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Income and Other Factors Influencing Fertility in China

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China has achieved remarkable success in increasing life expectancy and reducing fertility. Fertility and mortality rates have declined much more rapidly than in most developing countries, to levels only slightly above those in the developed world. Actual rates may be slightly higher than the official rates based on the vital registration system, due to underregistration. But even allowing for some underestimation, the comparative figures in Table 1 illustrate China's success.

Fertility rates are generally lower in high-income countries, and life expectancy longer, as Table 1 suggests. But the relationship between income and these rates is far from a perfect one because many other factors—including level of education, the availability of health services and of contraceptives, and, in the case of fertility, cultural norms—also make a difference. Figure 1 illustrates the relationship between per capita income and fertility in developing countries. China's distance from the curve indicates how low the fertility of its population is in relation to its estimated per capita income.[1]

There is no question that much of China's success is due to concerted government efforts. Low fertility is in part the outcome of government efforts to raise age at marriage, to provide free contraceptives and abortion, to use local birth quotas and peer pressure to discourage pregnancy, and, increasingly, to provide economic incentives and disincentives.[2]

We present evidence below, however, that government programs, although important, have not operated in a vacuum. We have data on rates of population increase for the 29 administrative regions of China and on income and other socioeconomic indicators for those regions. We also have data on yearly vital rates since 1972 by prefecture for one province; and income data and vital rate data (the latter for two separate years) by county for another. These data allow us to consider several important questions regarding future

TABLE 1 Selected development indicators, China and other countries

	Per capita GNP, 1980 (1980 US$)	Total fertility rate, 1980	Life expectancy, 1980 (years)
Low-income economies (excl. India and China)	230	6.1	57
India	240	4.9	52
Sri Lanka	270	3.6	66
China	290	2.5	67
Pakistan	300	6.1	50
Indonesia	430	4.5	53
Thailand	670	4.0	63
Middle-income economies	1,400	4.8	60
Hong Kong	4,240	2.2	74
Nonmarket industrial economies	4,640	2.3	71
Industrial market economies	10,320	1.9	74

SOURCE: For countries other than China and for country groupings, *World Development Report 1982* (*WDR82*) (Washington, D.C.: The World Bank, 1982). For China, *WDR82* for GNP, and Hill (1983) for fertility and life expectancy. *WDR82* defines "low-income economies" as those having a per capita income of $410 or less in 1980; 33 such economies are included in *WDR82* tables. The "middle-income" economies are those developing countries that have per capita incomes between $410 and $4,510; this group includes 62 countries. The nonmarket industrial economies have incomes ranging from $3,900 to $7,180 and the industrial market economies have incomes ranging from $4,880 to $16,440.

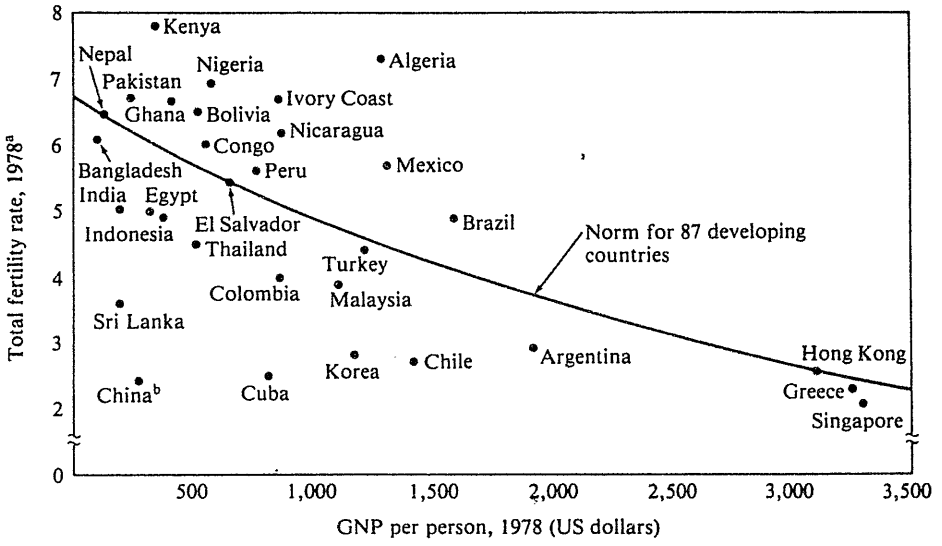
population policy in China. Our principal concern is whether future economic growth and liberalization can be expected to reinforce government programs to reduce fertility (as has generally been the case elsewhere), or whether these developments might weaken policies that have contributed to an already low level of fertility. Second, we provide a tentative assessment of the impact of provincial one-child-family programs on fertility. Our data allow us to address these questions, but only in a preliminary and limited way. Our conclusions are suggestive rather than definitive.

Subsequent to completion of this article in early 1983, China's State Statistical Bureau released early findings from the 1982 census that included information on crude birth rates by province in 1981. In order to test whether the weakening relation over time between income and fertility that we report here continued into 1981 we undertook additional analysis, reported in the Postscript, using the more recent and improved data available from the census. Also recently available are estimates by province of per capita income in rural and urban areas; this allows a separation of the effects of change in rural and urban income on fertility that strengthens and extends our initial conclusions.

A model incorporating policy and socioeconomic factors

There is a longstanding debate over the relative importance to fertility levels of a society's general level of development and of government programs spe-

FIGURE 1 Fertility in relation to income: developing countries, 1978



[a]The total fertility rate indicates the average number of children that would be born to each woman in a population if each were to live through her childbearing years (usually considered ages 15-49) bearing children at the same rate as women of those ages actually did in a given year.
[b]Estimated fertility and GNP for China are for 1979.

SOURCE: Updated from Birdsall (1980), Figure 1-3B.

cifically aimed at reducing fertility. This debate provides useful insights into interpreting available data from China, while, at the same time, China provides interesting if complicated additional evidence concerning the general issues.

China exemplifies the possibility of reducing fertility even in a poor, largely rural society, given a vigorous government program to reduce births. However, few countries at China's income level have governments that can draw on comparable political and organizational capabilities, or social and economic arrangements so well designed to accept and spread new norms and to enforce compliance with them. Has, then, the government program been the dominant contributor to the fertility decline? In the face of a very strong program, have income growth and associated socioeconomic change been relevant at all?

To address these questions, we use a simple model explaining current levels of fertility and changes in fertility over time. The fertility level at a given time is assumed to be some function both of a variety of socioeconomic factors and of specific government programs designed to affect fertility.[3] Even though it seems intuitively likely that, all else equal, higher income levels would lead to larger family sizes, other things are not equal, and higher levels of socioeconomic development generally reduce fertility. This is so both because development raises the costs of children (as the wage of adults, particularly women, relative to children increases, and as employment opportunities for women become less compatible with childbearing) and because it decreases their economic utility (as alternative means of support for parents in old age

are provided and as children contribute relatively less to family income). Government programs reduce fertility by lowering the cost of contraception so that parents who wish can restrict family size easily. In the case of China, the government has also encouraged late marriage[4] (which reduces crude birth rates), promulgated a small-family norm, and used a variety of social and financial incentives and disincentives to reduce fertility.[5] Obviously, the two broadly defined effects, socioeconomic factors and government programs, can interact with each other; for example, government programs are likely to be more effective where socioeconomic conditions reinforce government objectives.

