Morality Policy and Unintended Consequences: China's "One-Child" Policy

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Abstract: The ability of government to change human behavior by altering policy has severe limitations. Nowhere are these limitations more evident than in the area of fertility policy and sexual behavior. This paper considers the impacts of China's restrictive population policy with regard to two dependent variables. First, we attempt to explain the impact of the "one child" policy on population growth. Secondly, we examine the effect of the policy on an unintended consequence: the sex ratio, or the imbalance between males and women in Chinese society. We utilize a time series, cross-sectional (TSCS) research design for 31 Chinese provinces and municipalities for the years 1996-1999.

We consider the Chinese experience within the theoretical framework of morality policy and argue that, while China has been remarkably successful in lowering the growth rate of its still escalating population, the policy has had the unanticipated and harmful effect of an increasingly unbalanced sex ratio. While many Chinese have become convinced of the advantages of smaller families, their preference for sons has created a gender imbalance in the marriage market which potentially may have severe consequences for the future of Chinese society. We discuss these implications and argue that given the strong Chinese preference for sons, especially in rural areas of China, the government is now facing a new challenge in its effort to achieve a gender-balanced society.

Of the infinite number of public policies with which government concerns itself, one of the most difficult and invasive is fertility. Whether one considers abortion policy in the United States, contraception policy in India, or the many attempts by the former Communist nations of Eastern Europe to stimulate fertility, government has struggled to achieve its policy objectives because of the difficulty in changing sexual behavior. Often, government attempts to regulate fertility either have failed or resulted in unintended consequences. For example, failure of conservative governments to support contraception has resulted in increased abortion rates, while restrictive laws in the U.S. have apparently not altered abortion-seeking behavior (Meier et al., 1996).

The purpose of this article is to examine some of the consequences of China's efforts to limit the size of families. The "one child" policy went into effect in 1979 and has been credited by the government and by Western scholars with a slowing of the rate of population growth (Population Census Office, 2002; Information Office of the State Council, 1995; Family Planning Commission of China, 2001; Rosenberg and Qichen, 1996; Feeney and Feng, 1993; Scotese and Wang, 1995). But some of the long-term consequences of the policies have not been analyzed. Nor is it clear in what parts of the nation that the policy has achieved the most success. We utilize a pooled time series, cross-sectional (TSCS) design to examine the impact of the policy on two important dependent variables: the birth rate and the sex ratio, utilizing data from the 31 Chinese provinces.

With regard to the birth rate, the need for China to control its population is obvious if the nation is to transform itself into a modern industrial power. But the policy of one child is unevenly enforced, particularly in rural areas and in provinces with heavy concentrations of minorities. In addition to policy enforcement, we are interested in determining what other factors are influential in slowing the birth rate.

Considering the second dependent variable, one of the less fortunate aspects of the policy has been an unbalanced sex ratio at birth: a disproportionate number of boys are born and retained by families, as opposed to girls. Because of the traditional Chinese family preference for boys, it has been documented that the differentiation in the birth rate between the sexes has grown (Graham, Larsen, and Xu, 1998). With the development of new technology such as ultra-sound techniques, which have become more widely available throughout China, it is possible for couples to monitor the gender of the fetus and abort it if it is not of the desired sex. Other problems associated with an increasingly problematic sex ratio include the possibilities of the abandonment of female children, infanticide, and adoption of girls out of country. The unbalanced sex ratio at birth may lead to an unbalanced ratio later in the larger society. This problem has important implications for the future of Chinese society. The demographic literature already speaks of an imbalance in the marriage market in addition to the

already established inferior treatment of girls and women (Guo and Deng, 1996; Li, Tuljapurkar, and Feldman, 1995; Xie, 1994; Tuljapurkar, Li, and Feldman, 1995; Johannsson and Nygren, 1991).

We begin by explaining Chinese efforts to limit family size within the context of the one-child policy as it is actually practiced. We then describe the policy theoretically within the context of "morality policy." After formulating hypotheses, based upon theories of choice developed out of the concept of morality policy, we test a model which explains variation in birth rate and sex ratio across Chinese provinces using a time series/cross sectional (TSCS) model.

Family Planning Policy in China

Being the most populous country in the world, China has developed a well-defined policy to regulate population growth. As early as the 1950s, the incompatibility between unchecked and accelerated population growth and planned economic development began to gain the attention of the government. After some experimentation with pilot family planning projects during the 1960s, the control of population under central state guidance became much stronger during the 1970s. By that decade, China's population had already exceeded one billion (more than 20 percent of the world's population) and was about to enter another "baby boom" period. It was toward the end of the decade that the government made a decision to keep the population within 1.2 billion by the end of the century.

The revised constitution in 1978 included the statement that "the state advocates and encourages family planning," and, in 1979, a "one-couple, one-child" policy was approved by the second session of the fifth National People's Congress. The policy basically called for the achievement of "later...and fewer" births. Late marriage along with delayed childbirth was encouraged as was the spacing of children at intervals of three to five years. But most important was the mandate for a fewer number of births as decreed by the "one-couple, one-child" provision of the law. In addition to concern for population size, the law was also motivated by the desire for healthier children; for instance, close relatives and persons with congenital and genetic diseases were prohibited from marrying. In summary, China's population policy can be described as "the control of population quantity, the improvement of population quality, and the mutual adaptation of population and socioeconomic development" (Qian, 1983: 301).

