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Effects of Family Income and Education on Fertility: Cross-Section Results, Philippines, 1968

by

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Introduction and Summary

It seems to be the general view that, whatever the underlying mechanism or motivation, rising family income and educational levels tend to bring about lower fertility.[2/] Accordingly, as incomes increase in the course of economic development, one would then expect that rates of population growth would fall towards the lower rates observed for the developed countries. At the low income levels of the LDC's, however, it may well be that a major effect of rising incomes is to enable women to acquire better health and to have greater access to medical facilities and prenatal care --the result of which is to permit them to bear more children.

If, as seems reasonable, the expected negative response of fertility to higher income and education becomes effective only beyond some level of income (below which the response is positive on account of better health and nutrition), rising income levels during the early phases of development would result in higher birth rates.

Only when a sufficient proportion of the population has reached income levels exceeding the threshold would further increases in income have a negative effect on fertility.

This paper reports some regression results using data from the National Demographic Survey of 1968 which indicate that, indeed, the marginal effects of family income and education turn from positive to negative at some threshold level of income. A woman's fertility (defined as the number of live children born to her) is considered to be a linear function of her age at marriage, duration of marriage, family income and educational level. Compared to the usual urban-rural classification, differentiation by income level yields statistically superior results that conform to expectations.

The Data

The 1968 National Demographic Survey, conducted by the Bureau of the Census and Statistics and the University of the Philippines Population Institute, covers 7,237 households. Records are complete for 97.7 per cent of this number, from which the sample used in the regressions was selected.

For our purposes we included only single-family households and further selected only families of the so-called "nuclear" type, i.e. one consisting of a couple and any unmarried children living with them, possibly including unmarried relatives but excluding parents or grandparents of either spouse. Finally we considered only those families where the wife had been married only once and was under 45 years of age at the time of the survey. All these qualifications yielded a sample size of 3,833 women.

Regression Results

Twenty-seven regression equations are reported below in tabular form, grouped in sets of three each. The symbols have the following meanings.

NB: number of children the woman has had (live births only)

AM: age of the woman when she got married, in years

DM: duration of the marriage, in years

FY: annual family income, in thousand pesos

EH: educational level of the head of the household, coded as follows--

0 = no schooling

1 = finished from one to four years of grade school

2 = five to seven years of grade school

3 = one to three years of high school

4 = high school graduate

5 = one to three years of college

6 = college graduate

s : standard error of estimate

S.D.: standard deviation

r(NB,-): coefficient of correlation between NB and some other variable

The dependent variable is NB throughout. In each set, the first equation involves AM, DM, FY and EH as explanatory variables; the second omits EH while the third omits FY. The t-values are given in parentheses underneath regression coefficients. We take EH as a proxy for the educational level of the wife, since we may expect that the two are highly correlated.

A. All (sample size = 3833, urban and rural combined)

const.	AM	DM	FY	EH	$\bar{R}^2$	s
1.986	-.0362 (-4.16)	.2668 (51.51)	-.0076 (-1.728)	.0083 (0.403)	.452	2.029
1.991	-.0354 (-4.18)	.2666 (51.67)	-.0072 (-1.681)		.452	2.029
1.992	-.0363 (-4.17)	.2663 (51.49)		.0009 (0.045)	.452	2.030

	AM	DM	FY	EH	NB
Mean :	19.82	12.71	2.76	2.34	4.659
S.D. :	4.10	6.73	7.69	1.69	2.742
r(NB,-):	-.267	.671	-.006	-.115	1.00
r(FY,-):	.047	.026	1.00	.209	-.006

B. Urban (sample size = 2083)

const.	AM	DM	FY	EH	/ $\bar{R}^2$	s
2.401	-.0417 (-3.52)	.2574 (35.93)	-.0107 (-1.664)	-.0519 (-1.864)	.444	2.059
2.341	-.0467 (-4.04)	.2588 (36.30)	-.0139 (-2.24)		.443	2.060
2.416	-.0417 (-3.52)	.2563 (35.93)		-.0644 (-2.40)	.444	2.059