Similarly, the *change* in fertility during a period is likely to be affected both by the development level at the start of the period and by inputs to the government birth planning program. (Changes in development indicators and in government programs throughout the period could also influence fertility, and their effects could be examined were time series data on them available in addition to a time series on fertility.)

Unfortunately, we have no direct measures of inputs to the birth planning campaign in various regions, as distinct from other indicators of socioeconomic level. Without data on birth planning inputs, we cannot test the extent to which these inputs have mattered, though it is clear that for the country as a whole they have been important, based on China's low fertility compared with other developing countries. We do, however, have information on which of the 29 provinces, autonomous regions, and municipalities had implemented a specific program of incentives and disincentives to discourage births by 1979.

We use the available cross-sectional data on income and several other indicators of socioeconomic development, and on incentives, to estimate several sets of equations of the following form, using ordinary least squares regression:

$$\left.\begin{array}{r}\text{fertility}\\ \text{or}\\ \text{change in fertility}\end{array}\right\} = A + B_i X_i + CN + E \quad ,$$

where A is a constant term, the Xs are a series of development indicators, the Bs are the estimated coefficients of the indicators, N is an indicator variable indicating regions with an incentive program, C is the estimated coefficient on the incentive indicator, and E is the unexplained error. To the extent that birth planning program inputs are uncorrelated with the socioeconomic indicators and with the incentive variable, their effects will be included in the unexplained residual.[6]

Obviously cultural and institutional factors can also influence differences in fertility across provinces and change in fertility over time. These factors are necessary parts of any complete explanation of fertility, but we cannot measure and test their effects systematically. As with the birth planning inputs, to the extent these factors are uncorrelated with the included variables, their effects will be included in the unexplained residual.

Data

We have information (made available to the World Bank economic mission to China in the fall of 1980) at three levels—provincial, prefectural, and county. For each of the 21 provinces, five autonomous regions, and three major municipalities into which the country is administratively divided, we have information on the rate of natural increase in 1978 and 1979, on a proxy for per capita income in 1979,[7] on the percent of the population living in urban areas, on population density in rural areas, and on the proportion of relatively low-income production teams in each province (compiled by the economic mission from various sources). For the 12 prefectures of the northwestern province of Gansu, we have crude birth and death rates for each year between 1972 and 1979 and a proxy for income per person in 1979. For the 68 counties of the central coastal province of Jiangsu, we have data on crude birth and death rates in 1975 and 1979, a proxy for income per person in 1979, and information that four of the counties are urban. Table 2 shows the means and standard deviations of the variables used in the analysis.

The vital rates are based on the vital registration system, which though imperfect is probably more complete than in most other developing countries.[8] In urban areas, households register with the local police station; registration is probably close to universal since urban ration cards for food and cloth are obtained on the basis of the registers. In rural areas, permanent registers are kept with the production brigade or at the commune center. Since food is grown and distributed within the village itself, food distribution is less closely tied to the registration system, and there may be some undercounting of births. This may have been particularly the case in the last few years of the 1970s, in view of increasing central government pressure on local cadres to achieve reduced fertility. It is thus possible that actual birth rates are higher in rural areas relative to urban areas than reported rates and were higher in the late 1970s relative to the mid–1970s than reported. Although some underreporting is likely, it is probably greatest in the poorer regions; our results would thus tend to understate any negative effect of income level on vital rates.

Use of the total fertility rate instead of the crude birth rate would be preferable were it available. Since the crude birth rate is affected by age composition, provinces with a larger proportion of women in childbearing ages will have higher crude birth rates even for the same average number of children per woman. However, crude birth rates are highly correlated with the total fertility rate across countries,[9] and if anything, we would expect differences in age composition across regions within one country to be smaller than differences across countries since countries will have had greater past variation in fertility and mortality rates.

Prior to publication of tabulations from the 1982 census, data on birth rate by province were unavailable. For the province-level analysis, therefore, we constructed an estimated crude birth rate by adding to the rate of natural increase for each province an estimated crude death rate; the death rate is based on province-specific life expectancy and is estimated by applying to every

TABLE 2 Means and standard deviations of variables used in fertility analysis

Variable	Mean[a]	Standard deviation
Province-level data, n = 29		
Rate of natural increase, 1964[b]	2.93	.647
Rate of natural increase, 1978	1.30	.436
Rate of natural increase, 1979	1.21	.344
Estimated crude birth rate, 1975[c]	8.98	1.84
Rural income per capita proxy, 1979[d]	94.7	34.0
Natural logarithm of rural income per capita proxy, 1979[d]	4.50	.321
Proportion of population urban, 1979	.175	.157
Indicator, provinces with official incentives to reduce births	.24	
Indicator, autonomous region (takes value 1 for autonomous regions, 0 elsewhere)	.172	
Natural logarithm of total income per capita estimate (US$), 1979	4.91	2.78
Agricultural product per capita as percent of national average	130	55.5
Industrial product per capita as percent of national average[e]	150	222
Measure of rural population density	9.07	4.65
Measure of amount of inequality[d]	.860	.39
Actual life expectancy minus predicted life expectancy[c]	.0019	2.96
Prefecture-level (Gansu) data, n = 12[f]		
CBR 1972	37.3	3.72
CBR 1973	35.0	5.25
CBR 1974	28.0	6.00
CBR 1975	21.8	4.52
CBR 1976	18.3	3.71
CBR 1977	17.9	3.53
CBR 1978	17.6	2.34
CBR 1979	16.9	1.77
Income per capita proxy, 1979	59.0	23.0
Natural logarithm of income proxy, 1979	4.01	.377
County-level (Jiangsu) data, n = 68		
CBR 1975	18.1	3.59
CBR 1979	14.8	2.67
CBR 1975 − CBR 1979	3.34	3.72
CBR 1975 − CBR 1979 ÷ CBR 1975	.162	.176
Income per capita proxy, 1979	77.7	41.6
Natural logarithm of income proxy	4.21	.562
Urban indicator (for 4 county towns)	.059	.237

NOTE: Rates of natural increase and crude birth rates (CBR) are per thousand population per year.
[a] Unweighted means of area-level data. They are not population means.
[b] 27 province-level units only.
[c] See text. Applies to 24 provinces only.
[d] See text for explanations of income and inequality measures.
[e] 28 province-level units only.
[f] Data on all variables available for 12 of 13 prefectures.

province the reported age distribution for the country as a whole.[10] We also show results using the rate of natural increase as the dependent variable. As a measure of fertility, this is far from ideal since it reflects death as well as birth rates. However, for the 68 counties and 12 prefectures where a comparison is possible, the range of birth rates is much larger than the range of death rates; as a result the rate of natural increase reflects primarily the birth rate. In our

prefecture- and county-level data, the correlation of birth and natural increase rates is .90 for the prefectures and .98 for the counties in 1979. For the provinces, birth rates and rates of increase are also probably highly correlated, with less variation in the increase rates, since death rates vary less than birth rates. Again this means that use of the natural increase rate provides a strong test of any hypothesis regarding effects of income on fertility.