In contrast to popular understanding, the one-couple, one-child policy is not a compulsory single-birth law to be enforced throughout China without regard to local circumstances. For instance, one unique feature is the treatment of national minorities. Besides the Han nationality, there are 55 ethnic minorities in the nation which are distinguished by language, custom, religion, and historical and cultural background. While imposing a reduction in the growth rate of the Han majority, family planning policy favors an increase of at least some ethnic minorities (Hardee-Cleaveland and Banister, 1988). Another feature concerns the different treatment in urban as opposed to rural households. In most rural areas, the family is the basic unit of small-scale agricultural production. Rearing children, especially males, is very important as it brings new labor to a family and benefits its economic welfare. Therefore, the control of family size is more lenient for rural households (Hardee-Cleaveleand and Bannister, 1988; Chang, 1987).

Implementation of Family Planning Policy

The Chinese government states that its family planning policy combines the voluntary spirit of the masses with state guidance. The government directs national population development through population planning "in accordance with socio-economic development and the peoples' living standard and psychological acceptance," and it has developed a complex but systematic network to implement the policy. Each year, following discussions with individual provinces, the national government sets provincial targets consistent with the broader national goal of keeping the population within 1.2 billion. The provincial population targets are then encompassed into the state's comprehensive economic and social development plans. These provincial plans are distributed to lower levels of government, where they are specified as task assignments and work targets to be achieved by local government leaders and family planning administrators (Hardee-Cleaveland and Banister, 1988).

To implement the policy, the state conducts propaganda and educational work to enhance citizens' understanding of the need for family planning and its benefits in relation to the interests of the individual, the public, and the nation as a whole. Instruction on the techniques of contraception is provided. In addition, each province has a system of rewards and penalties for those complying with or disregarding family planning regulations. Couples who already have one child are eligible to sign a one-child pledge and receive a single-child certificate that entitles them to certain financial rewards. On the other hand, those who violate family planning policies and have more pregnancies and children than allowed undergo administrative interventions and economic sanctions. For instance, those who disobey family planning regulations may be given a warning from the Communist party, be deprived of the opportunity for promotion, or even be discharged from their position. Workers may suffer from salary reductions or even cancellation of employment contracts; farmers may be fined.

Over the past two decades, family planning policy in China has been implemented continuously (although it may differ in its degree over time and location), and has achieved a remarkable impact.

According to the government, the birth rate and natural growth rate have dropped respectively to 17.7 per thousand and 11.2 per thousand in 1994 from 33.43 per thousand and 25.83 per thousand in 1970. But as stated in a report from the State Family Planning Commission of China (2001), the absolute number of births remains high, especially in rural areas. Along with the continued high although reduced numbers of births, other social problems such as the unbalanced sex ratio have arisen.

Fertility Control as Morality Policy

In terms of Lowi's (1964) typology of public policies, morality policy most often would involve the "redistributive" aspects of policy in that government attempts to alter deeply-held social values (McFarlane and Meier, 2001: 3).[1] In regulating fertility, government has an especially arduous task because the demand for sex is inelastic. While demand may vary somewhat depending upon age and personal desire for sex, individuals engage in this behavior, sometimes for procreation but primarily for fulfillment in a relationship or simply for personal enjoyment.

But the interesting moral value which is present in China and largely absent in the U. S. and other Western cultures is the strong Chinese preference for sons. Confucianism continues to exert a strong influence and instills male superiority. Families still hope for the birth of sons in the face of severely limited opportunities to procreate, under the present policy (Xi, 1994). Sons are viewed as being crucial to the perpetuation of the family and are vital in the care for elderly parents. In contrast, especially in rural areas, daughters are perceived as being members of the in-laws' families and once marriage takes place, they are of limited economic or social value.

McFarlane and Meier (2001: 121-130) make a strong argument that in the case of fertility control in the U. S., women who want abortions will be successful in procuring them regardless of state efforts to limit the procedure. In a similar vein, we believe that demand for sons is inelastic in China and argue that couples who desire to have male offspring will go through considerable risk to have one. Still, in contrast to McFarlane and Meier, we believe that the literature on China provides propositions which suggest that the elasticity of demand for sons would vary, depending upon factors such as a province's level of economic development, density, urbanization, present level of population growth, level of available health care, demand for school enrollment, and the educational level of women, among other factors.

Developing Hypotheses

Utilizing a comparative framework, we present a "filtering model" in order to describe the determinants of policy outcomes, either intended (birth rate) or unintended (sex ratio), in 31 provinces of China (to include municipalities). The subfield of comparative policy analysis is concerned with explaining variation of policy outcomes across large numbers of states or localities. With the influence of Dye (1966), Sharkansky (1970), and Hofferbert (1974) a basic policy model was developed, which presented a sequence of related sets of variables. These include the broadest background variables which capture historical and geographical environments of the policy, on through socioeconomic attributes of the population, mass political attitudes, and elite behavior, among other factors. Although interest in this approach has declined somewhat in the U.S., the Dye-Sharkansky-Hofferbert (DSH) approach is still popular in OECD nations, particularly in explaining variation in social welfare programs.

The "filtering" model presented in **Figure 1** is actually a reduced form of a DSH-style study. In this particular context, the provinces have been strictly mandated to implement family planning policy for decades. Variation in political attitudes are unmeasurable but can be ruled out as a factor because officials at each level have the incentives to do their best at enforcement, since achievement of this policy is considered one of the most important criteria of their administrative capability and is closely tied to future promotion. Elite behavior or policy innovation can likewise be eliminated as a concern because of the frequent exchange of both information and personnel among the different provinces. Consequently, given that the provinces are all informed and the cadre consists of loyal and experienced policy makers, the internal characteristics of the provinces to include physical characteristics, socioeconomic attributes, and different levels of policy strictness due to minority composition should be able to explain a large amount of variation in both the birth rate and sex ratio.

