) + 0.002*GNPPC(t-1)$$
$$(R^2=.393) \qquad (t=7.12) \qquad (t=4.42)$$

For males, neither primary nor secondary enrollments made an appreciable contribution to labor force participation in our modeling efforts. Only relative economic prosperity (proxied by GNPPC) and proportion of agricultural labor force activity (LAGRI) made important and significant contributions. Relative economic prosperity appears to exert a positive effect on male labor force participation, in contrast to its apparently negligible effect for females. The agricultural proportion of the labor force also exerts a positive effect, a result which is likely to reflect the relative labor-intensivity of the agricultural sector generally.

[6] Equations tested were equivalent to those used in female labor force participation estimation efforts, except that fertility and age at marriage (available for females only) were excluded as theoretically nonrelevant variables.

ANNEX 1: Countries in the EIM database with selected 1980 data values*

COUNTRY	POP	GNPPC	GER1F	GER1M	GER2F	GER2M	TFR	IMR	LEXP	LFPRF	LFPRM
Algeria	18919	2077	81	109	26	40	7.3	118	56	3.6	37.3
Argentina	27740	5468	106	106			2.8	45	70	20.2	56.4
Bangladesh	88513	130	46	78	7	23	6.4	136	47	12.9	56.9
Benin	3479	318	40	88	8	24	6.5	154	49	39.7	51.6
Bhutan	1273	78	10	22			5.7	150	44	38.3	59.2
Bolivia	5570	1048	79	89	31	41	6.1	131	50	13.7	50.2
Botswana	901	909	100	84	23	21	6.5	83		42.2	43.4
Brazil	118332	2036	97	101			4.0	77	63	14.3	48.7
Burma	33313	173	89	93			5.3	101	54	28.3	51.5
Burundi	4114	214	22	36	2	4	6.4	122	44	41.5	53.9
Cameroon	8444	768	94	114			5.8	109	50	37.2	53.9
Central African Rep	2330	334	51	93	7	19	5.5	149	42	50.8	58.5
Chile	11104	2391	108	110	59	51	3.0	43	67	16.2	47.0
China	979552	290	103	121	35	51	2.5	72	66	35.5	56.3
Colombia	25892	1284	130	128	49	43	3.8	56	63	16.7	50.8
Congo People's Rep	1605	989					6.0	129	59	23.9	43.1
Costa Rica	2279	2018	104	106	52	44	3.6	28	72	14.1	53.7
Dominican Rep	5431	1186	119	117			4.8	68	61	6.9	48.0
Ecuador	8354	1297	116	110			6.0	82	61	13.6	50.3
Egypt Arab Rep	42289	561	65	91	39	65	4.9		57	4.2	47.4
El Salvador	4540	777	75	75	23	23	5.7	78	63	12.5	49.2
Ethiopia	341		25	45			5.0	143	42	2.6	54.3
Gabon	657	5261	113	117			4.5	117	48	35.8	59.2
Ghana	11500	1290	71	89			7.0	103	54	30.4	43.9
Greece	9599	4321	103	103			2.3	18	73	27.3	57.6
Guatemala	7262	1075	65	77	15	17	5.4	66	59	8.7	52.0
Haiti	5009	287	68	80	12	14	4.8	115	53	42.6	52.5
Honduras	3691	637	94	92	30	30	6.8	88	58	8.1	50.0
India	674984	242	67	99	20	40	4.9	123	52	25.9	51.8
Indonesia	146345	473	100	114	22	34	4.5	105	53	20.9	51.0

* Note abbreviations as follows:

POP = Total population (in 1000's)

GNPPC = Gross national product per capita (in constant 1975 US $)

GER1F = Gross female primary enrollment rate

GER1M = Gross male primary enrollment rate

GER2F = Gross female secondary enrollment rate

GER2M = Gross male secondary enrollment rate

TFR = Total fertility rate (births per woman)

IMR = Infant mortality rate (deaths per 1000 births)

LEXP = Life expectancy (years)

LFPRF = Female labor force participation rate (%)

LFPRM = Male labor force participation rate (%)

ANNEX 1: Countries in the EIM database with selected 1980 data values* (cont.)