Finally we show results using several different measures of income. The variable labeled rural income per capita is the amount of yuan distributed to workers on communes, per worker. It excludes private income (which is increasingly important), communal income that is retained for communal expenditures (capital investments, health outlays, etc.), and the wage and salary income of those working in cities. Thus, it does not by any means represent all income generated, nor does it represent consumption, insofar as much consumption of services occurs through the commune system and is not directly paid for by individuals. Nonetheless, it is a reasonable proxy for income given two assumptions: the proportionate amount of income generated outside of the communes is not too different across the units concerned; and the proportionate amount retained, and thus not distributed, is not too different. These assumptions are probably only partially valid; by 1979, the responsibility system, under which farming on private plots was allowed, had been instituted, and the result was probably to increase rural production more in areas closer to urban markets. However, it should be noted that in the estimates below, coefficients on the income variable will be biased toward zero by errors in the measurement of income, so that a coefficient which is significantly different from zero, either positively or negatively, represents a stronger finding than if income were well measured.

The variable labeled total income per capita is an estimate combining the rural income variable with a figure for urban income per capita that is the same across all provinces. This variable takes into account differences among provinces in the proportion of their urban population.

In addition, we use variables based on reported total agricultural and total industrial production by province. These are reasonable proxies of household income only under the assumption that production and consumption are highly correlated within regions. Such is probably the case for agricultural production, since taxation of agriculture is light and incomes of commune members depend directly on the productivity of their commune. It is less the case for industrial production, since provinces do not control the end uses of most of the industrial output produced within their borders. On the other hand, industrial output could reflect wage levels, which tend to be higher in the nonagricultural sector.

There are substantial interprovincial differences in output per capita and in reported rural distributed income per capita. For example, the range in agricultural output and in rural income as a percentage of the national average is from about 200 in the outlying areas of the three major municipalities to about 70 in Gansu and Guizhou. The range is even greater for industrial output—from 36 in Guizhou to over 1,000 in Shanghai.

Results of analysis

Three major conclusions summarize our analysis.

Conclusion 1 Differences in level of development across regions of China are associated with differences in fertility levels. China follows the general pattern: fertility is lower in high-income regions.

Table 3 shows the results of various regressions of the crude birth rate in selected areas (or rate of natural increase in the case of the cross-section of provinces) on several income per capita variables. The results are straightforward. The rural income variable alone accounts for as much as 45 percent of the variance in crude birth rates within one province (column 1). Across provinces (columns 2–10) income accounts for between 17 and 38 percent of the variance in the dependent variable, depending on the particular set of variables used and the form of the equation. The elasticity of the rate of population increase with respect to income is about −.4 (column 6). As expected, the agricultural output measure is more closely tied to lower birth rates than industrial output, as indicated by the size of the coefficients (compare column 4 to 5 and column 9 to 10).[11] In general, the various income measures are more closely linked to the estimated crude birth rate than to the rate of natural increase; this is not surprising since we know from the results below regarding life expectancy that higher income is associated with lower death rates and thus, for given birth rates, increases the overall rate of population growth.

It would be incorrect to conclude from these results that it is higher income per se that lowers fertility. It is more likely that in China, as in most other countries, income is highly correlated with a number of other variables (on which we have no data here)—such as the educational attainment of adults and wage rates and employment opportunities for women[12]—that more directly influence fertility by raising the "price" of children to parents. Indeed, if all these factors could be controlled for, the pure "income" effect is generally expected to be positive. On the one hand, it is not surprising that the combination of income and price effects captured by the per capita income variables is negative in China; this is also the case across countries, as shown in Figure 1, and within countries, in many of which the fertility of the poor is higher.[13] On the other hand, given that there is much greater variation in incomes and fertility across countries, the power of the income variable in explaining fertility differences within China is notable. The amount is comparable to the 40 percent explained among the 87 developing countries on which the line in Figure 1 is based.[14] Thus even in a country with an active government policy to reduce fertility, a substantial proportion of differences in fertility can be attributed to the general level of development, captured by the per capita income variable.

Table 4 shows results of regressions for the Jiangsu counties (columns 1–2) and for the provinces (columns 3–7) in which the effects of other measures of socioeconomic development and of China's fertility policy are tested. Once income is taken into account, using the rural income variable, there is, surprisingly, only weak evidence that fertility is lower in urban areas. The indicator

TABLE 3 The effect of income per capita on birth rates and rates of natural increase (standard errors in parentheses)

	Dependent variable									
		Province-level analysis								
	Crude birth rate, 1975 (Jiangsu counties)	Rate of natural increase, 1979				Natural logarithm of rate of natural increase, 1979	Estimated crude birth rate, 1979			
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	47.3	3.693	3.333	1.632	1.320	2.04	72.3	62.9	28.5	22.7
Natural logarithm of total income per capita		−.505* (.218)					−10.5* (3.48)			
Natural logarithm of rural income per capita	−6.40* (0.879)		−.471* (.185)			−.420* (.150)		−9.35* (2.93)		
Agricultural product per capita as percent of national average				−.003* (.001)					−.058* (.016)	
Industrial product per capita as percent of national average					.000753* (.00027)					−.014* (.004)
R^2	.45	.17	.19	.27	.23	.25	.29	.32	.38	.35

NOTE: An asterisk indicates that the coefficient is significant at least at the 5 percent level.

TABLE 4 Birth rates and socioeconomic indicators (standard errors in parentheses)

	Dependent variable						
	68 counties of Jiangsu		Province-level analysis				
	Crude birth rate, 1975	Crude birth rate, 1979	Rate of natural increase, 1977		Estimated crude birth rate[a]		
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	43.60	30.40	3.64	3.12	54.3	17.4	22.2
Natural logarithm of rural income	−6.06* (.870)	−3.11* (.802)	−.551* (.246)	−.461 (.394)	−7.20* (2.95)		−1.38 (−6.90)
Indicator for county towns	−2.76* (1.39)	−1.23 (1.27)					
Indicator for provinces with official incentives to reduce births			−.362* (.151)	−.215 (.186)	−4.49* (2.23)	−1.21 (2.64)	−1.91 (3.20)
Indicator for autonomous regions				.367* (.178)		2.46 (2.45)	3.32 (3.00)
Proportion of population in urban areas			−.644 (.555)	−.397 (.674)		−10.3 (6.18)	−6.77 (11.3)
Measure of rural population density[b] (increases with density)				−.000422 (.016)			.133 (.261)
Measure of amount of inequality[b] (increases with greater inequality)				(.294) .0845		(2.79) 6.06*	(5.23) 5.65
Actual life expectancy minus predicted life expectancy[c]			−.038 (.021)	−.0172 (.021)			
R^2	.42	.51	.47	.61	.43	.51	.52

NOTE: An asterisk indicates that the coefficient is significant at least at the 5 percent level.

[a] See text for explanation of how CBR for 24 provinces was estimated, using provincial data on the rate of natural increase (1979) and on life expectancy (1973–75).

[b] See text.