The model posits that a province's fertility behavior is a product of several different factors. The first set of variables concern the physical aspects of a province. These natural factors tend not to vary over time and cannot be manipulated by policymakers. Included in these characteristics are elevation, the amount of rainfall, and whether or not a province is seaside or interior. Intuitively, the impact of physical characteristics on fertility behavior can go through several different channels to include biological characteristics, living style, wealth, or social norms. Although not all of these factors can be measured comprehensively, controlling for variation in physical conditions is helpful in assessing the impact of socioeconomic variables as well as policy implementation.

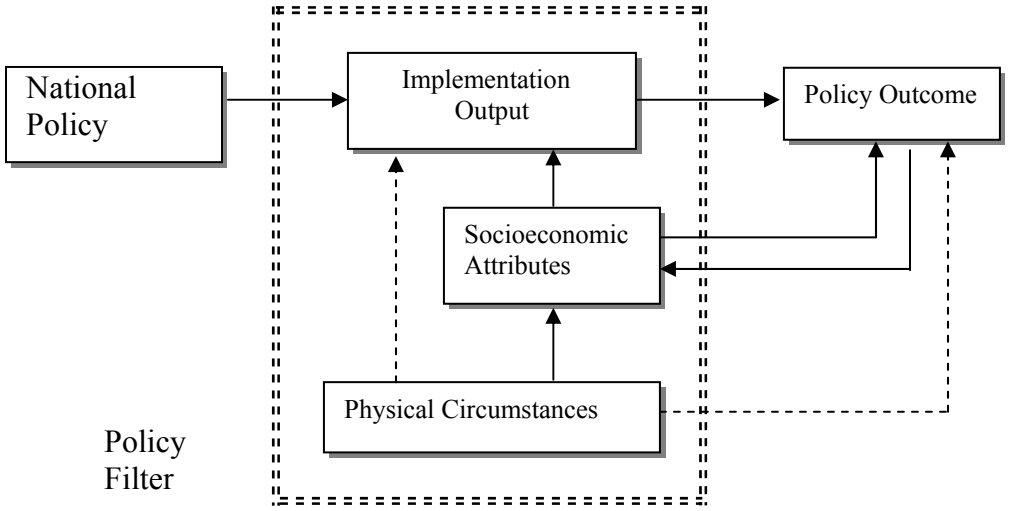


Figure 1: The "filtering" Model of Family Planning Policy Implementation

A second set of predictor variables is socioeconomic. These include population density, the gross domestic product (GDP) per capita, the percentage of GDP produced by the primary industry, cultivated area per capita, the percentage of illiterate women, the volume of international trade per capita, health resources as measured by hospital beds or health personnel per capita, and whether or not a unit of analysis is a municipality such as Shanghai or Beijing.

In general, we hypothesized that the more concentrated the density within a given province, the greater would be the pressure to limit the number of births and the less likely that the sex ratio would emerge as a problem (Cheng, 1992). Survey work has demonstrated that preference for sons has been declining primarily in urban areas (Zhang and Sturm, 1994). In addition, we believed that the government and party are in a better position to control the population through various inducements and penalties in more urbanized areas (Yi and Vaupel, 1989).

We also considered the gross domestic product (GDP) adjusted for the population, and the proportion of the province's economy which is dominated by the primary industry (in China this is a measure of agricultural dominance due to the diversity of the economy in more urban areas).[2] Low levels of industrial and other economic output are indicative of a more agricultural society where there may be more dependence on sons. Likewise, the domination of a single industry in a province limits diversity and restricts economic opportunity beyond an agricultural existence (Yang, 1993). In areas with a basic economy and limited economic opportunity, we hypothesized that preference for sons would be higher. Because of this preference, we believe that couples will take more risks to give birth to sons, even if it is a second child; consequently, the lower the economic development, the higher the sex ratio. Finally, in provinces which are highly agricultural (as measured by the percentage of land that is cultivated), we would expect traditional Chinese preferences to be present: there should be a high birth rate, and, because of the effort to have sons, the sex ratio should exhibit an imbalance.

Other factors which may impinge on the birth rate and sex ratio are the characteristics of the women themselves in a given province. Education, as measured by the percentage of illiterate women, could be a primary determinant of reproductive behavior. Research has shown that the sexual behavior of educated Chinese women differs a great deal from their less educated counterparts. For example, they are more likely to have pre-marital relations and have a fertility rate which is far lower than the uneducated (Wang and Yang, 1996; Zeng, 1994). In addition, it is likely that they will be somewhat more relaxed in their preference for sons. In terms of the McFarland and Meier terminology, the demand for sons becomes more elastic with educated women, probably because they rely upon their greater achievement to attain status in society. Thus, in areas where the percentage of illiterate women is lower, we expect a more balanced sex ratio as well as a lower birth rate.

The extent to which a given policy is obeyed may be partly a function of the extent to which the Chinese are exposed to outside contacts, especially the Western world. The amount of international trade (imports and exports combined) may be a useful predictor in that such commerce not only involves an exchange of goods and capital but also information, communications, and exposure to ideas outside of one's culture. We hypothesize the greater the international

trade in a given province, the greater the probability of families with balanced genders.

