ECONOMIC FACTORS AND INSTITUTIONAL CHANGES IN DETERMINING FERTILITY IN CHINA: AN EMPIRICAL STUDY

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ABSTRACT

It is claimed that China has completed the demographic transition. Causality tests based on time series data for 1949-1988 proves this claim. It is also found that income contributes to the process of demographic transition. Regression analysis is done to find out the effect of the current institutional reform on the fertility rate in China, as well as that of other economic factors. Institutional change regarding the economic reform is found the have a negative effect on the birth rate. Contrary to the general view, there is indirect evidence to show that the one-child-policy may not be so effective in resolving the high birth rate in China.

CHAPTER 1

DEMOGRAPHIC PATTERN AND POPULATION POLICIES

1.1 Introduction

China has experienced a constant decline in the mortality rate since the mid-1950s, and its mortality rates stabilized in the late 1980s. On the other hand, the decline in the fertility rate came after the decline in the mortality rate and paralleled the improvement of medical services. Based on these facts, it was claimed that China has already undergone the demographic transition (Banister 1984, Peng 1989). During the late 1970s, China encountered a dramatic institutional change, namely, economic reform and an unprecendent population policy, the one-child-policy. Such institutional change and policy change undeniably triggered different responses in fertility. The most common viewpoint is that one-child-policy contributed a lot to the recent rapid decline in the fertility rate decline during the late 1970s (Banister 1988, Sun and Wei 1987, and Platte 1984/85). Another popular claim is that the economic reform in rural areas may dampen the effect of the one-child policy (Dalsimer and Nisonoff 1987, Croll 1983, and Whyte and Gu 1987). In the first part of this paper, formal tests are undertaken to see whether the demographic transition phenomenon really happened in China. The second part of this paper investigates the effects of the current institutional change, along with other economic factors on fertility. It may provide indirect evidence on whether the one-child-policy is effective.

The successive sections of this chapter review the current literature on China's demography, demographic pattern and population policies.

In chapter two, causality tests are done to find out the dynamic relationship between fertility and mortality to see whether China has completed its demographic transition. Furthermore, the role of income in influencing the dynamic relationship between fertility and mortality is also examined. Annual national data as well as annual regional data from 1949 to 1988 are used in the tests.

In chapter three, the impact of the institutional change, together with other economic variables, on fertility (birth rate) is studied in details. Regression analyses using pooled cross-sectional time series data from 1979 to 1987 of 29 administrative regions in China are employed. A short conclusion is presented in chapter four.

1.2 Current Literature On China's Demography

Before 1979, China's demographic statistics were not published. Because of the lack of data, there were almost no studies on China's demography. Starting from 1979, China began publishing these data. Since then research on China's population have been quite active. Many studies have been undertaken by academics from different fields, such as economists, sociologists and demographers.

Some studies are on general demographic characteristics such as its growth rate, and forecasting future growth, providing secondary resources for other researchers (Banister 1984, Schran 1978, Jowett 1984, Tien 1983).

Another line of study concentrates on the one-child-policy which was launched in 1979 (Chen 1985, Dalsimer and Nisonoff 1987, Wong Siu-lun 1984, Sun and Wei 1987, Platte 1984). Some of these studies examine the cross effects between the new agriculture policy and the one-child policy in China (Dalsimer and Nisonoff 1987, Croll 1983, Whyte and Gu 1987). It is commonly agreed that the new agriculture policy weakened the effectiveness of the one-child-policy in the rural areas. Infanticide, aging population and an unbalanced sex ratio are also emphasized as the consequences of the new population policy (Wong Siu-lun 1984, Banister 1988,). Other studies considered structural changes to the family caused by the one-child-policy (Chen 1985).

The other line of research is on the correlation or the relationship between the birth rate and other socio-economic variables (Chan 1986, Lam 1987, Tien 1983, Peng 1989, Poston and Gu 1987). It is argued that the birth rate is highly negatively correlated with the level of economic development. In provinces where economic development is more advanced, the birth rate tends to be lower. Despite the fact that different research have different indicators for the economic development, they reach the same conclusion. Besides, education level and characteristics of married women are found to have a high correlation with the birth rate (Chan 1986).

Most of the literature conclude that China has completed the demographic transition but there is no formal test to support this claim. This will be done in chapter two of this paper.

1.3 Recent Demographic Trend In China[1]

Mortality Trend

As seen in table 1.1, during the 1930s and the 1940s, the crude death rate in China was as high as 40 per thousand population. This was partly explained by the active warfare between Japan and China, and the warfare between the Communist and the Nationalist armies. In the period of 1949 to 1950, the crude death rate was around 20 per thousand population or above. Throughout the first half of the 1950s, the crude death rate remained as high as 17 per thousand population. Many observers estimated that the crude death rate at that period was as high as 30 per thousand,[2] which was far

[1] for details, see Banister (1987), Tien (1983) and the Statistical Yearbook of China.

[2] see Banister (1987), p. 80.

above the official figure. The high death rate was understandable because after the warfare, there was land reform; production was not resumed quickly and the public health situaton was very poor. Besides, plague epidemics were widespread in the early 1950s. Other diseases like scarlet fever, typhus and measles were common. Tuberculosis, diphtheria, malaria, kala-azar, typhoid and parasitic diseases were not yet cured and prevented.