[c] Predicted life expectancy is based on a regression for 24 provinces of life expectancy on the natural logarithm of income. Results were: predicted life expectancy = 34.9 + 6.77(lnY); F = 12.9, R^2 = .37. The coefficient on income was significant at the 5 percent level.

for county towns in Jiangsu is negative and significant (column 1) in 1975, though not in 1979. Across provinces the coefficient on percent of population in urban areas has a negative sign but is not statistically significant (columns 3, 4, 6, 7). This is also the case even when no other variables are entered except income and urbanization, and holds regardless of the income variable used (supporting regressions not shown). Official data on crude birth rates for the nation as a whole do indicate a substantial difference between urban and rural rates: for example, for 1971 the rates were 21.9 and 31.9 births per thousand for urban and rural areas respectively, and for 1979 were 13.9 and 18.5.[15] The overall weakness of the urban variables in the province-level regressions could be real, that is, because lower fertility in more highly urbanized provinces is entirely due to higher income (so that there is no "urban" effect per se once income is controlled for[16]). It is plausible that the urban populations in other countries enjoy many amenities—particularly access to educational, health, and family planning services—that are not available to those in rural areas, and that are not well reflected in urban–rural income differences. In contrast, China is notable for the extent to which birth planning and health services have reached rural areas. The alternative explanation is that there are real differences in fertility, even controlling for income, but that underregistration of births in rural areas is greater than in urban areas, and the dependent variable is therefore artificially low for rural areas.

Several variables that capture the effects of the Chinese policy aimed at reducing fertility are also included in Table 4. The regressions reported in columns 3–7 include an indicator variable to test the effect of having a policy of financial incentives and disincentives. By the beginning of 1980, seven of the province-level units had formally instituted such a policy. Typical incentives for one-child families who pledge to have no more children are provision of a monthly subsidy (in Sichuan 8 percent of the average worker's wage) until the child is 14 years old; provision of private plots and housing equivalent to a two-child standard, and of bonus workpoints in rural areas; and priority for single children in admission to schools and in obtaining factory jobs. Some areas also have disincentives that apply at the birth of a third child; they include deduction of wages or workpoints (amounting to 5 percent in Hunan and 10 percent in Tianjin and Shanghai), payment by parents of medical expenses for a third child (Anhui), and a higher price for a third child's grain ration (Anhui and Sichuan).[17] The variable probably fails to capture the direct effect of incentives on the behavior of couples, since the systems were only beginning to be implemented in 1979.[18] Promulgation of incentives is, however, likely to reflect relatively greater political strength of the birth planning campaign in provinces that moved rapidly to implement such systems.

It is not true, however, that having such a system is in itself a guarantee of low population growth or low fertility. Both Guangdong and Anhui, for example, have incentive systems and rates of growth above the national average, the latter presumably due to its low per capita income. It is unlikely

that incentive systems were simply introduced in those areas where their political success was assured. As Table 4 shows, the incentive variable has the expected negative effect controlling for income (columns 3–7) though it loses statistical significance when variables other than income are included.[19]

An indicator variable for the five autonomous regions is used because in those regions, mostly populated by minority ethnic groups, the central government has not pushed the birth planning campaign. Autonomous regions do have higher population growth, controlling for income; the rate of natural increase is higher by .37 (column 4) and the crude birth rate by 2 to 3 points per thousand (the official reported crude birth rate for the country as a whole was 17.9 per thousand in 1979). Again, however, the effect is not statistically significant when other variables in addition to income are included.

A measure of rural population density is included because the birth planning campaign has emphasized the scarcity of available land as a reason for couples to have fewer children. The variable is the ratio of the rural population in each province to cultivated land in 1979. It has, however, no apparent effect.

Table 4 also shows the results of including a measure of inequality in the province-level analysis. The measure is constructed using information on the proportion of low-income production teams in each province, controlling for average income. It reflects the extent to which a greater proportion of the population is living at low levels of consumption than would be expected given average provincial income. It has the expected positive effect on fertility (columns 6 and 7) and is statistically significant in the equation from which rural income is excluded (column 6).[20] The result reinforces the conclusion that fertility is, in China as elsewhere, lower where living standards, broadly defined, are higher.

Conclusion 2 Income differences help to explain differences not only in fertility levels but also in rates of fertility decline between 1975 and 1979 among counties of Jiangsu Province. Counties with higher income experienced greater fertility decline, controlling for the 1975 crude birth rate.

Table 5 shows the results of regressing the difference between the 1975 and 1979 birth rates on income (column 1) and on income and the 1975 crude birth rate (column 2). The income variable has a negative sign in column 1; crude birth rates fell more in lower-income regions on a point-by-point basis. But this was largely because point reductions in rates tend to be greater from higher levels. Once the 1975 starting point is controlled for, income has a positive effect on the crude birth rate decline. This reinforces the first conclusion. The level of development had not only a negative effect on fertility levels in 1979, but also a positive effect on the amount of fertility decline between 1975 and 1979.[21]

In column 3, the dependent variable is the percentage decline in the crude birth rate over the period, rather than the difference. The income variable retains its positive sign but becomes statistically insignificant.

TABLE 5 The effect of income on crude birth rate (CBR) declines in Jiangsu Province (standard errors in parentheses)

Independent variable	Dependent variable: CBR 1975 − CBR 1979 (1) (n = 68)	(2) (n = 68)	Dependent variable: (CBR 1975 − CBR 1979) ÷ CBR 1975 (3) (n = 68)
Constant	6.88	−15.8	−.619
Income	−.0347*	.0234*	(.000849)
	(.0114)	(.0107)	(.00057)
Crude birth rate, 1975		.924*	.0383*
		(.112)	(.00595)
R^2	.12	.57	.46

NOTE: An asterisk indicates the coefficient is statistically significant at least at the 5 percent level.

Conclusion 3 Between 1975 and 1979 the negative impact of income (and probably of other socioeconomic factors associated with income) on fertility weakened.

Income accounts for a lower proportion of overall birth rate differences in 1979 than in 1975. In Table 6, we show the results of regressions of the birth rate in 1975 and in 1979 for the 68 Jiangsu counties. The amount of variance explained by income alone drops from 45 percent in 1975 to 20 percent in 1979 (columns 1 and 3). (This result holds when other functional forms are used, such as quadratic in income and income entered in linear form.) The beta coefficient[22] (not shown) on income drops from −.67 in 1975 to −.45 in 1979. The effect of the urban variable also declines (compare columns 2 and 4).

Similarly since 1964 there appears to have been a decline in the impact of income on interprovincial differences in the rate of natural increase. Table

TABLE 6 Crude birth rates, 1975 and 1979, Jiangsu Province (standard errors in parentheses)

Independent variable	Dependent variable: CBR 1975 (1)	(2)	Dependent variable: CBR 1979 (3)	(4)
Constant	24.5	436	29.4	304
Natural logarithm of income	−6.40*	−6.06*	−3.21*	−3.11*
	(.879)	(.874)	(.784)	(.802)
Crude death rate, 1975		.361		−.218
		(.476)		(.436)
Indicator for county towns		−2.76*		−1.23
		(1.39)		(1.27)
R^2	.45	.48	.20	.22

NOTE: An asterisk indicates the coefficient is statistically significant at least at the 5 percent level.