Health facilities and personnel also figure in the calculation to have another child. One might think that where health resources are the greatest, in proportion to the population, couples would be more likely to have additional children. This, however, may not be the case in China. In developed metropolitan areas such as the four municipalities – Beijing, Shanghai, Tianjin, and Chongqing, where health resources are most accessible, families generally do not have the incentive to have more children, neither do they have a strong son-preference, due to different social norms and the urbanized lifestyle.[3] Therefore, the birth rate in these areas tends to be low, and sex ratio at birth is more balanced. In rural areas with fewer resources, ironically, families would prefer to have more children because of labor-intensive, family-based agricultural production. Hence, violations of the one-child policy have been more common. The issue of the sex ratio is also complicated in this situation. If health facilities are so scarce that prenatal sex determination such as ultrasound B techniques are not widely accessible, the sex ratio remains balanced no matter how many children a family would have. In other rural areas, where health facilities are better and the techniques are more available, the possibility is much greater that some families will abort female fetuses so as to insure that their second child is a son (Gu, 1995). As a result, the sex ratio at birth would be raised. Overall, we expect that the existence of health facilities would be negatively correlated with the birth rate. But, on the other hand, the relationship between health facilities and the sex ratio may be much more complicated ─ the sex ratio may be relatively low at both ends of a distribution with the greatest imbalance occurring in provinces with a moderate number of health facilities.

A final predictive variable outside of physicality and socioeconomic characteristics is a policy index. [4] The policy index is an indicator of how strict the family size is controlled and how vigorously the Chinese government enforces sanctions against couples who violate the reproductive policy. In provinces where the policy is enforced strictly, the birth rates are expected to be lower, while sex ratios, on the other hand, may be higher as an unintended consequence of the policy implementation.

Data and Methods

Data were gathered from the *China Statistical Yearbook* for the years 1996-1999. The study design consists of a pooled time series, cross-sectional (TSCS) analysis of 31 provinces for four years for a total of 120 observations.[5] Because the data are not consistent in that many important variables are omitted prior to 1996, we are limited to these four years.

Methodologically, the TSCS design presents special problems in statistical estimation that are not present in ordinary least squares (OLS) regression. The TSCS can suffer from the problems of autocorrelation which is a common feature of univariate time series analysis (McCleary and Hay, 1980), simultaneously, there can be problems of heteroskadasticity which are peculiar to the particular panels (provinces in this case) (Stimson, 1985). There are a number of strategies to cope with these problems. One such approach is to utilize generalized least squares (GLS) (Parks, 1967; 1985; Greene, 2000). This method involves correcting for both contemporaneous and serial correlation of errors. But this strategy has been criticized in that the standard errors which are generated through GLS tend to be grossly deflated; a researcher may conclude falsely that a variable is significant when in fact it is due to statistical artifact. In addition, it has been asserted that it is not possible to employ GLS in TSCS analysis reliably when the number of cross-sectional units exceeds the number of time points. In the present instance, the number of time points is small and the cross-sections greatly exceed them (Beck and Katz, 1995) so another strategy was deemed more appropriate: generalized least squares regression (a Praxis-Winsten solution) with panel-corrected standard errors (*STATA*, 2001). Since our time frame is quite short ($t = 4$), it is clear that our preference should be to employ the GLS with panel-corrected standard errors.

Data Analysis

We attempted to estimate the birth rate and sex ratio of the Chinese provinces for the years 1996-1999, utilizing generalized least squares regression, correcting with the Prais-Winsten technique in the face of auto-correlation. But we were unable to utilize any estimation technique initially because of the high multicollinearity among the predictor variables, especially in the socioeconomic category. In particular, there were high correlations between variables such as GDP per capita, the amount of land being cultivated, and the percentage of illiterate women in a province. Thus, it was difficult to untangle the effects of these variables without combining them in some fashion.

Principal Components Analysis

Principal components analysis has the advantage of reducing a large number of variables into a smaller number of factors. While one loses the information that can be detected from the individual variables, the principal components technique, combined with an orthogonal rotation, makes the generated factors uncorrelated with each other by definition. Once the factors are derived and found adequate, factor scores can be generated which makes it possible to utilize the factors in combination to predict the dependent variable. We performed two principal component analyses. The first consisted of a confirmatory factor analysis which is presented in **Table 1**.[6] Confirmatory analysis is used when one is reasonably certain that predetermined variables fit together in a single dimension. Such seemed to be the case with the variables which measure

the physical aspects of the provinces. Thus, province elevation, precipitation, and seaside/inland location were analyzed to determine if they fit a single dimension. The data presented in **Table 1** indicate that this is the case.

Table 1

Principal Components Analysis of Natural Characteristics of the Provinces

Variable	**Factor 1 (Natural Characteristics)**
Elevation	-.714
Precipitation	.729
Seaside Location	.664
Eigenvalue	1.48

The sole Eigenvalue of 1.48 for the single factor generated in the analysis indicates that the three variables are part of a unique dimension. The negative coefficient for elevation, combined with positive estimates of precipitation and seaside/inland location suggest that the less elevated provinces tend to be located nearer to the sea and to experience greater amounts of rainfall. The loadings for the three variables for this factor were converted into factor scores to be utilized in the multivariate analysis.

The second principal components analysis was exploratory. When one is not exactly certain of the relationship among a complex number of variables, exploratory factor analysis is typically employed. In the case of the socioeconomic variables, we were uncertain as to the how the variables would be related to each other given their greater number and complexity. Accordingly, we employed a second principal components analysis which we report in table 2.

Table 2

Principal Components Analysis of the Socioeconomic Characteristics of the Provinces
(Rotated Factor Loadings)

Variable	**Factor 1 (Industrial)**
Municipality	.889
GDP per capita	.858
Density	.704
Cultivated area per capita	.045
Percentage of illiterate Women	-.498
Imports and exports per capita	.867
The primary industry (agriculture) as a percentage of the GDP	-.800
Hospital beds per capita	.786
Health personnel per capita	.873
Eigenvalue	5.33

An initial solution demonstrated two factors discerned from the socioeconomic variables. However, a scree plot diagnosis suggested that only one factor be kept in the analysis. The factor might be termed "industrial" as the highest loadings indicate a dominance of municipalities (.889), a high amount of GDP per capita (.858), a dense population (.704), a high volume of imports and exports per capita (.867), a high concentration of hospital beds per capita (.786), a large number of health personnel per capita (.873), and, finally, a low percentage of the GDP being devoted to the primary industry (-.800). Stated differently, there is an indication of considerable economic diversity.