COUNTRY	POP	GNPPC	GER1F	GER1M	GER2F	GER2M	TFR	IMR	LEXP	LFPRF	LFPRM
Ivory Coast	8262	1213	59	89			6.8	127	46	42.9	56.5
Jamaica	2172	1147	101	101			3.9		71	27.9	44.0
Jordan	3244	1108	81	83			7.3	69	61	3.2	43.4
Kenya	16642	414	110	120	15	23	8.0	87	55	23.8	47.8
Korea	38198	1479	111	109	74	86	3.0	34	65	25.1	51.3
Lesotho	1341	504	120	86			5.8	115	52	44.5	58.2
Liberia	1873	522	35	63	11	29	6.9	154	53	21.8	47.7
Madagascar	8714	367	139	147			6.5	71	47	45.2	56.4
Malawi	6037	247	48	72	2	6	7.8	172	44	30.8	53.3
Malaysia	13871	1634	92	94	49	53	4.1	31	64	22.1	47.6
Mali	6699	199	18	32			6.5	154	44	49.0	55.5
Mauritania	1523	408	26	48	4	16	6.0	143	44	2.5	55.3
Mauritius	957	1173	107	109	50	50	3.0	35	65	15.5	54.1
Mexico	69393	2615	115	117	46	52	5.1	56	65	11.4	46.4
Morocco	20182	904	63	103	18	30	6.9	107	56	8.3	44.2
Mozambique	12084	323	84	114	3	9	6.5	115		18.4	55.9
Nepal	14640	135	52	124	9	33	6.4	150	44	37.5	57.6
Nicaragua	2672	782	102	96	47	39	6.3	91	56	13.3	46.7
Niger	5532	327	19	35			7.0	146	44	6.2	56.8
Nigeria	84732	942	85	111			6.9	135	49	28.7	44.2
Oman	891	5366	42	78	7	21	7.2	128	48		
Pakistan	82061	311	27	51			6.4	126	50	5.9	47.2
Panama	1835	1822	104	108	69	61	3.9	22	70	18.2	50.4
PNG	3007	823	51	67	8	16	5.2	105	51	42.2	56.4
Paraguay	2982	1471	101	107			4.3	47	65	15.1	49.4
Peru	16610	1120	111	117	52	62	5.2	88	57	13.7	45.5
Philippines	48300	730	113	113	68	58	4.7	55	63	23.2	47.6
Zimbabwe	6894	786	79	91			8.0	74	54	19.2	46.6
Rwanda	5168	223	60	66	1	3	8.3		45	50.4	56.2
Senegal	5703	462	36	56			6.5	147	43	34.2	52.6

* Note abbreviations as follows:

POP = Total population (in 1000's)

GNPPC = Gross national product per capita (in constant 1975 US $)

GER1F = Gross female primary enrollment rate

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GER2F = Gross female secondary enrollment rate

GER2M = Gross male secondary enrollment rate

TFR = Total fertility rate (births per woman)

IMR = Infant mortality rate (deaths per 1000 births)

LEXP = Life expectancy (years)

LFPRF = Female labor force participation rate (%)

LFPRM = Male labor force participation rate (%)

ANNEX 1: Countries in the EIM database with selected 1980 data values* (cont.)