Table 1.1
Official birth rate, death rate, and rate of natural increase in China (rates per 1,000 population)

Crude Year	Crude Birth Rate	Rate of Death Rate	Natural Increase
1949	36.00	20.00	16.00
1950	37.00	18.00	19.00
1951	37.80	17.80	20.00
1952	37.00	17.00	20.00
1953	37.00	14.00	23.00
1954	37.97	12.18	24.79
1955	32.60	12.28	20.32
1956	31.90	11.40	20.50
1957	34.03	10.80	23.23
1958	29.22	11.98	17.24
1959	24.78	14.59	10.19
1960	20.86	25.43	-4.57
1961	18.02	14.24	3.78
1962	37.01	10.02	26.99
1963	43.37	10.04	33.33
1964	39.14	11.50	27.64
1965	37.88	9.50	28.38
1966	35.05	8.83	26.22
1967	33.96	8.43	25.53
1968	35.59	8.21	27.38
1969	34.11	8.03	26.08
1970	33.43	7.60	25.83
1971	30.65	7.32	23.33
1972	29.77	7.61	22.16
1973	27.93	7.04	20.89
1974	24.82	7.34	17.48
1975	23.01	7.32	15.69
1976	19.91	7.25	12.66
1977	18.93	6.87	12.06

1978	18.25	6.25	12.00
1979	17.82	6.21	11.61
1980	18.21	6.34	11.87
1981	20.91	6.36	14.55
1982	21.09	6.60	14.49
1983	18.62	7.08	11.54
1984	17.50	6.69	10.81
1985	17.80	6.57	11.23
1986	20.77	6.69	14.08
1987	21.04	6.65	14.39
1988	20.78	6.58	14.20
1989	20.83	6.50	14.33

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Source: *Statistical Yearbook 1989*, State Statistical Bureau, 1989, p. 88.

In 1957, the public health campaign had reduced filth and the number of diseases carrying pests. Epidemic control was in progress. Vaccination was used for prevention of small pox. As a result of these effort, death caused by infectious diseases began to decrease. In 1957, official estimate of the crude death rate was 10.8 per thousand population, far below 1950's 20 per thousand. Since then, China's mortality began to decrease in a slightly oscillating pattern.

During the period from 1958 to 1960, the death rate climbed to 25.43 per thousand population in 1960. This was due to widespread famine during this period. Afterwards, production resumed gradually and the death rate was eased to 10 or below in the successive years.

From 1965 to 1976, the death rate kept on decreasing to around 7 or 8 per thousand population. The political system during this period underwent a substantial turmoil because of the Cultural Revolution. The statistical reporting system was under serious attack during the period of 1966-1969. Therefore, the official figure may be far from the truth. It was believed that the actual rate was under-reported at this period.

Starting from 1969, the medical services in China began to have a great improvement. Barefoot doctors served in the rural areas, thus decreasing the death rate in the rural areas. Regularized access of medical services was made reachable to most of the populace. The death rate was further decreased from 8.03 in 1969 to 7.04 per thousand population in 1973.

Throughout the 1970s and the 1980s, China's death rate was steadily decreasing, this might be attributed to the constant improvement on medical services, improving living stardard and the stable political environment. In spite of occasional natural disasters, it was quickly confined locally, therefore the death rate was not affected on a large scale.

On the whole, the mortality rate decreased since the mid-1950s and stablized recently at around 6.5 per thousand population, a rather low level, compared with the levels of other developing countries, e.g., 10.8 of India, 14.8 of Nepal, and 20.2 of Angola; an it is also lower than the level of some of the developed countries, e.g. 9.4 of France and 9.3 of Italy.

Birth and Fertility Trend

China was for long famous for its high birth rate and fertility rate. Traditionally, Chinese advocated large family, their primary goal of marriage was the bearing of children because having sons to continue the family name was a must and an honorable thing. So it was not strange that Chinese like to maintain a large family and have a high birth rate. Of course, this phenomenon is not so common nowadays in China. In recent years, China has successfully decreased its birth rate and fertility rate; large families are now perhaps rare rather than common.

From the official figures, it was found that throughout the 1950s and the 1960s, China had an extraordinarily high crude birth rate (except 1959, 1960 and 1961), ranging from 29.22 to 43.37 per thousand population (see table 1.1). These levels were high in absolute terms because China's population was already about 22% of the world's total. During this period, although China was alarmed by such a high birth rate, not much effort was put to tackle the problem. For the years 1959 to 1961, the rather low birth rate (18 to 24 per thousand) was due to the great famine of that period.

In 1963, after the famine, the birth rate hit its peak since the establishment of the People's Republic of China, at 43 per thousand population.

Since 1970, birth control based on the slogan "wan, xi, shao" (later marriage, mid-20s for women, late 20s for men; longer intervals between births three to four; fewer children--no more than two per family in cities and three in rural areas) was implemented. This represented the government's declared effort tackling the problem of high birth rate. From this time onwards, the birth rate began to fall.

For the whole of the 1970s, the birth rate declined from 33.43 in 1970 to 17.82 per thousand population in 1979. During the period of 1980 to 1982, the birth rate rose a little bit. During this period, shortly after the implementation of the one-child-policy, people might have hurried with their birth plans as they feared that the policy might get stricter over time, thereby pushing up the birth rate. During the years 1983 to 1985, the crude birth rate fell slightly. This can be attributed to the coercive manner the Chinese government was pursuing the one-child-policy. However, in the following years, the birth rate had a rather unstable pattern. It increased to 20.77 in 1986 and to 21.04 per thousand population in 1987 and then fell somewhat afterwards.

By and large, during the 1970s and the 1980s, there was a downward trend in the birth rate. Many demographers attributed this to the effectiveness of the birth policy in China (Tien 1983, Banister 1984). Meanwhile, the effects of the rising education levels and the change in attitude towards bearing children on the birth rate cannot be neglected.

Many observers speculated that China's birth rates were under-reported.[3] In viewing this and in hope of getting more accurate data for future use, in September 1982, the State Family Planning Committee carried out a nationwide fertility survey. The sample population was over 1 million persons. This large sample provided more reliable information on fertility behaviour. A closer look at China's fertility based on this information may give us a clearer picture on China's demography.