Time Series/Cross Sectional Analysis

The regression equation used to estimate the variation in the birth rate and the sex ratio in China's provinces is the following:

$$Y = b_0 + b_1 (\text{NATURAL}) + b_2 (\text{INDUSTRIAL})$$

$$+ b_3 (\text{ENFORCEMENT}) + e$$

where NATURAL is equal to the principal component measuring the physical characteristics of the province, while INDUSTRIAL is equal to the variables which load highly on the socioeconomic dimensions of the provinces. Examination of the data reveals that the NATURAL variable is highly correlated with the economic development levels of the provinces, with the commonly perceived "poorest" provinces such as Tibet and Qinghai having the lowest scores. The "richest" locations such as Shanghai and Jiangsu possess the highest scores. This suggests that the disparities of economic development among the provinces in China are determined in great part by their different levels of natural resources. The INDUSTRIAL variable, on the other hand, seems to reflect more of the characteristics of socio-economic development in a province than its absolute development level. Provinces that are populous, relatively poor, and dominated by agriculture (e.g. Guizhou and Anhui) have lower INDUSTRIAL scores than Tibet, which is commonly perceived as the "poorest" but does not have a polar position in the agricultural-industrial continuum. Finally, ENFORCEMENT is measured by the policy index which indicates the degree to which the Chinese government implements the one-child policy.

Results of the Prais-Winsten estimation are presented in **Tables 3** and **4**. Analyzing the birth rate first (**Table 3**), it is possible that the birth rate may fluctuate over time. In the Chinese case, we expect there to be some natural decline in the birth rate as a result of the one-child policy. In other words, there should be some continuing decline in births as time passes. In order to investigate this possibility, we established the years 1997, 1998, and 1999 as dummy variables and used 1996 as a reference category against which the other years could be compared. If the birth rate is continuing to decline in response to the one-child policy, we should observe a decline in all years following 1996. **Table 4** indicates that this is the case as the coefficients for the three dummy years are negative and significant.

With the factor of time controlled, it is obvious that all the predictor variables impact the birth rate and in the hypothesized direction. The coefficient for NATURAL is negative, indicating that in areas with larger amounts of rainfall, located near the coast with low elevations, there tend to be lower birth rates. The estimate for the INDUSTRIAL variable demonstrates that in provinces which are primarily rural and agriculturally-based, government has a difficult time controlling the birth rate; conversely, birth rates tend to be lower in urban and industrialized areas, where couples are more apt to comply with officials who enforce the policy, either out of choice or because of fear of sanction. Considering the high loadings of individual socioeconomic variables in INDUSTRIAL, the results suggest that the birth rate, as is hypothesized, tends to be lower in municipalities, and provinces with higher population density, higher GDP per capita, lower percentage of GDP from the primary industry, higher concentration of hospital beds per capita and health personnel per capita, and lower percentage of illiterate women.[7]

Finally, the data indicate that enforcement has an important impact on the birth rate. As expected, the greater the degree of policy enforcement, the more couples will be inclined to limit the size of their families. Overall, the fit of the model is very good as illustrated by the multiple R^2 of .935. The Rho statistic (.869) indicates that the amount of autocorrelation is substantial. More important than increasing the amount of variance explained by the model, by including the autoregressive component, we are able to insure that the estimates that we attain are not significant by virtue of inflated standard errors which would not be controlled by a standard OLS estimation.

A somewhat different picture is evident with regard to the sex ratio (**Table 4**), when it is analyzed with the same equation. First of all, the coefficient for NATURAL is not significant, even though the variable is related to the overall economic development of the provinces. The variable of primary impact is INDUSTRIAL, which again depicts the characteristics of economic development within the provinces. The table indicates that the sex ratio is significantly lower in provinces where there is a higher level of urbanization and a lower concentration on agriculture. This is congruent with our expectations, as citizens in more urbanized and industrialized areas have a lower preference for sons and are less likely to conduct sex-selective abortions.

If the unbalanced sex ratio is an unintended effect of policy implementation, we would expect it would be greater in provinces where enforcement is stricter. The coefficient for ENFORCEMENT is in the

expected direction (positive) but is not significant. The insignificance may in part be caused by a measurement problem — if sex ratio at birth were considered as opposed to sex ratio for the population at large — it might be easier to assess the impact of enforcement more directly. Changes in sex ratio at birth in any given year would cause a much smaller change in the sex ratio at large.[8] Second, the migration pattern and death rates of women and men may be quite different, and these could also lead to changes in the sex ratio at large.

The most striking finding is, nevertheless, indicated by the dummy variables 1997, 1998, and 1999. **Table 4** demonstrates that the sex ratio increases every year with growth greater than 2 percent within the four years. The overall fit of the model is very good with a multiple R^2 of .977. Apparently, the sex ratio rises simultaneously as the birth rate decreases. This suggests that in terms of morality policy the intended impacts which the Chinese government produces with regard to limiting births has had the ironic and unintended consequence of accelerating an imbalance of the sexes. While couples are somewhat elastic in their demand for the number of children, they are less flexible when it comes to the gender preference of a child.