	AM	DM	FY	EH	NB
Mean :	20.37	12.56	3.50	2.99	4.592
S.D. :	4.21	6.81	7.34	1.76	2.762
r(NB,-):	-.304	.662	-.006	-.167	1.00
r(FY,-):	.042	.053	1.00	.263	-.006

C. Rural (sample size = 1750)

const.	AM	DM	FY	EH	/ $\bar{R}^2$	s
1.409	-.0280 (-2.18)	.2792 (37.29)	-.0016 (-0.271)	.1700 (4.27)	.468	1.981
1.588	-.0213 (-1.666)	.2759 (36.87)	.0001 (0.010)		.463	1.991
1.408	-.0280 (-2.19)	.2792 (37.30)		.1693 (4.26)	.468	1.980

	AM	DM	FY	EH	NB
Mean :	19.17	12.89	1.88	1.57	4.738
S.D. :	3.88	6.62	8.00	1.21	2.717
r(NB,-):	-.217	.681	.000	-.027	1.00
r(FY,-):	.022	.001	1.00	.067	.000

D. Urban (sample size = 617; FY < 1.500)

const.	AM	DM	FY	EH /	$\bar{R}^2$	s
1.967	-.0511 (-2.47)	.2655 (21.14)	.3876 (1.897)	.0216 (0.339)	.464	1.965
2.004	-.0506 (-2.45)	.2647 (21.50)	.3930 (1.931)		.465	1.964
2.249	-.0495 (-2.38)	.2650 (21.06)		.0311 (0.487)	.462	1.969

	AM	DM	FY	EH	NB
Mean :	19.66	12.44	0.84	1.88	4.632
S.D. :	4.00	6.70	0.39	1.28	2.686
r(NB,-):	-.255	.678	.017	-.144	1.00
r(FY,-):	.060	-.053	1.00	.091	.017

E. Urban (sample size = 1466; FY $\geq$ 1.500)

const.	AM	DM	FY	EH /	$\bar{R}^2$	s
2.488	-.0381 (-2.62)	.2546 (29.03)	-.0106 (-1.601)	-.0833 (-2.44)	.437	2.095
2.365	-.0465 (-3.30)	.2567 (29.35)	-.0141 (-2.18)		.435	2.099
2.494	-.0379 (-2.61)	.2533 (28.99)		-.0953 (-2.85)	.437	2.096

	AM	DM	FY	EH	NB
Mean :	20.66	12.60	4.62	3.45	4.575
S.D. :	4.26	6.86	8.50	1.72	2.794
r(NB,-):	-.324	.656	-.005	-.191	1.00
r(FY,-):	.018	.062	1.00	.208	-.005

F. Rural (sample size = 1319; FY < 1.500)

const.	AM	DM	FY	EH /	$\bar{R}^2$	s
1.124	-.0214 (-1.477)	.2645 (31.10)	.4590 (3.15)	.1344 (2.54)	.449	1.940
1.290	-.0205 (-1.407)	.2613 (30.99)	.5223 (3.63)		.447	1.944
1.400	-.0226 (-1.551)	.2659 (31.21)		.1626 (3.12)	.445	1.947

	AM	DM	FY	EH	NB
Mean :	19.07	12.62	0.68	1.40	4.553
S.D. :	3.80	6.55	0.37	1.04	2.615
r(NB,-):	-.191	.665	.099	-.037	1.00
r(FY,-):	-.029	.036	1.00	.162	.099

G. Rural (sample size = 431; FY ≥ 1.500)

const.	AM	DM	FY	EH /	$\bar{R}^2$	s
1.600	-.0375 (-1.388)	.3076 (19.33)	-.0070 (-1.016)	.1178 (1.703)	.515	2.047
1.629	-.0246 (-0.946)	.3053 (19.21)	-.0072 (-1.129)		.513	2.052
1.556	-.0378 (-1.399)	.3083 (19.37)		.1190 (1.719)	.514	2.048