Referring to table 1.2, before 1949, the total fertiltity rate[4] was around 5.5 per woman. The fertility rate began to rise in the late 1940s. During the years 1952 to 1957, the fertility rate was as high as 6 births per woman. This was partly explained by the afterwar baby boom. Another factor contributing to the high fertility rate was the land reform. Landless peasants and tenants were redistributed land in the land reform campaign. For the sake of more farm laborers, peasant demanded more children.

Table 1.2
Total fertility rates in China, 1940-1981

Year	Total Fertility Rate	Year	Total Fertility Rate
1940	5.251	1961	3.287
1941	5.317	1962	6.023
1942	5.001	1963	7.502
1943	5.300	1964	6.176
1944	5.187	1965	6.076
1945	5.295	1966	6.259
1946	5.514	1967	5.313
1947	5.840	1968	6.448
1948	5.509	1969	5.723
1949	6.139	1970	5.812
1950	5.813	1971	5.442
1951	5.699	2972	4.984
1952	6.472	1973	4.539

[3] Banister (1987), p. 229.

[4] Total fertiltity rate (TFR) is defined as the average number of children who would be born alive to a woman during her lifetime if she lived through all her childbearing years. (See Banister 1987, p. 395)

1953	6.049	1974	4.170
1954	6.278	1975	3.571
1955	6.261	1976	3.235
1956	5.854	1977	2.844
1957	6.405	1978	2.716
1958	5.679	1979	2.745
1959	4.303	1980	2.238
1960	4.015	1981	2.631

Source:Chen Shengli, "Fertility of Women During the 42-Year Period From 1940 to 1981", in China Population Information Centre, *Analysis On China's National One-per-Thousand-Population Fertility Sampling Survey,* Beijing (1984), pp. 56-57.

During the period of 1958 to 1961, the fertility rate dropped slightly owing to the famine in that period. Afterwards, it reached the peak of 7.5 per woman in 1963. This was not surpris because it could be explained by the post-famine baby boom. For the whole of the 1960s, China still experienced a high fertility rate of around 6 per woman.

After 1970, the fertility rate began to fall constantly. Total fertility rate dropped from 5.812 per woman in 1970 to 2.631 in 1981. This change was rather large.

In short, fertility decline took place in the 1970s, but the scale of decline was remarkable.

The behaviour of the crude birth rate and the total fertility rate were quite similiar, e.g., both had its peak in 1963, and exhibited a declining trend beginning in the 1970s.

Population Growth

During the 1950s, the mortality rate and the birth rate were high, leading to a moderate population growth at around 20 per thousand population (for the population trend see table 1.1). In the 1960s, the mortality rate fell considerably due to the advancement in medical services, however, the birth rate was still high. The result was a rather high population growth rate. In 1963, the population growth was at its peak of 33.33 per thousand population. During the early 1970s, the mortality rate remained low and the birth rate began to slide, resulting in a slight decline in the population growth rate. Beginning in the late 1970s, the birth rate dropped speedily and the population growth rate began to fall at around 12 per thousand population. In the 1980s, the death rate and the birth rate were rather low. The population growth rate exhibited a pattern of ups and downs at a low level of 10 to 14 per thousand population.

From the above discussion, we know that the history of China's demographic pattern since the 1940s was quite similar to that of western countries. Mortality dropped first, then came the decline in births. Finally, both rates decreased to a low level, resulting in a low population growth rate.

1.4 Policies For Controlling Birth

Although China is famous for its birth control policy, it has in fact another device for coping with the population problem and that is the marriage law.

The Marriage Law

The first attempt by the People's Republic to regulate marriage was the Marriage Law of 1950.[5] This law set the minimum age for marriage at 18 and 20 for women and men, respectively. Although in this period, China's birth rate was as high as 36 to 38 per thousand population (see table 1.1), this law did not aim at decreasing fertility as the officials were not aware of the seriousness of the population growth problem. This law was, in fact, aimed at getting rid of the old conventions of early and arranged marriages.

The issue of late marriage was raised again in 1956. China began to perceive her unusually high population growth as a hindrance to economic development (Aird 1972). However, opinion among officials were divided on the issue and the marriage law was not tightened.

In 1962, after the Great Leap Forward, the officials paid more attention towards the problem of high population growth. The issue of late marriage reappeared. Although the early marriage law was not amended, youth were educated and encouraged to marry until well past the legal minimum age.

Throughout the 1970s, the marriage law remained unchanged. However, the government began to delay marriages by other devices: introducing letters of introduction, permissions to marry and other credentials. Meanwhile, localities used such documents as a means to achieve their target average minimum marriage age. Permission was frequently not granted to youths who applied for marriage until they were older.

During the 1970s, population control in China was furthered promoted with the slogan "wan, xi, shao' (later, longer, fewer). The late marriage rate emerged as an indicator of performance of local birth control practice. Localities tried to achieve a high average age of first marriage as far as possible.

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[5] The information on marriage law is based on Tien (1983), pp. 90-107.

Since the imposition of the marriage law in 1950, the official report showed that the average age at first marriage was gradually increasing from 18.7 to 22.8 (refer to table 1.3). The performance of the urban areas were constantly better than that of the rural areas (table 1.3). It was understandable because in the urban areas, less resistance was experienced, while in some rural areas the subterfuge of Chinese age reckoning was allowed.

From the official figure, it seemed that the official marriage age constraint had achieved a continuous success since the average age of first marriage was falling, if we ignore the increasing education level and other social changes that were also causing people to postpone their age of marriage. In 1980 the new marriage law was changed and the minimum marriage age was set at 20 for women and 22 for men. Compared with the old marriage law, these levels were only two years higher.