TABLE 7 Accounting for rates of natural increase, 1964 and 1979 (standard errors in parentheses)

	27 province-level units[a]			
	Dependent variable: Rate of natural increase		Dependent variable: Natural logarithm of rate of natural increase	
Independent variable	(1) 1964	(2) 1979	(3) 1964	(4) 1979
Constant	8.41	3.33	3.55	2.17
Natural logarithm of rural per capita income	−1.23* (.337)	−.471* (.185)	−.560* (.131)	−.451* (.161)
R^2	.35	.19	.42	.24

NOTE: An asterisk indicates the coefficient is statistically significant at least at the 5 percent level.

[a] The 1964 rate of natural increase was not available for two provinces; they were, therefore, excluded from both sets of regressions.

7 shows the results of regressions of the rate of natural increase across provinces in 1964 and in 1979 on the 1979 income data. The same pattern is evident. The proportion of variance explained drops from about 40 percent to 20 percent. In the double-logarithmic specification (columns 3 and 4), the value of the income coefficient, which can be interpreted as an elasticity, drops from −.56 to −.45.

The 1979 crude birth rates in the Jiangsu sample range from 10.7 to 21.7 per thousand; the 1975 range is greater, from 10.8 to 25.8. Some of the reduction in the explanatory power of income might be interpreted as the result of this squeezing of crude birth rates into a range close to replacement-level fertility, where there may well be a floor on further declines. This cannot, however, be the entire explanation. The coefficient of variation[23] of the 1979 CBR is .18, only slightly lower than the coefficient of .20 for 1975. Even within the smaller range, there continue to be differences across counties in birth rates in 1979; income simply is not as highly associated with these differences.

A second explanation is that birth rate declines in the 1975–79 period, though positively associated with income (conclusion 2 above), were less positively associated than were the earlier declines prior to 1975. There is no doubt that for Jiangsu Province as a whole, the greater decline in fertility took place prior to 1975. The officially reported crude birth rate for China as a whole was 38 in 1965, and the crude death rate was 9.6. This resulted in a 1965 rate of natural increase of 28.4 for the country as a whole. The rate in Jiangsu in 1965 was slightly lower, at 27.4. It is reasonable, therefore, to assume a 1965 crude birth rate for Jiangsu of at least 35 per thousand. This implies a decline of 49 percent between 1965 and 1975 (from 35 to about 18 per thousand[24]), or an average 5 percent annual decline, compared to a decline of 17 percent between 1975 and 1979 (from 18 to 15), or an average 4.25 percent annual decline. (If much of the decline actually took place after 1970,

as is the case for China as a whole, the annual percentage decline from 1970 to 1975 would be even greater.)

These declines, which are dramatic by international standards, were the result not only of improvements in general economic conditions, but also of birth planning efforts, which did not begin in earnest until 1972. It is plausible that in the initial period (1972–75) the effects of the new policy were greatest in high-income areas, where the environment for reduced fertility was more auspicious. This would result in a growing *differential* in fertility for several years. It is also plausible that subsequently the relative impact of the environment declined, and further reductions were increasingly due to birth planning policy and accompanying programs. Such a pattern of increasing and then declining differentials appears to have occurred elsewhere. Birth control programs often have their strongest impact on fertility in the least modern areas, where preprogram fertility is typically highest.[25] In countries of Latin America such as Colombia and Brazil, where governments provide less support for birth control programs, the current fertility reductions appear to be driven more by declines among the better-off groups, and current fertility differentials by income group are substantial.[26]

A pattern of increasing and then declining differentials is also suggested by data on vital rates for 12 of the 13 prefectures of Gansu Province. In Figure 2, we have plotted the mean[27] crude birth rates for the years 1972 to 1979.

FIGURE 2 Crude birth rate trend, 12 prefectures of Gansu Province, 1972–79

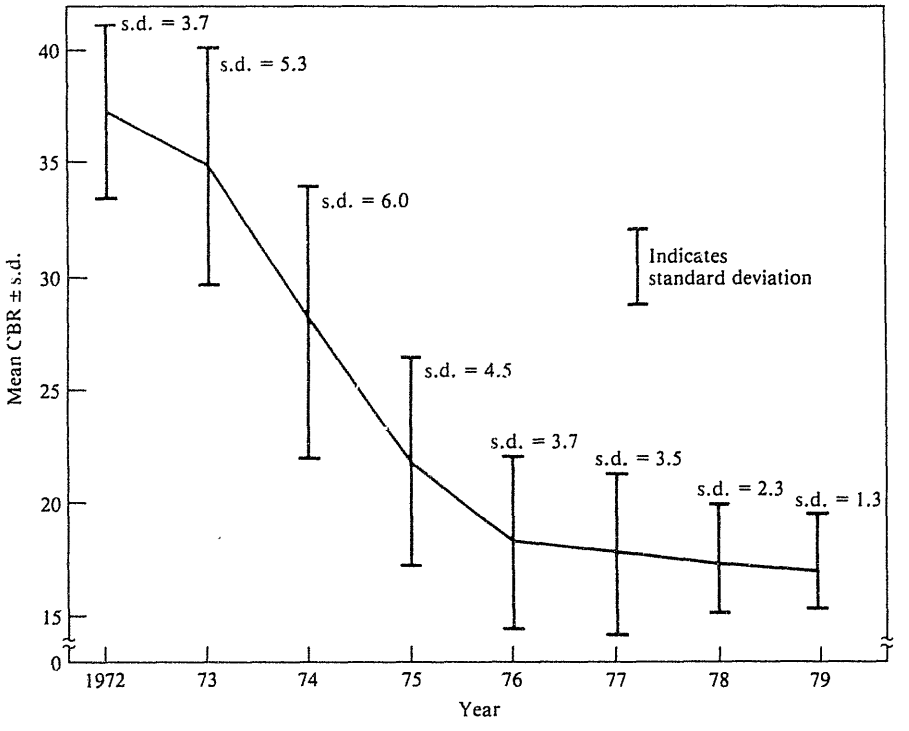
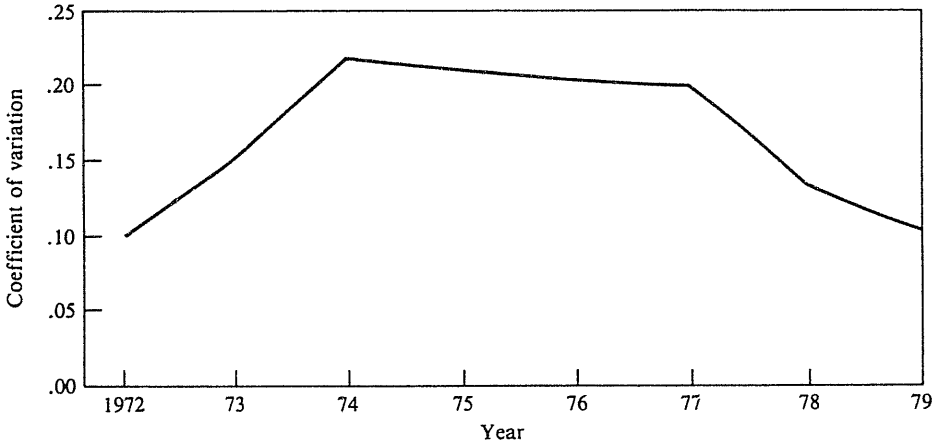


FIGURE 3 Coefficients of variation[a] in the crude birth rate, Gansu Province, 1972–79



[a]The coefficient of variation equals the standard deviation divided by the mean.