Sex Ratio and the Socioeconomic Variables

Gu and Roy (1995) argue that sex ratios cannot be explained by a simple linear model which is based on the supposition that rural areas will have unbalanced ratios and urban provinces more balanced ones. Instead, these scholars assert the dynamic component of fertility behavior in China, holding that what might be more important is the actual pace of socioeconomic development as well as "accelerated fertility transition(s)" in explaining an unbalanced ratio. Provinces at the extremes, with fertility patterns already in place, have the best chances for an even ratio. The scholars indicate that the provinces with the lowest sex ratios tend to be those which are highly urbanized, such as Shanghai and Beijing, and, at the other extreme, areas such as Tibet and Xinjiang, which are rural in character. As a final step in this analysis, we attempted to uncover more fully the exact circumstances under which an unbalanced sex ratio is likely to occur. To accomplish this, we decomposed the relationship between the ratio and the variables which comprise the INDUSTRIAL factor.

Table 3

Estimates of Regressors with Chinese Birth Rate
(Praxis-Winsten Solution with Panel-Correlated Standard Errors)

Variable	Coefficient	Std. Error	Z	prob.
Natural Characteristics	-1.70	.106	-16.02	<.001
Industrial	-1.94	.249	-7.81	<.001
Enforcement	-3.76	.179	-20.97	<.001
1997 dummy	-.388	.009	-39.41	<.001
1998 dummy	-.813	.017	-48.50	<.001
1999 dummy	-1.38	.018	-75.31	<.001
Constant	22.03	.309	71.27	<.001

R^2 = .935
Prob. < .001
Rho = .869

Table 4

Estimates of Regressors with Chinese Sex Ratio
(Praxis-Winsten Solution with Panel-Correlated Standard Errors)

Variable	Coefficient	Std. Error	Z	prob.
Natural	.28	.221	1.25	.212
Industrial	-1.91	.296	-6.46	<.001
Enforcement	.490	.521	.930	.350
1997 dummy	.581	.012	49.66	<.001
1998 dummy	.650	.020	32.44	<.001
1999 dummy	.870	.022	39.50	<.001
Constant	102.04	.917	111.32	<.001

R^2 = .977
Prob. <.001
Rho = .394

As the scattergrams presented in **Figure 2** show, the general patterns, as suggested by Gu and Roy, can be observed. Specifically: [9]

1. The sex ratio reaches its peak in provinces with relatively low population density and GDP per capita. In areas with extremely low population density and GDP per capita, such as Tibet and Qinghai, however, the sex ratio is very low.
2. In provinces where agriculture takes up a higher percentage of the GDP, the sex ratio is higher, but then it drops in provinces which are most agriculturally-based.
3. The relationship between sex ratio and women's education level presents a curvilinear pattern as well. The sex ratio is the highest in provinces with moderate percentage of illiterate women.
4. The provinces which have moderate accessibility to health facilities have the highest sex ratio.[10]

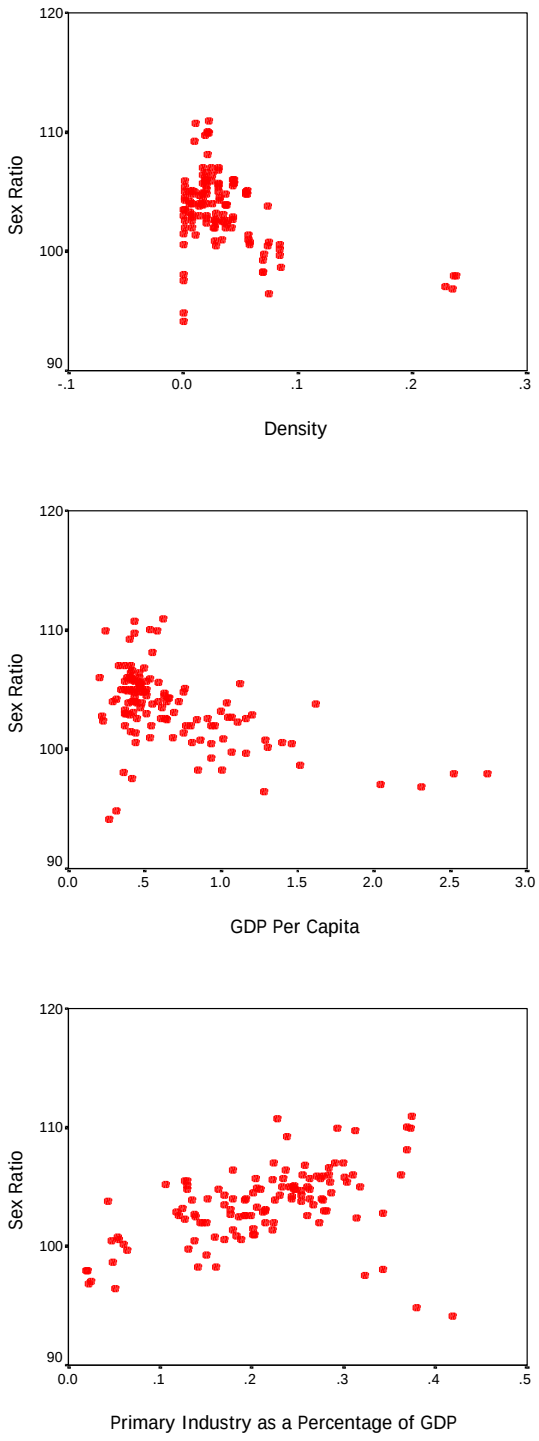
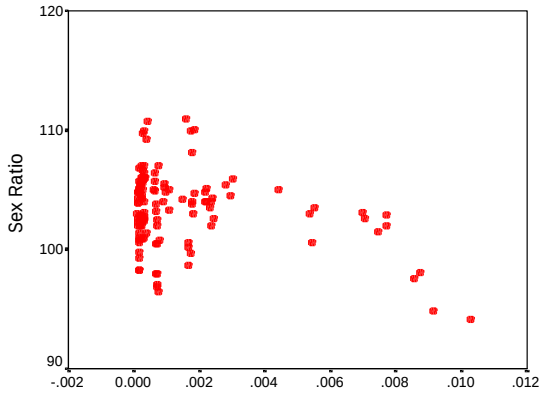
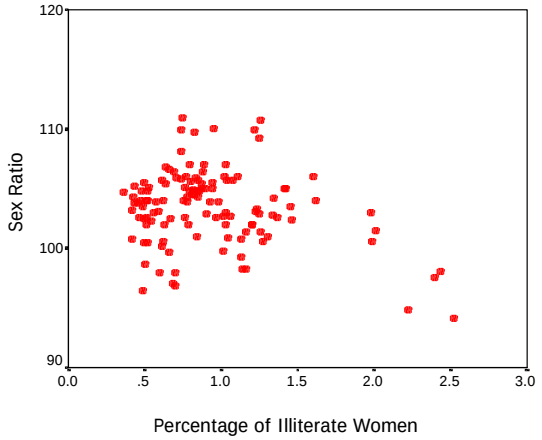