Table 1.3
Women's Average Age at First Marriage in Urban and Rural Areas of China, 1950-81

Year	Urban	Rural	National
1950	19.7	18.5	18.7
1951	19.7	18.5	18.7
1952	20.1	18.7	19.0
1953	20.2	18.7	19.0
1954	20.4	18.8	19.1
1955	20.5	18.8	19.1
1956	20.7	18.8	19.2
1957	20.5	18.9	19.2
1958	20.7	18.8	19.1
1959	20.7	19.0	19.3
1960	21.1	19.3	19.6
1961	21.2	19.4	19.7
1962	21.2	19.3	19.6
1963	21.1	19.3	19.5
1964	21.7	19.2	19.5
1965	22.1	19.3	19.7
1966	22.5	19.4	19.4
1967	22.5	19.5	19.5
1968	22.4	19.7	19.7
1969	22.4	20.0	20.0
1970	22.3	19.9	19.9
1971	22.8	19.9	19.9
1972	23.3	20.3	20.3

1973	23.6	20.6	20.6
1974	23.9	20.9	20.9
1975	24.3	21.3	21.3
1976	24.7	21.8	21.8
1977	25.1	22.0	22.0
1978	25.2	22.3	22.3
1979	25.5	22.6	22.6
1980	25.3	22.5	22.5
1981	24.8	22.3	22.3

Source: Judith Banister, *China's Changing Population*, Stanford University Press, 1987, p. 156, table 6.1.

With reference to the ever-increasing effort to curb the population growth, it was surprising that the minimum marriage age had not been adjusted to an even higher level in spite of its claimed performance. Why were the new ages not set at 23 and 25 for women and men respectively or even higher? It may be due to the problem of feasibility. Although for long, the reported figures said that the average age of first marriage was increasing and far above the level set in the first marriage law, it would not be surprising if in effect the actual figures were much lower. Localities often under-reported the true figures. In other cases, youth began their married lives by ignoring or delaying registration. Therefore, it was understandable that the government set a less stringent requirement. This might be deemed as a compromise between the need to curb fertility and the social realities and the youths's desire to get married at an early age.

The Birth Policy

Another means to curb the population growth in China was the birth policy. Since the 1950s, China had unprecedentedly high rates of population growth (about 24%).[6] The government tried to control the fertility by telling people to limit their fertility voluntarily. Of course, this attempt was in vain. During the period of 1955-58, mass distribution of contraceptives including diaphragms, unlubricated condoms, contraceptive jellies and foams began. Intra-uterine devices were supplied in a few cities. It was not surprising that contraceptive use in the 1950s was not common because contraceptives were poor in quality and in supply. Moreover, the demand for birth control at that time was not deemed as impelling.

By 1958, China had made the supply of contraceptives much more available. Yet, success was not accompanied with this effort because of the problem with social acceptance. After the Great Leap Forward, the government furthered its effort to slow

[6] Banister (1987), p. 267, table 8.11.

down the fertility rate. In addition to encouraging late marriage, the ideal of a two-child family was promoted. To facilitate this promotion, intra-uterine contraceptive devices, vasectomy and abortion were encouraged and made available. In 1963, a huge effort to raise the quantity and quality of contraceptive devices was forwarded and since then, supply problems became less popular. Research on abortion, sterilization and contraceptive pills were continued.

In 1964, the first national Family Planning Office was set up. Some provinces set up their own committee to coordinate their propaganda work. During 1962-66, rapid fertility decline was reported in many cities, and rural resistance to fertility control was also softened. In the 1970s, in order to further lower the fertility rate, the introduction of family planning programs was deemed as urgent. The government tried to require urban couples to stop at two living children and rural couples to stop at three. These requirements were not compulsory at that time. In 1977, the government switched the policy from a voluntary stage to a compulsory stage. Rural and urban couples had to stop at two. Abortion and sterilization became popular measures.

Despite the constant effort to curb population growth since the 1950s, the government wanted to further decrease the natural rate from 1.21 in 1977 to 1 per thousand population by 1980 (Banister 1984). The government decided to implement a new birth policy or better say a stricter birth policy, the one-child-policy. This new policy was announced in January 1979. The initial goal of this policy was that 20% of urban couples and 5% of rural couples stopped at one child.

During 1979, the government quickly changed its attitude from encouragement of the one-child family to insistence that all couples should follow the one-child-policy. The corresponding incentive and disincentive scheme were implemented in most provinces except in areas where minorities inhabitated. In cities and towns, monthly cash payment, housing allocation, job assignments, free medical care for the child, free schooling and priority for enrolment in kindergarten and preferred schools were given to couples who signed a pledge to declare that they would cease childbearing when they had a child. In rural areas, couples were granted with more work points. On the other hand, the birth of a third or higher order child would be accompanied with economic penalties. In urban areas, salaries were reduced; medical care and schooling benefits would not be given to extra children. In rural areas, work points would be deducted.

By 1981, most provinces tried to prevent the second birth. A second child was not officially permitted except in rare cases. This practice was also implemented even in rural areas where the birth policy was usually implemented in a more lenient way. Since the implementation of the policy, it was claimed that it had attained considerable achievements (Sun and Wei 1987). From 1949 to 1979, the average natural population growth was about 25 while in 1985, it was 10.81 per thousand population.

However, despite its claimed performance, other serious consequences could not be denied. Female infanticide became serious after the implementation of the one-child-policy (New Statesman 1986). Traditionally, Chinese families had a preference towards male offsprings rather than female ones. If families were only allowed to have one child, they would prefer a son. Hence, if the first child was female, some families might kill their baby immediately after her birth and hope to bear another baby son later on. This was extraordinarily common especially in rural areas where manpower was an important asset to the family. This phenomenon became even worse since the introduction of the responsibility agricultural system after 1978. This new agricultural system emphasized the importance of production at family level; families were awarded according to their production achievements, hence manpower became more important than under the collective agricultural system in which people were granted according to the production level of the whole production team. As a result of female infanticide, there was an unbalanced sex ratio. The policy would also alter other demographic characteristics of the population. Aging population would be expected in the next several decades. Hence the one-child-policy is not without cost. Some studies reveal that this policy has not been tightened in recent years (Zeng 1989). This may reflect the government's understanding on the negative aspects of this policy. The future evolution of this policy will probably depend on how much pressure the problem of population growth will bring to bear on the Chinese government.