We also show for each year the standard deviation of the birth rates across the 12 units. In Figure 3, we plot the coefficient of variation for each year. The coefficients of variation take the shape of an inverted U, reflecting growing variation in birth rates in the early 1970s, followed by declining variation.

Implications for future population trends

What does the preceding analysis suggest for the future? To begin, there is no evidence that income gains in themselves will *increase* fertility. Even in 1979, income is negatively associated with estimated birth rates. The usual pattern holds in China, presumably because higher income is associated with higher wage rates for adults and a higher "price" of children.

However, it is also unlikely that future income gains will substantially *reduce* fertility.[28] The negative impact of income on fertility is declining. There are two possible and complementary explanations. One is that with fertility already close to replacement level in most regions, and on average well below that of countries at similar income levels, the scope for differences due to socioeconomic conditions has simply narrowed. (On a country level, this is analogous to saying that income differences between the United Kingdom, the United States, and Switzerland cannot be expected to account for any fertility differences, since fertility is already very low in all three.) In terms of fertility decline, China has already reached a point at which rapidly diminishing returns to further improvements in income (and education, employment, etc.) have set in.

The complementary explanation is that the birth planning campaign has grown relatively more important as birth planning efforts have been intensified. Program efforts, then, may be providing incentives and sanctions that are

powerful relative to nonprogram economic considerations, resulting in actual fertility levels below those that would be desired even at substantially higher income levels.

The implication is that additional fertility reductions are unlikely to occur simply as a result of further income gains. Additional fertility decline, or even maintenance of current fertility levels, will likely be possible only through increased direct efforts on the part of government—not only through improvements in the accessibility, safety, and convenience of using contraceptives and of abortion, particularly in poorer rural areas, but also in the form of continued mobilization of social pressure and implementation of economic incentives and disincentives.[29]

The central question then becomes whether and at what cost the goal of lower fertility over an extended period of time can be attained. Three aspects of this question are pertinent. First, even with economic incentives, will rural parents restrict fertility further without alternative guarantees of support in old age? And what sort of guarantees would be credible to parents? Second, will the poorer provinces be able to finance a system of financial incentives to discourage births? And third, will efforts to increase productive efficiency—for example, by removing restrictions on labor migration or permitting more use of land for private production—weaken the tightly knit system of community pressure, reinforced by common awareness of local land scarcity, that now bolsters the goals of birth planning? These are difficult questions that lie outside the scope of this paper.

Postscript: analysis of preliminary 1982 census data

In March 1983, the State Statistical Bureau[30] published substantially more data from the 1982 census than had previously been released to the press. The new data included crude birth and death rates by province, and numbers of individuals by educational attainment by province. In addition to directly reported values of crude birth rates (rather than the constructed estimates used in the earlier analysis) we now have improved estimates of per capita income and separate estimates, for each province, of rural and urban per capita income. Our income variables are based on a 1981 income and expenditure survey of a nationally representative sample conducted by the State Statistical Bureau,[31] and were constructed in the following way. Urban income per capita was measured as the estimated average urban wage rate in each province weighted by national average urban participation rates in 1981. Rural income per capita was estimated by inflating provincial collective distributed income per capita and rural household expenditure per capita respectively by the relevant national ratios of rural net income to these variables. Total income per capita was then computed as the population-weighted average of urban and rural income per capita in each province. These weights are given by official estimates of the percent urban population, which is defined to include the population of cities,

county towns and some towns below the county level, excluding their agricultural subpopulations.

Measurement of urban income is problematic because during the 1950s at least, income levels in different urban areas were set to compensate for price level differences among cities. This raises the question whether any association found between urban income levels and fertility rates might result only from differences among urban areas in factors influencing price level differences (e.g., remoteness), not from real income differences. Commodity-specific price data are available for five large cities for a number of important commodities, and these data were used to construct approximate price level indexes for these cities. We used these indexes to deflate our urban income data for the five cities; price level differences accounted for little of the observed income variation among the cities. While a conclusive analysis of the impact of inter-city income differences on fertility must await publication of better data, this exercise indicated that our estimate of urban income is reasonable.

In this section we report analysis of these new census and income data that tests the extent to which the conclusions reported in the preceding section are confirmed with more recent and better data. Table 8 lists the variables for the analysis and reports their means and standard deviations.

Table 9 reports results of regressions designed to assess urban–rural differences in crude birth rates. The simple regression of *CBR81* on percent urban *(URB)* allows us to estimate birth rate levels in rural and urban areas;

TABLE 8 Variables used in supplementary analysis of province-level data from 1982 census

Variable name	Variable definition	Mean	Standard deviation
CBR81	Crude birth rate, per thousand, as reported in 1982 census	21.9	4.1
TOTINC	Per capita income, 1981, in yuan[a]	271	70
RURINC	Per capita income in rural areas, 1981, in yuan[a]	238	69
URBINC	Per capita income in urban areas, 1981, in yuan[a]	439	56
LOWINC79	Proportion of population of province who lived in rural production teams with a per capita income below 50 yuan, 1979	0.23	0.16
ILLIT	Number of illiterates and semi-literates over the age of 12, divided by the provincial population, from 1982 census (in percent)	36.4	14.5
URB	Proportion of population in urban areas, 1981	0.19	0.14
AUT	Indicator variable taking on the value "1" for autonomous regions, "0" otherwise	0.17	—
*RURINC**	*RURINC* × (1 − *URB*)	188	44
*URBINC**	*URBINC* × *URB*	83	67
ln RNI81	Natural logarithm of the rate of natural increase for 1981 as reported in the 1982 census	2.71	.22
ln RURINC	Natural logarithm of *RURINC*	5.44	.26

[a] See text for description of the construction of these variables.

TABLE 9 Urban-rural differences in fertility (standard errors in parentheses)

	Dependent variable: Crude birth rate, 1981		
Independent variable	(1)	(2)	(3)
Constant	24.0	21.8	22.5
Proportion of population in urban areas, 1981	−11.4*	−7.3	−10.1*
	(5.1)	(6.1)	(3.6)
Proportion of population with very low income (*LOWINC79*)		6.4	
		(5.5)	
Indicator for autonomous regions			7.2*
			(1.4)
$\bar{R}^2$	.13	.14	.57

NOTE: An asterisk indicates that the coefficient is statistically significant at least at the 5 percent level.

column 1 of Table 9 shows the result. From the regression coefficients in column 1, the rural rate in 1981 is estimated to be about 24.0 per thousand and the urban rate to be about 12.6 (= 24.0 − 11.4). This finding, that the rural rate is almost twice the urban rate, is not unexpected and is roughly consistent with reports from a 1982 sample survey of the State Family Planning Commission indicating a total fertility rate in urban areas of 1.5 and in rural areas of 2.9.[32] In column 2 of Table 9 the percent of the population of a province in very low income areas *(LOWINC79)* is also included in the regression. In this case, the regression results (although not statistically significant) can be interpreted as indicating an average birth rate in non-low-income rural areas (i.e., where income was above 50 yuan per capita in 1979, about U.S. $32 at the 1979 official exchange rate) of 21.8; in low-income rural areas the level is 28.2; and in urban areas the level is 14.3. Column 3 replaces *LOWINC79* in the regression with the indicator for autonomous regions. The results again suggest that rural birth rates are about twice as high as urban rates (22.5 versus 12.4) and that rates are about 7.2 points higher in autonomous regions. The adjusted R^2 on this last regression shows a much better fit than in the other two regressions, suggesting that the differences between Han and minority nationalities are more important than differences between high- and low-income rural areas.