	AM	DM	FY	EH	NB
Mean :	19.48	13.74	5.56	2.10	5.306
S.D. :	4.13	6.76	15.55	1.52	2.940
r(NB,-):	-.308	.717	-.067	-.102	1.00
r(FY,-):	.021	-.040	1.00	-.004	-.067

H. All (sample size = 1936; FY < 1.500)

const.	AM	DM	FY	EH	$\bar{R}^2$	s
1.397	-.0318 (-2.68)	.2652 (37.71)	.4435 (3.79)	.0884 (2.21)	.454	1.948
1.506	-.0303 (-2.56)	.2627 (37.81)	.4873 (4.23)		.453	1.950
1.663	-.0315 (-2.64)	.2661 (37.74)		.1142 (2.89)	.450	1.955

	AM	DM	FY	EH	NB
Mean :	19.26	12.56	0.73	1.56	4.578
S.D. :	3.87	6.60	0.38	1.14	2.637
r(NB,-):	-.211	.669	.073	-.072	1.00
r(FY,-):	.015	.004	1.00	.167	.073

I. All (sample size = 1897; FY ≧ 1.500

const.	AM	DM	FY	EH	$\bar{R}^2$	s
2.349	-.0372 (-2.90)	.2661 (34.57)	-.0093 (-2.02)	-.0725 (-2.50)	.457	2.094
2.280	-.0457 (-3.69)	.2678 (34.87)	-.0107 (-2.32)		.456	2.097
2.333	-.0371 (-2.89)	.2654 (34.48)		-.0794 (-2.76)	.456	2.096

	AM	DM	FY	EH	NB
Mean :	20.40	12.86	4.83	3.15	4.741
S.D. :	4.26	6.86	10.53	1.77	2.844
r(NB,-):	-.329	.672	-.022	-.196	1.00
r(FY,-):	.014	.028	1.00	.113	-.022

The means and standard deviations of the variables are given for each set, as also the correlation coefficients between them and NB and FY. Note that the entries in the last column pertain to NB.

In set A, based on all selected observations, AM and DM have the expected signs--they do in all the regressions reported here--but EH is not significant and FY is barely so at the 10 per cent level. FY and EH are only moderately correlated, r(FY,EH) = .209, while NB and FY are practically uncorrelated. There is a slight negative correlation between NB and EH.

An urban-rural classification of the data gives sets B and C.[3/] The coefficients have the expected signs in B for urban families but not in C for rural families. FY is not significant in the latter, and the marginal effect of EH is positive, which appears surprising at first glance.

A further breakdown of the urban sample using FY $\gtreqless$ 1.5 as the criterion gives sets D and E. The figure 1.5 would be somewhat greater than the median FY (the survey results indicate that 40.4 per cent of families had FY < 1.0 and 24.5 per cent fell in the range 1.0 $\leqq$ FY < 2.0) but is otherwise arbitrary. At the low income levels of families in D where FY < 1.5, the marginal effect of FY on NB is positive. For the higher-income families in E, this is negative as expected, as is also EH.

A similar breakdown of the rural sample yields sets F and G. As in the urban case, the marginal effect of FY is positive for low-income families; that of EH is also positive. For upper-income families in G, the coefficient of FY is negative even if not significant at the customary levels. In contrast to the case of higher-income urban families, however, G shows EH with positive coefficients. This result is similar to the one observed earlier for all rural families and would presumably call for the same explanation.

We observe that there is no correlation between FY and EH among higher-income rural families G (cf. sets D, E and F where r(FY, EH) = .091, .208 and .162 respectively) and that the mean FY in G is higher than that in E (5.66 vs. 4.62). Also, the mean EH in G, 2.10, corresponds to a level only slightly better than that of an elementary school education--substantially lower than the corresponding figure for upper-income urban families E, which is 3.45.

What is suggested by these observations is that the positive marginal effect of EH among higher-income rural families might be due to the possibility that at their relatively low educational levels, better knowledge of health practices resulting from higher EH enables their women to bear more children. The constraint is not the level of family income as is the case with lower-income families, but simply the level of education.