CHAPTER 3

FERTILITY CHANGE IN THE REFORM PERIOD 1979-1987

During the late 1970s, China underwent a drastic institutional reform and policy change. In 1978, China started its economic reform comprising agricultural reform in the rural areas and industrial reform in the urban areas. In 1979, in order to achieve a more desirable population growth rate, the government introduced a new birth policy, the one-child-policy. This policy allowed each couple to have one child only. In the early stage the policy was quite relaxed. After several years, it became more coercive.

In this chapter, I want to explore how the institutional change and the policy change, as well as other economic factors affect fertility behaviour in the reform period 1979-1987. The method employed in this chapter is the regression analysis using pooled time-series and cross-sectional data. Before regression analysis, a brief review of the economic reform is presented first.

3.1 The Economic Reform

Since the establishment of the People's Republic of China in 1949, China adopted the communist system; but the economic development of the country was undesirably slow. People's living standard was not upgraded in spite of the admirable ideal of communism. In viewing the defects of the system, China's leaders decided to reform the economic system. This was not done until Mao Zedong who advocated the communist system and held the ultimate power of China's leadership died in 1976. The new leadership under Deng Xiao Peng took economic development as the primary goal and introduced economic reform in 1978.

The reform was divided into two parts: agricultural reform in the rural areas and industrial reform in the urban areas. The rural reform came first. The objective was to increase material incentive for peasants, thus increasing the production level. The first step was to free up the free markets, allowing peasants to trade goods exceeding the quota that had to be submitted to the government. The second stage was to transform the traditional collective agricultural system into the responsibility system. This was undertaken in 1979 and greatly improved peasants' incentive to work harder and better; and resulted in higher productivity (Perkins 1988).

Reform in the urban areas came in 1981. The objective was to improve the industrial production. Firstly, markets for inputs and outputs like steel, machinery, raw materials and some consumer products were created so that resources could be allocated by the market force. Previously, inputs and outputs were allocated by the administration, resulting in misallocation. The second step was to offer incentive to factory managers so that they could perform and respond to profit incentives. Increases in the number of private-owned and collective-owned enterprises led to more competition with the state-owned enterprises, thus improving the quality of goods that were produced. Other policies like opening the economy to trade with foreign countries were also executed. The aims were to stimulate local production, to earn foreign curriencies and to import technology.

Table 3.1
Growth Rate of National Income in China

Period	Growth Rate of National Income (at 1980 Prices)
1953-57	6.61%
1957-65	2.09%
1965-76	5.11%
1976-85	8.78%

Source: Dwight Heald Perkins, "Reforming China's Economic System", *Journal of Economic Literature*, June 1988, p. 628.

The remarkable performance of the economic reform was recognized locally and in foreign countries. This performance was reflected in the growth rate of national income in China. As shown in table 3.1, the growth rate of national income during the years of 1953-1957 was 6.61 percent. It fell to 2.09 percent in the period of 1957-1965. In the nine years following the death of Mao Zedong, the growth rate accerelated to 8.78 percent per year. Such a high growth rate was partly due to an increase in capital and labour. However, productivity increase due to economic reform was also substantial (Lin 1989).

3.2 Effects Of The Economic Reform and Other Economic Factors On Fertility

In order to find out the effect of the institutional change, as well as that of other economic factors, the following equation will be estimated:

$$FR = PNI + NTP + EI + T + T^2 + LS + LC + PMAD1 + PMAD2 + e....(3.1)$$

Where FR = fertility rate
PNI = per capita income
NTP = non-agricultural population/total population
EI = index of economic reform

T = time
LS = share of labour working in state enterprise
LC = share of labour working in collective enterprise
PMAD1 = provincial dummy (i.e. for provinces, this equals to 1, and for municipalities and autonomous regions, this equal to 0)
PMAD2 = municipal dummy (i.e. for municipalities, this equals to 1, and for provinces and autonomous regions, this equal to 0)
e = error term

Income is a well-known factor that influences fertility.[7] In economic theory, people's demand for children is constrained by their income. They choose the optimal number of children they want according to their preference and their income. Therefore, income affects fertility level through the income effect. The income effect is positive as children is usually deemed as a normal good. However, in our analysis, in absence of women's wage rate, income effect may imply a negative sign because of its high correlation with wife's market opportunities. Thus income in our analsis not only captures the income effect but also the price effect. Hence its effect on fertility can only be determined empirically.

The proportion of agricultural population influences fertility as there exists an essential difference between the demand for children of the agricultural population and the non-agricultural population. To the agriculatural population, children's value to parents comes from both consumption and production because children in rural areas ususally help their parents in agricultural work. Demand for children in this case will be thus higher than demand for children in the case where children are only for consumption mainly (Wong Yue-chim 1987, 1990). The latter case usually happens in non-agricultural population as the productive use of children is less direct and less emphasized because in urban areas, people are mainly employees, their children can hardly help them in their work. Therefore, if the agricultural population share increases, it is likely that the fertility rate increases. On the contrary, if the share of non-agricultural population increases, fertility rate decreases.

Institutional change may have an effect on fertility, because they may influence people's preference and income. The institutional change we want to discuss here is the economic reform. There are two aspects of the reform: agricultural reform in rural areas and industrial reform in urban areas. In urban areas, industrial reform offers more opportunities for people to work harder because now wage rates are more likely to be linked with work effort. People's wage rates increase generally as their marginal product

[7] for details, see Becker (1960, 1973), DeTray (1973), Willis (1973).

of labour increase. Therefore, time cost for bearing children increases. Although increase in wage rate may bring about positive income effect on child-bearing, it is believed that this effect will be suppressed by the government's one-child-policy.