Earlier we presented several separate lines of analysis suggesting that, in China, the typically negative association between fertility and income was growing weaker with time. We then concluded that, although additional income gains would be unlikely to reduce fertility much further, there was no indication that improvements in income would actually undermine family planning policy. Analysis of the 1982 census data suggests that our original conclusion may no longer hold and that, at least in urban areas, higher incomes are associated with higher fertility levels.

Regression 1 in Table 10 shows per capita income in a province to have virtually no correlation with the 1981 crude birth rate. Table 7 reported our

TABLE 10 Rural income, urban income, urbanization, and fertility, 1981 (standard errors in parentheses)

Independent variable	Dependent variable: Crude birth rate, 1981				
	(1)	(2)	(3)	(4)	(5)
Constant	26.7	8.9	6.5	11.3	25.1
Total income per capita, 1981	−.017 (.01)				
Urban income per capita, 1981[a]		.043 (.01)	.046 (.008**)	.031 (.06**)	.187**
Rural income per capita, 1981[a]		−.026** (.006)	−.012 (.01)	negligible	−.007 (.01)
Proportion of population in urban areas, 1981			−11.1* (4.9)	−10.1* (3.8)	−98.7** (27.7)
Indicator for autonomous regions				5.1** (1.2)	5.9** (1.2)
$\bar{R}^2$	.06	.43	.51	.70	.67

[a]In the regression in column 5, URBINC and RURINC have been replaced by *URBINC** and *RURINC**.
NOTE: An asterisk indicates that the coefficient is statistically significant at least at the 5 percent level; a double asterisk indicates it is significant at the 1 percent level.

earlier regressions showing that rural provincial income was negatively associated with the rate of natural increase in both 1964 and 1979, but that the R^2 had declined by about half between those two years. In order to compare directly the census results with those reported in Table 7, we regressed the logarithm of the 1981 rate of natural increase against the logarithm of rural per capita income in 1981 (not shown); rural income remained significant, but the elasticity declined from −.45 in 1979 to −.36 in 1981, and the R^2 declined from .24 to .18. Thus the aforementioned trend continued into 1981.

When urban and rural incomes are entered simultaneously into the regression, as in column 2 of Table 10, a very different pattern emerges: rural income is significantly negatively associated with fertility and urban income is significantly positively associated with it. As noted in preceding paragraphs, fertility rates in urban areas are about half those of rural areas, and all accounts of population policy indicate much more vigorous enforcement in urban areas. Thus it is plausible to picture two quite different regimes—an urban one where, as incomes rise, the range of options open to couples to buy their way out of fertility-limiting policies increases, and a rural regime where rising income is associated with increases in the economic costs of children and decreases in their economic benefits.

A simple model incorporating two fertility regimes is the following:

$$CBR_r = a_o + a_1 \times RURINC + c \times AUT, \quad \text{and} \tag{1}$$

$$CBR_u = b_o + b_1 \times URBINC + c \times AUT \quad , \tag{2}$$

where CBR_r and CBR_u are rural and urban crude birth rates in 1981. We do not have data on CBR_u and CBR_r by province, so we cannot directly estimate

equations (1) and (2). Recall, however, that the value of *CBR81* for a province is simply the weighted average of the rural and urban rates, where the weights are the percent urban *(URB)* and percent rural (1 − *URB*):

$$CBR81 = (1 - URB) \times CBR_r + URB \times CBR_u.$$

Substituting for CBR_r and CBR_u from equations (1) and (2) and rearranging, we obtain:

$$CBR81 = a_o + (b_o - a_o) \times URB + b_1 \times RURINC^* + a_1 \times URBINC^* + c \times AUT \quad , \quad (3)$$

where $RURINC^* = RURINC \times (1 - URB)$ and $URBINC^* = URBINC \times URB$. Equation (3) can be estimated from the available data and the resulting coefficients then used to provide the coefficients for equations (1) and (2), which model the response of fertility to income in the rural and urban policy regimes.

Column (5) of Table 10 reports the results of estimating equation (3) with our data; that regression is the same as the one in column (4) except that *URBINC* and *RURINC* have been replaced by *URBINC** and *RURINC**. Using the estimated coefficients, equations (1) and (2) become:

$$CBR_r = 25.1 - .007 \times RURINC + 5.9 \times AUT \quad \text{and} \qquad (1')$$

$$CBR_u = -73.6 + .187 \times URBINC + 5.9 \times AUT \quad . \qquad (2')$$

The principal effect of using the specification in column (5) rather than the similar but less correct specification in column (4) is to decrease slightly the size of the effect of rural income and to increase markedly the size of the effect of urban income; R^2s and patterns of significance among coefficients change very little.[33] Using equations (1′) and (2′) one can calculate that a 10 percent increase in rural income (24 yuan) would decrease the crude birth rate in rural areas by .17 per thousand, or virtually not at all; a 10 percent increase in urban income (44 yuan) would increase the urban rate by about 8, if this model is correct. Undoubtedly the true effect of increasing real incomes in urban areas would be less than this, but the large magnitude of the estimated effect strongly suggests that efforts at urban fertility reduction will need to increase substantially to counter the effect of income improvement on the desire for larger families.

The 1982 census includes data on the educational attainment of respondents, and tabulations by province are now available. We are able to examine the impact of the lowest educational attainment category, "illiterates and semi-literates," on the crude birth rate. The simple relation between illiteracy and CBR, even controlling for total income, suggests that higher levels of literacy are significantly associated with lower levels of fertility (columns 1 and 2 of

Table 11). But the findings on income and fertility just reported lead one to expect a positive association between education and fertility, at least in urban areas. (Assuming that, others things equal, more educated people are better able to realize their objectives and that in urban areas virtually everyone wants more children, education and fertility should be positively associated.) Columns 3–5 of Table 11 report regressions exploring the effect of illiteracy when urbanization and rural and urban income are controlled. Controlling for percent urban leaves illiteracy's estimated impact unaltered (column 4), but controlling for rural and urban income (column 3) or *URBINC** and *RURINC** (column 5) results in a major drop in the estimated impact of illiteracy. This suggests that illiteracy has different effects in rural and urban environments or in high- and low-income environments. Until rural–urban breakdowns of data on illiteracy (and other education variables) become available, or less aggregated data are available, it will be difficult to assess the nature of illiteracy's impact (if any) on fertility. Analysis with available data, however, provides no evidence for a link between fertility levels and illiteracy in China today, controlling for income.