Figure 2-1, 2-2, and 2-3: Sex Ratio with Population Density, GDP Per Capita, and Primary Industry as a Percentage of GDP





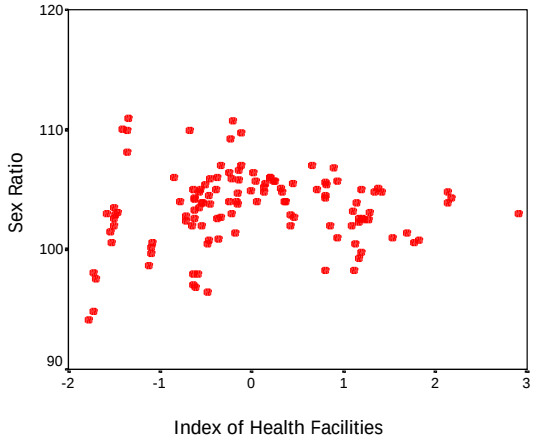


Figure 2-4, 2-5, and 2-6: Sex Ratio with Cultivated Area Per Capita, Percentage of Illiterate Women, and Index of Health Facilities

In short, there is no linear relationship between the sex ratio and the set of socioeconomic variables which compose INDUSTRIAL. In most urban and industrial areas, such as Shanghai and Beijing, it is most likely that couples are less tied to the traditional preference for sons, so the sex ratio would remain natural even when the birth rate is lowered. In the most remote and undeveloped provinces such as Tibet and Qinghai, on the other hand, the sex ratio is still balanced either because of the less strict policy enforcement or the lack of new technology such as ultra-sound techniques.

A summary of our major findings is presented in **Table 5**.

Table 5

Summary of Findings

Variables	Birth Rate and Sex Ratio
Natural Resources	● The birth rate tends to be lower for more resourceful provinces located near the coast, with lower elevations and larger amounts of precipitation. ● The sex ratio is higher for those areas as described above, but the result is not statistically significant.
Socioeconomic Conditions	● The birth rate tends to be lower in more industrialized areas, such as the municipalities, and provinces with higher population density, higher GDP per capita, lower percentages of GDP from the primary industry, higher concentrations of hospital beds per capita and health personnel per capita, and lower percentages of illiterate women. ● The sex ratio tends to be lower for those areas as described above. Careful examination, however, shows that the relationship is non-linear. The unbalanced sex ratio becomes most serious in provinces more agriculturally based and with middle-level socioeconomic development.
Policy Enforcement	● The birth rate tends to be lower where population control is more strictly implemented. ● The sex ratio tends to be higher where population control is more strictly implemented, but the result is not statistically significant.
Year Dummies	● The birth rate significantly decreases during the study period. ● The sex ratio significantly increases during the study period.

Conclusions

The Chinese government has been successful to a large extent in decreasing the rate of population growth, though the problem is far from solved. The enormous population in proportion to the amount of resources necessary to achieve a prosperous and modern society continues to make economic progress lag. On the other hand, this somewhat successful policy appears to have an unfortunate unintended consequence of a severely unbalanced sex ratio which has worsened over the past several years. This sex ratio problem is unlikely to occur in provinces with either extremely high or low birth rates; rather, like the relationship between sex ratio and the different components of INDUSTRIAL, the relationship between birth rate and sex ratio is presented convincingly as a curve (see **Figure 3**). In areas with high birth rates and relaxed policy enforcement, the sex ratio problem takes care of itself as families have more freedom to create the family composition they prefer. In the low birth rate areas with strict enforcement, couples seem to settle for the political and social norm of a smaller family, regardless of the gender of the child.

The sex ratio problem is likely to become more serious in the "middle" provinces where individuals struggle with the desire to have sons coupled with the political requirement of the state to limit families. Men may find it increasingly difficult to find spouses and to start new families. A legitimate question is why the unintended consequence exists despite the success demonstrated in family limitation.