In rural areas, the responsibility system enables peasants to enhance their work effort. It is deemed that under this system, peasants demand more children to obtain more labour to help in their agricultural production. As mentioned before, the demand for children will be higher among the agricultural population because they have both consumption value and production value. This effect leads to a higher fertility rate (Wong Yue-chim, 1987, 1990). On the other hand, the price effect caused by a higher wage-rate and by the one-child-policy is still operative in rural areas, thus decreasing the demand for children. Therefore, we can hardly conclude that demand for children in rural areas must increases a priori.

There are three types of enterprises in China: state-owned, collective-owned and private enterprises. The latter two became popular after the economic reform in 1978. The proportion of labourers of these three types of enterprises can be deemed as another measurement of the level of economic reform. The fact that more labourers work in the state-owned enterprises instead of collective-owned and private enterprises may reflect a lower level of reform and vice versa. Therefore, if the effect of the economic reform on fertility is positive, the proportion of labourers who work in state-owned enterprises will have a negative effect on fertility and vice versa.

On the other hand, higer proportion of labourers work in the collective-owned enterprises may reflect a higher level of reform. And if the effect of the economic reform on fertility is positive, the proportion of labourers who work in collective-owned enterprises will have a positive effect on fertility and vice versa.

In order to find out whether there are inherent differences in fertility rate among provinces, municipalities and autonomous regions, dummy variables are created. They are PMAD1 and PMAD2. The former represents province and the latter represents municipality.

Time is included as an explanatory variable as I want to investigate over time, how the fertility rate changes, holding other mentioned variables constant, this may shed light on whether the one-child-policy is effective.

Due to data insufficiency and assuming that the fertility rate bears a close positive relationship with the birth rate, the latter is used to measure the fertility rate, hence, equation (3.1) becomes:

$$BR = PNI + NTP + EI + T + T^2 = LS + LC + PMAD1 + PMAD2 + e....(3.2)$$

3.3 Data Specification

All data are annual data of 29 administrative regions in China. As our aim is to analyse the effect of institutional change on fertility together with other economic factors, we use data series that begins in 1979 and ends in 1987 in which period the economic reform was being implemented.

The crude birth rate is used. Data for per capita income are in real term (1952 as the base year). We use per capita income instead of national income because per capita income more appropriately decribes the level of people's disposable income. NTP is the fraction of non-agricultural population in total population. LS and LC are the fractions of workers in state-owned enterprises and in collective-owned enterprises in the total labour force respectively. For the index of economic reform, figures estimated by Yang, Wang and Wills (1991) is used. As the data they compile are national data, not regional data, I assume that all regions bear the same level of reform and use the national data as a proxy for all regions. That means the data series of EI for all regions are the same. Though this assumption may seem to be less realistic, it may not hamper our purpose to measure the effect of economic reform on the birth rate.

3.4 Statistical Specification

To be specific, our analysis is based on the time series data of different regions, i.e., pooled cross-section time series data. Therefore, equation (3.2) should be written as:

$$BR_{it} = PNI_{it} + NTP_{it} + EI_{it} + T + T^2 + LS_{it} + LC_{it} + PMAD1_i + PMAD2_i + e_{it} \;....(3.3)$$

The functional form of equation (3.3) is assumed to be additive. However, in order to have a more robust result, regressions based on other functional forms: log form and semi-log form, will also be done for comparison.

The statistical properties of the estimates of equation (3.3) are determined by the nature of the disturbance in the model, e_{it}, where i refers to region. There are many approach to deal with cross-sectional time-series data, e.g. cross-sectionally heteroskedastic and time-wise autoregressive model, cross-sectionally correlated and time-wise autoregressive model, and error components model.

One approach to the specification of the behaviour of the disturbances when dealing with cross-sectional and time-series data is to combine the assumptions that we frequently make about cross-sectional observations with those that are usually made when dealing with time series.[8] For cross-sectional observations, regression disturbances for observations on individual units at a point of time are assumed to be mutually independent but heteroskedastic. Concerning the time series data, the distubances are assumed to be autoregressive. Combining these assumptions, we may adopt the cross-sectionally heteroskedastic and time-wise autoregressive model. Recall the assumptions of the model as follows:

$E(e_{it}^2)$	$= \sigma_i^2$	(heteroskedasticity)
$E(e_{it}e_{jt})$	$= 0\ (i \neq j)$	(cross-sectional independence)
e_{it}	$= \delta_i e_{i,t-1} + u_{it}$	(autoregression)

For different regions, the behaviour of the disturbances is likey to be different, e.g., in regions where most populace are minority races, birth rate tends to be higher because they are less subject to the one-child-birth-policy. The disturbances of different regions may be uncorrelated because they are subject to different strengths of policy and different environment changes. The error term is assumed to be time-wise autoregressive because we consider that we may omit the relevant explanatory variable systematically. We confine the autoregressive order to be one for convenience.

With the above assumptions on the error term, efficient estimates of the parameters for equation (3.3) can be obtained by using a variant of generalized least squares. Each δ_i will be estimated first and the estimated δ_i will be used as the basis for the generalized least-squares regression of equation (3.3).

Results for the cross-sectionally heteroskedastic and time-wise autoregressive model is reported in table 3.1. Also results for models assuming a white noise process is also listed in the same table for reference.

3.5 Empirical Results

As showed in the column one of table 3.1, NTP, EI, T^2, PMAD1, and LS are significant in explaining the birth rate in different regions.

The proportion of non-agricultural population (NTP) is found to have a negative relationship with birth rate. This result is consistent with our prediction as mentioned early in this chapter.