Another point that calls for an explanation about the set G is that the regression coefficients of DM are close to 0.31, which is substantially higher than the average figure of 0.26 observed in sets D, E and F. This may be due to a relevant variable correlated with DM but omited in the specifications, whose effect is being attributed to DM in G. Such a possibility is suggested by the higher coefficients of determination in G, compared to those in D, E and F.

Pursuing the above hypothesis, one likely candidate for the omitted variable is the specific knowledge gained from more years of marriage that enables the mother to give herself better prenatal care. We expect the extent of this knowledge to be correlated with DM among lower-educated wives, since such knowledge is specific and not covered by formal education at the grade-school level. Among upper-income rural wives, this knowledge can become effective because the level of family income is not a constraining factor, unlike in the case of lower-income urban and rural wives. As for upper-income urban wives, their relatively higher educational levels preclude the specific knowledge gained from longer DM to have a separate and additional effect on NB. In other words, it is only in the case of upper-income rural wives (whose education is low) that the specific knowledge correlated with DM is translated into higher NB. In the other three cases, this variable is ineffective either because FY is a constraining factor or because the level of education is already high.

Ignoring complications of omitted variables, consider now the two subsamples obtained from all the observations by dividing them according to FY $\gtrless$ 1.5 (sets H and I). All coefficients are now significant and with the expected signs: at low income levels, both FY and EH have positive marginal effects; at higher income levels, negative. Although upper-income women marry later than lower-income, they have more years of marriage; the difference in AM + DM (equal to current age at the time of the survey) between them is almost a year-and-a-half, due presumably to better health or access to medical care among those with higher incomes. It is interesting that the coefficients of DM are practically the same in the two sets, even though the coefficients of AM are somewhat larger in the set I for higher-income women.

Qualifications and Conclusion

The use of linear specifications for determining fertility is not without defects when one of the explanatory variables is DM, considering that the risk of childbearing varies nonlinearly with age. It is also difficult to interpret cross-section results when fertility and age patterns of marriage have been changing.[4/] The main purpose of this paper is not to arrive at numerical estimates of particular coefficients, however, but to present the hypothesis that the usually assumed effects of higher income and education on fertility are realized only when these variables exceed certain minimum levels.

If the Philippine case is typical of the LDC's, the threshold level of income appears to be in the neighborhood of the median income level. This is disturbing from a population planning viewpoint, for it indicates that birth rates are likely to be higher before they get lower during the earlier stages of development unless large-scale family planning programs are undertaken.

Footnotes

1. This is part of the preliminary work in a research project, under the general direction of my colleague Agustin Kintanar, Jr., which has as one of its objectives the construction of a demographic-economic model of the Philippines. The writing of this paper has benefited from discussions with Romeo M. Bautista, Mercedes B. Concepcion, Patricia K. Encarnacion and Mahar Mangahas. Computations were done at the University of the Philippines Computer Center with the excellent assistance of Porfirio Sazon, Jr.

2. See, for example, [2, p. 353] and [3].

3. Inclusion of a dummy variable for urban vs. rural in the set A does not yield significant results for the dummy variable. Cf. [1].

4. The average age at marriage appears to have risen since the turn of the century, and overall fertility seems to have fallen [4].

References

/‾1_7 Harman, A.J., "Fertility and Economic Behavior of Families in the Philippines," RAND Corporation RM-6385-AID, September 1970.

/‾2_7 Jones, G.W. "Effect of Population Change on the Attainment of Educational Goals in the Developing Countries," in Rapid Population Growth, Johns Hopkins Press, 1971.

/‾3_7 Simon, J.L., "The Effect of Income on Fertility," Population Studies, vol. 23, no. 3, November 1969, pp. 327-341.

/‾4_7 Smith, P.C., "The Timing and Incidence of Marriage in the Philippines: Temporal Change and Sub-Group Differentials in 1968," Population Institute, University of the Philippines, February 1972 (mimeo.)