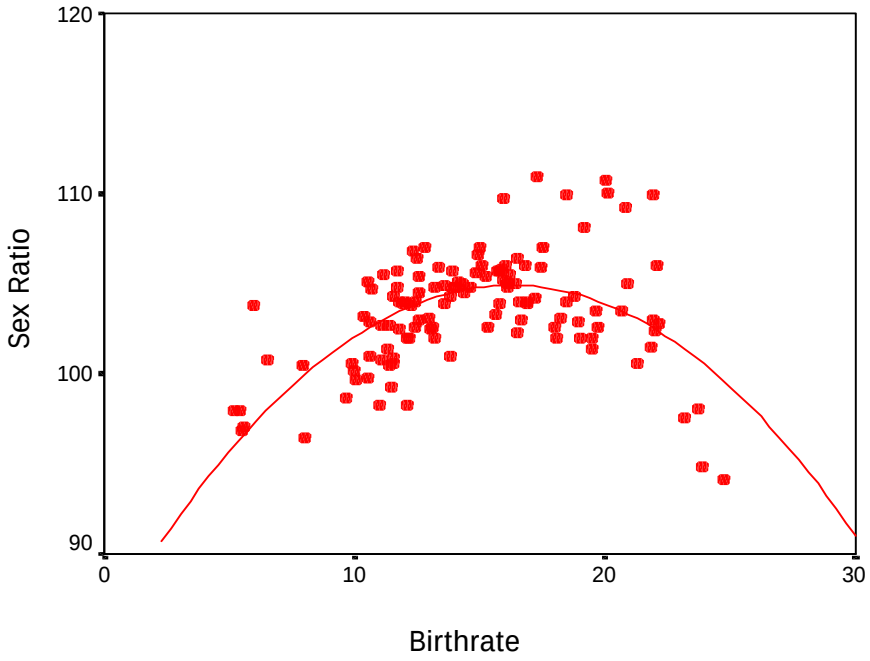


Figure 3: The Curvilinear Relationship between Sex Ratio and Birth Rate

We believe that the unanticipated consequence of an unbalanced sex ratio relates to the concept of morality in the public policy setting. The Chinese government has been successful in lowering the rate of population growth because it has offered alternatives to couples in terms of contraception and abortion to limit families. Through propaganda as well as the experience of living in a resource-scarce society, some Chinese have come to appreciate the value of a small family. This approval has accelerated as China has developed commercially and industrially. But government has not been able to address the very deep and traditional preferences many families have in terms of wishing for sons. While some of the reason for preferring sons is economic, it is also a widely held social norm. Couples are given very limited opportunities to have children and when the gender of a baby is not one they care for, they will take steps to alter gender, regardless of enforcement.

One approach out of this dilemma is that in the long run, the imbalance of genders may create a market to solve the problem; in other words, girls may become more valuable should there be fewer available for marriage. But the market solution creates several sociological problems which violate traditional Chinese culture. A market solution assumes that two individuals enter a marriage arrangement to start a completely new family. But especially in rural areas, young women will be absorbed by the male's family and a corresponding shift of labor to that family will occur. Western wisdom would assume that in a female-scarce society some men would be willing to be absorbed by the young woman's family if the competition of being married is very high; however, Chinese culture would treat such maneuvering with deep disdain.

A second difficulty with the market solution is that given the value placed on the different genders, females are more likely to be "upward moving" in Chinese society than are men. Rural women are far more likely to marry urban males than the reverse; likewise, females from poor areas are more likely to marry wealthier men than the other way around. Thus, the negative effect of the unbalanced sex ratio will be directed to poor areas where many men of marriage age cannot afford to get a spouse. Perhaps because of this problem, there have been some reports of illegal trading of young women in rural China. Some women may be kidnapped or forced into an involuntary marriage and lose their freedom for years. All of these undesirable externalities may work to block the market solution in the Chinese case.

Notes

[1]As McFarlane and Meier (2001:3) indicate, morality politics most frequently address social relationships but have a primary concern with values. Social values were not an original concern of Lowi's typology which dealt more with the regulation of economic relationships.

[2]In China, the primary industry refers to the agricultural sector (including forestry and fishery); the secondary industry refers to the industrial production sector, and the third industry is concerned with the service sector.

[3]It has been widely reported that, as in western counties, more and more Chinese couples living in big cities like Beijing and Shanghai have chose to maintain a DINK family — "Double Income, No Kids."

[4]Family planning policy in China allows minority nationalities to have more than one child. Thus, the more minorities in a province, the less stringent the policy control. There are four Minority Autonomous Regions in China. In addition, there are a few Minority Areas within provinces. Since the population control for those living in Minority Regions or Areas is relaxed, the policy index is coded according to the following formula.

PI = 2 - MP (MP = the population in Minority Areas as a percentage of the total population of a province).

Thus, for a Minority Autonomous Region, PI = 1; for a province where there are no Minority Areas, PI = 2; for a province with some Minority Areas internal, PI ranges between 1 and 2.

[5]Chongqing Municipality was not created until 1997 and data are missing for 1996.

[6]For each province, there is little variation across the limited time period and the variables are, for the most part, permanent characteristics of the provinces. Therefore, we performed the factor analysis across all years rather than within years.

[7]The correlation between birth rate and cultivated area per capita cannot be inferred from the coefficient of INDUSTRIAL, however, as cultivated area per capita is barely loaded (0.045) in INDUSTRIAL.

[8]As an example, if the sex ratio at birth increases 2 percent (which is considered a large increase) in a particular year, given that the birth rate is 1.5 percent (if normal), the sex ratio at large would increase by only .03 percent, which is hardly detectable.

[9]There is a great deal of variation shown in these figures, because there are quite a lot of other things that influences the sex ratio. As noted above, for instance, sex ratio for the population at large, as measured in this study, is not solely decided by sex ratio at birth, an indicator which may relate to these socioeconomic variables much more directly.

[10]In order to improve the construct validity of the health measure, the data presented in **Figure 2-6** consists of a factored variable which is composed of:

a. the number of health institutions per capita;
b. number of hospitals per capita;
c. number of hospital beds per capita;
d. number of health personnel per capita; and,
e. number of hospital personnel per capita.

Authors' Notes

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