The effect of economic reform (EI) on fertility is found to be negative. This reveals that although on the one hand peasants may demand more children under the new agricultural system in seeking more labourers, the increasing cost of bearing children may override the former effect. Besides, in urban areas, couples tend to

[8] Kmenta 1971, pp.509-510.

decrease demand for children because of the price effect of children. Hence, the overall effect of the economic reform may be negative.

The provincial dummy (PMAD1) is found significantly related to the birth rate. It bears a negative relationship with birth rate. This in turn, means that birth rate of provinces are lower than autonomous regions.

Table 3.2 Empirical Result for Equation (3.3)

Dependent Variable: BR

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
PNI	*0.1330 (0.267)*	0.2362 (0.608)
NTP	*-31.9610 (-4.522)* *	-31.8679 (-4.199) *
EI	*-18.3230 (-3.230)* *	-38.8799 (-3.282) *
T	*-0.2436 (-0.954)*	0.5147 (1.006)
T^2	*0.1148 (6.078)* *	0.1019 (3.048) *
PMAD1	*-2.2511 (-3.223)* *	-2.6617 (-4.193) *
PMAD2	*2.6400 (1.565)*	2.6416 (1.610)
LS	*18.8630 (3.443)* *	18.0522 (2.651) *
LC	*-7.9639 (-1.161)*	-8.2746 (-1.517)

Note: ( ) are t-value of the estimated coefficient.

- significant at 5%.

Table 3.3 Empirical Result for Equation (3.3) In Log form

Dependent Variable: LogBR

==

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
logPNI	*0.0316 (1.618)*	0.0526 (3.016) *
NTP	*-1.8511 (-4.346) **	-1.8008 (-4.330) *
EI	*-1.570 (-3.578) **	-2.3636 (-3.619) *
T	*-0.0088 (-0.589)*	0.0312 (1.106)
T^2	*0.0061 (5.270) **	0.0057 (3.116) *
PMAD1	*-0.1251 (-3.396) **	-0.1194 (-3.350) *
PMAD2	*0.1447 (1.593)*	0.1452 (1.712)
LS	*0.9165 (2.850) **	0.7796 (2.067) *
LC	*-0.4560 (-1.185)*	-0.3580 (-1.249)

==

Note: ( ) are t-value of the estimated coefficient.
* significant at 5%.

Table 3.4 Empirical Result for Equation (3.3) In Semi-Log Form

Dependent Variable: BR

==

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
logPNI	*0.7043 (1.950)*	0.9692 (3.123) *
NTP	*-31.0400 (-4.371) **	-29.9346 (-4.043) *
EI	*-2.0808 (-3.582)*	-40.5758 (-3.489) *
T	*-2.2253 (-0.861)*	0.5035 (1.003)
T^2	*0.1138 (5.892) **	0.0991 (3.021)
PMAD1	*-2.4526 (-3.707) **	-2.2737 (-3.583) *
PMAD2	*2.1237 (1.400)*	2.0087 (1.330)
LS	*13.9190 (2.489) **	11.9840 (1.784)
LC	*-7.6030 (-1.212)*	-5.9816 (-1.172)

==

Note: ( ) are t-value of the estimated coefficient.
* significant at 5%.

This is understandable because in autonomous regions, the populace are mainly minority group like Manchu , Tibetan, Mongolian etc. The birth pattern of minority groups are quite different from the Hans. There is a study showing that minority groups in general have more children than the Hans (Poston and Shu 1987). Besides, they are not subject to the restrictions of the one-child-birth-policy.

The fraction of workers in stated-owned in the total labour force (LS) is significant in explaining birth rate. As predicted, when economic reform has a negative effect on fertility, it bears a positive relationship with birth rate.

Finally, as indicated by the coefficient of T and T^2, we find that over time the birth rate is increasing at an increasing rate, holding the other variables in equation (3.3) constant. The variables T and T^2 represents the residual effect of omitted variables. This result is amazing because holding the economic reform and other economic variables constant, the birth rate is still rising over time.

One of the omitted variable is probably the one-child-policy effect. The residual effect may capture the effect of the one-child-policy on fertility. Therefore, it may suggest that the one-child-policy has not effectively decreased the birth rate over time. It is commonly believed that the birth rate declined in the 1980s in China because all the measures the government took was to bid down the fertility rate. The most well-known measure is the one-child-policy which has not been adopted in other countries. Since its first announcement, it was widely praised for its sound achievements. Although it is hard to test whether this policy is effective in lowing down the fertility, our results indirectly suggest that the one-child-policy may not be as effective as is commonly believed.

One of the reason for this result may be that the policy had not been strictly enforced. Zeng Yi (1989) suggested the policy had been relaxed after 1986. On the other hand, many people probably delayed their fertility plans several years after the policy was announced in 1979, thus leading to a small baby boom in later years. This effect may be significant if the policy itself was not tightened.

The above empirical results apply to both the log form and the semi-log form of equation (3.3). The results are reported in tables 3.2 and 3.3 also. The findings are therefore quite robust.

From the above results, we know that the provinces have a lower birth rates than the autonomous regions. One of the explanations is that minority groups are concentrated mainly in the autonomous regions and tend to have a higher fertility rate. Minority groups here means the ethnical groups other than Hans, e.g. Tibetan, Hui, Uygur, Salar, Baoan and Kazak.

In order to prove this claim, we want to test the hypothesis: the higher the proportion of minority group in a region, the higher the birth rate. A new variable, MIN, the percentage of minority group in total population in the region is included in equation (3.3). The new equation is

$$BR_{it} = PNI_{it} + NTP_{it} + EI_{it} + T + T^{2} + LS_{it} + LC_{it} + PMAD\,1_{i} + PMAD\,2_{i} + \mathrm{MIN}_{it} + e_{it} \;....(3.4)$$

Because of the lack of a comprehensive data series and knowing that there were no large scale migrations of minority group in the 1980s, we use the data obtained from the Population Census in 1982 for the entire time period of 1979 to 1987, i.e., this variable MIN is assumed to be constant for the period of our analysis.