Finally, in regressions not reported here we sought relations between health service availability and CBR. The effects of number of barefoot doctors per thousand population and of other variables measuring health service availability were not statistically significant. We conclude that there is virtually no effect of health service availability on fertility levels as assessed at the provincial level. (Specific cases of inadequate capacity to deliver family planning services are reported in China, and analysis of data at the county or commune level in affected areas would probably demonstrate the effect of inadequate capacity on fertility levels.)

TABLE 11 Birth rates and socioeconomic indicators, 1981 (standard errors in parentheses)

Independent variable	Dependent variable: Crude birth rate, 1981				
	(1)	(2)	(3)	(4)	(5)
Constant	15.6		8.9	16.3	23.4
Percent of population over 12 and not literate	.173** (.042)	.166** .048	.08 (.05)	.162** (.053)	.032 (.049)
Total income per capita, 1981		negligible			
Urban income per capita, 1981[a]			.032* (.012)		.158* (.073)
Rural income per capita, 1981[a]			−.018 (.01)		−.007 (.01)
Proportion of population in urban areas, 1981				−1.9 (5.4)	−83.6* (36.4)
Indicator for autonomous regions					5.8** (1.3)
$\bar{R}^2$	.35	.33	.46	.33	.67

[a]In the regression in column 5, *URBINC* and *RURINC* have been replaced by *URBINC** and *RURINC**.
NOTE: An asterisk indicates that the coefficient is statistically significant at least at the 5 percent level; a double asterisk indicates it is significant at the 1 percent level.

Notes

This paper was initially prepared as a background document for the report of the World Bank's first economic mission to China (World Bank, 1983); it has been subsequently expanded to include analysis of data from China's 1982 census. The views and interpretations expressed in this paper are those of the authors and do not necessarily reflect those of the World Bank group.

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1 The per capita income estimate used in the figure is $260, which is the World Bank estimate for 1979 (World Bank, 1981).

2 See Tien (1983) and Chen (1982).

3 This division into two sets of factors was first formally tested using cross-country data by Mauldin and Berelson (1978).

4 To the extent that marriage age has increased due to the government campaign, rather than to economic change, the effect of later marriage on the birth rate would be included in the second set of factors. In fact, of course, marriage age is also affected by economic conditions. Increasing opportunities for female employment could theoretically increase marriage age, but it is also possible that improving economic conditions—e.g., more housing, easier access to jobs for young people, would make household formation easier and lower marriage age. Unfortunately, we cannot sort out these effects. A recent careful study of trends in age of marriage in Shanghai County (a rural suburb of Shanghai municipality) has, however, clearly demonstrated increases in marriage age, for whatever combination of reasons. See Gao et al. (1982).

5 For discussion of China's birth planning program and of various local incentive and disincentive schemes, see the official statement of Chen Muhua (1979) and accompanying notes by Pi-Chao Chen, as well as the papers cited in the introductory paragraphs.

6 A difficulty with the analysis of change in fertility is that while our provincial data on fertility are for 1975 and 1979, our data on income are for 1979 only, at the end rather than the beginning of the period of concern. We are thus forced to use income in 1979 as a proxy for income in the 1975–79 period.

7 This proxy is an approximation based on the assumption that, in all urban areas, income is slightly over twice the national average rural income and that, in each province, provincial distributed collective income is a reasonable approximation to rural income. This definition excludes state farms, which are relatively unimportant, and income used for collective expenditures (such as health and primary education), which may or may not be proportional to distributed income. The income variable that we use is highly correlated ($r = .95$) with an improved income variable estimated for 1979 from data that became available in 1982.

8 See Banister (1980) for a discussion of the vital registration system.

9 Mauldin and Berelson (1978) find the correlation of crude birth rate declines with total fertility rate decline (1965–75) to be 0.97 in a sample of countries.

10 This procedure is, of course, an approximation that is designed to improve on the assumption that crude death rates are constant across provinces. Age distributions will certainly vary across provinces, introducing error into this procedure. The Postscript to the paper discusses preliminary results of analyses of data from the census utilizing reported values of crude birth rates rather than estimates.

11 The mean of the agriculture variable is slightly lower (see Table 2); its coefficient is about 4 times more negative.

12 Gu (n.d.) provides this table—Spearman's rank correlation coefficients between economic-cultural levels and fertility—based on data from a 1963 survey in Shanghai:

	Economic level	Illiteracy rate
Mean age of marriage	0.80	−0.77
Fertility rate	−0.78	0.80
Contraceptive rate	0.87	−0.87
Family size	−0.98	0.87

These data indicate that at least in this sample in 1963, illiteracy and fertility were positively correlated, and that economic level (how it was defined we do not know) and education were positively correlated.

13 Fertility of the poor tends to be higher compared to the rich in countries in which fertility decline has recently begun. See Potter (1978) and Merrick and Graham (1979). See also Birdsall (1980).

14 See Birdsall (1980, Appendix B).

15 See World Bank (1983), Vol. III, p. 86.

16 This is not unusual. In many countries, fertility is only lower among high education groups in urban areas. See Birdsall, 1980 (Table III-1) for compilation of World Fertility Survey data to illustrate the point.

17 For more detail on incentives by province, see Chen (1979).

18 In our analysis of 1982 census data (Postscript), which includes estimates of crude birth rates by province in 1981, we find no effect of the 1979 incentives indicator variable on fertility. By early 1980 all provinces had incentive programs, so the question to address is not that of whether a program exists but of whether different characteristics of provincial programs lead to different fertility outcomes.

19 Both incentive and autonomous indicators are significant when no other variables are included (not shown).

20 The correlation between the inequality measure and rural income per capita is −.7.

21 Note that income is measured at the end of the period. It is possible that it was the amount of income growth over the period that mattered for crude birth rate declines, not the level. With only one date at which income is measured, we cannot distinguish between the two possible effects, nor test whether there are lags in the income-fertility relationship. It is clear, however, that the income-fertility relationship was negative.

22 The beta coefficient reflects the impact of the independent variable on the dependent variable, as captured in the coefficients shown and standardized for the variance in the variables used.

23 The standard deviation divided by the mean of a variable.

24 18.2 per thousand is the mean of the 1975 CBRs for the 68 counties, weighted by their 1979 populations. 14.8 is the weighted mean for 1979.

25 See Hermalin (1974, p. 319) and Birdsall (1980, Figure IV-1, p. 65).

26 See Potter (1978) and Birdsall (1980).

27 This is an unweighted mean of the 12 prefecture means.

28 We refer here to gains in private disposable income. Increases in aggregate income may well facilitate creation of social security systems or enhance the capacity of the state to provide economic incentives for compliance with the one-child policy.

29 It is perhaps worth noting, however, that the Director of the Family Planning Office of Zhang Shu County, Jiangsu Province, stressed to one of us her belief that better success with birth limitation in the future will depend importantly on employment and retirement policies adopted by the state.

30 See General Census Office (1982).

31 State Statistical Bureau (1982).

32 See State Family Planning Commission (1983).

33 A difficulty with using specification (5) is that problems of multicollinearity become substantial between some variables; nonetheless, similar findings to those from specification (4) support the qualitative findings concerning income.

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