COUNTRY	POP	GNPPC	GER1F	GER1M	GER2F	GER2M	TFR	IMR	LEXP	LFPRF	LFPRM
Sierra Leone	3474	302	43	61			6.1	208	47	25.0	48.4
Somalia	4272	355	24	44	6	16	6.5	146	39	21.9	57.4
South Africa	28723	2670	90	90			5.1	96	62	25.6	48.8
Sri Lanka	14738	271	100	106	52	50	3.6	44	68	17.4	50.9
Sudan	18681	430	41	59	12	20	6.7	124	46	7.0	55.9
Syrian Arab Rep	8979	1521	89	115	35	57	7.4	62	65	6.0	41.6
Tanzania	18534	261	86	100			6.5	103	51	29.2	53.2
Thailand	46950	699	97	101			4.0	55	63	44.2	51.3
Togo	2578	384	93	151	16	50	6.5	109	48	32.6	49.5
Trinidad	1168	5233	101	95			2.6	32	72	24.0	54.0
Tunisia	6369	1369	88	118	20	34	5.3	90	60	4.3	46.5
Turkey	44438	1313	90	102			4.7	123	62	31.9	54.3
Uganda	12630	2617	43	57			7.0	97	47	27.3	54.2
Burkina Faso	6161	222	14	22	2	4	6.5	211	44	48.3	56.6
Uruguay	2908	3500	106	106	65	55	2.8	40	71	22.4	54.6
Venezuela	14930	4017	109	109			4.5	42	67	14.9	46.4
Yemen Arab Rep	7039	438	12	80	2	8	6.8	190	42	2.5	49.8
Yemen PDR	1907	430	36	94			7.0	146	45	2.8	46.4
Zaire	28893	203	79	109			6.3	112	49	34.5	48.0
Zambia	5647	622	92	104			6.9	106	50	23.1	49.8

* Note abbreviations as follows:

POP = Total population (in 1000's)

GNPPC = Gross national product per capita (in constant 1975 US $)

GER1F = Gross female primary enrollment rate

GER1M = Gross male primary enrollment rate

GER2F = Gross female secondary enrollment rate

GER2M = Gross male secondary enrollment rate

TFR = Total fertility rate (births per woman)

IMR = Infant mortality rate (deaths per 1000 births)

LEXP = Life expectancy (years)

LFPRF = Female labor force participation rate (%)

LFPRM = Male labor force participation rate (%)

ANNEX 2: Variables employed in modeling efforts

1. Education variables[a]

GER1F	Gross female primary enrollment rate (1960 - 1985)
GER1M	Gross male primary enrollment rate (1960 - 1985)
EDSHP	Primary education budget as share of GNP (1975, 1980)
XPSP	Per-student expenditures in primary education (1975, 1980)
STRP	Student-teacher ratio in primary school (1975, 1980)
GER2F	Gross female secondary enrollment rate (1960 - 1980)
GER2M	Gross male secondary enrollment rate (1960 - 1980)
EDSHS	Secondary education budget as share of GNP (1975, 1980)
XPSS	Per-student expenditures in secondary education (1975, 1980)
STRS	Student-teacher ratio in secondary school (1975, 1980)

2. Outcome variables[b]

TFR	Total fertility rate (births per woman) (1975, 1980)
LEXP	Life expectancy (years) (1975, 1980)
IMR	Infant mortality rate (deaths per 1000 births) (1975, 1980)
LFPRF	Female labor force participation rate (1975, 1980)
LFPRM	Male labor force participation rate (1975, 1980)

3. Control variables[c]

GNPPC	Gross national product per capita (1975, 1980)
URB	Proportion of population in urban areas (1975, 1980)
LAGRI	Proportion of labor force in agriculture (1975, 1980)
PPP	Population per physician (1975)
AGEMARR	Female age at marriage (mid-1970's)
BCSCORE	Level of government support for family planning (mid-1970's)
AFRICA	Dummy variable grouping Subsaharan African countries
ASIA	Dummy variable grouping Asian countries east of Pakistan
EMENA	Dummy variable grouping Middle East and North African countries (includes Greece, Turkey, and Pakistan)
LATIN	Dummy variable grouping Latin American countries
REGION	Dummy variable grouping EMENA and AFRICA subregions

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a. The principal source of primary education data (1965-1985) was Lockheed, Verspoor, et al. (1989); 1960 primary-level data and 1960-1980 secondary data were drawn from the 1984 World Tables database (World Bank, 1984); missing values were supplied where possible from Komenan (1987).

b. The 1984 World Tables database (World Bank, 1984) was the source for all outcome variables listed.

c. GNPPC, URB, LAGRI, and PPP data were drawn from the 1984 World Tables database (World Bank, 1984); AGEMARR from United Nations (1987); and BCSCORE from Population Crisis Committee (1987).

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