Table 3.5 Percentage of Minority Groups for different regions in China

Regions	%	Regions	%
Anhui	0.50	Liaoning	8.15
Bejing	3.50	Nei Mongol	12.92
Fujian	1.00	Ningxia	31.94
Gansu	7.95	Qinghai	39.10
Guangdong	1.78	Shaanxi	0.46
Guangxi	38.26	Shandong	0.55
Guizhou	26.00	Shanghai	0.47
Hebei	1.61	Shanxi	0.25
Heilongjiang	4.94	Sichuan	3.67
Henan	1.07	Tianjin	2.12
Hubei	3.72	Tibet	94.41
Hunan	4.08	Xinjiang	59.59
Jiangsu	0.18	Yunnan	31.70
Jiangxi	0.07	Zhejiang	0.42
Jilin	8.11		

Table 3.5 shows the figures of MIN for different administrative regions.
Test results for equation (3.4) is showed in table 3.6. NTP, EI, T_2, PMAD2, LS, and MIN are found significant in explaining the birth rates in the different regions. The signs for the estimated coefficients for NTP, EI, T_2, PMAD2, and LS are exactly the same as the test results for equation (3.3). However, PMAD1 now becomes insignicant, and the sign of the estimated coefficient becomes positive whereas in the previous result, it is significantly negative. MIN is found to be positively related to the birth rate, therefore, our hypothesis that a higher proportion of minority groups in a region leads to a higher birth rate is supported.

Besides, in the previous section, we guess that because minority groups are mainly concentrated in autonomous regions and tend to have a higher birth rate than the Hans, autonomous regions tend to have higher birth rate in general. Now as the percentage of minorities is included in our regression (i.e. equation 3.4), PMAD1 becomes insignificant in explaining birth rate, we may conclude that the main difference in the birth rate between provinces and autonomous regions lies in the difference in the proportion of minorities in these two administrative regions.

The above empirical results apply also to the other two functional form of equation (3.4) (see tables 3.7 and 3.8), therefore, the test results are robust.

3.6 Summary

In this chapter, it is found that the institutional change - the economic reform has a negative effect on fertility. Other economic variables, the proportion of non-agricultural population, and the proportion of workers in stated-owned enterprises are also significant in explaining the birth rate. In addition, there is some indirect evidence to show that the one-child-policy may not be as effective as is commonly believed. Besides, the inherent difference in the birth rate between provinces and autonomous regions is due to the proportion of minorities in these areas.

Table 3.6 Empirical Result for Equation (3.4)

Dependent Variable: BR

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
PNI	*-0.7176 (-1.570)*	-0.2643 (-0.707)
NTP	*-31.4080 (-4.182) **	-27.4172 (-3.834) *
EI	*-23.4850 (-3.735) **	-39.6654 (-3.573) *
T	*-0.1428 (-0.485)*	0.5097 (1.063)
T^2	*0.1226 (5.128) **	0.1035 (3.302) *
PMAD1	*0.1162 (0.112)*	-0.2941 (-0.409)
PMAD2	*7.8571 (4.181) **	6.1258 (3.717) *
LS	*14.6050 (2.081) **	11.1867 (1.725)
LC	*-6.7091 (-1.128)*	-4.0402 (-0.783)
MIN	*0.1287 (5.968) **	0.1051 (5.879) *

Note: ( ) are t-value of the estimated coefficient.
* significant at 5%.

Table 3.7 Empirical Result for Equation (3.4)
In Log Form

Dependent Variable: LogBr

==

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
LogPNI	*-0.0039 (-0.180)*	0.0225 (1.241)
NTP	*-1.6659 (-3.594) **	-1.6168 (-4.010) *
EI	*-1.2916 (-3.840) **	-2.3679 (-3.760) *
T	*-0.0106 (-0.667)*	0.0314 (1.156)
T^2	*0.0068 (5.182) **	0.0585 (3.293) *
PMAD1	*0.0178 (0.327)*	-0.0263 (-0.652)
PMAD2	*0.3973 (3.743) **	0.2946 (3.328) *
LS	*0.5292 (1.300)*	0.5709 (1.557)
LC	*-0.1435 (-0.407)*	-0.1628 (-0.582)
MIN	*0.0055 (4.667) **	0.0047 (4.401) *

==

Note: ( ) are t-value of the estimated coefficient.
* significant at 5%.

Table 3.8 Empirical Result for Equation (3.4)
In Semi-log Form

Dependent Variable: Br

===

Cross-sectionally Heteroskedastic Model Assuming and Time-wise Autoregressive Model White Noise

Independent Variable	Estimated Coefficient	Estimated Coefficient
LogPNI	*-0.1194 (-0.281)*	0.3657 (1.145)
NTP	*-26.4140 (-3.477) **	-26.2396 (-3.696) *
EI	*-23.8550 (-3.801) **	-40.6636 (-3.667) *
T	*-0.1910 (-0.649)*	0.5082 (1.061)
T^2	*0.1222 (5.110) **	0.1013 (3.238) *
PMAD1	*0.0242 (0.024)*	-0.4041 (-0.569)
PMAD2	*6.5534 (3.632) **	5.0095 (3.213) *
LS	*7.2727 (1.061)*	7.7942 (1.207)
LC	*-3.3007 (-0.585)*	-2.0632 (-0.419)
MIN	*0.1127 (4.767) **	0.0942 (5.018) *

==

Note: ( ) are t-value of the estimated coefficient.
* significant at 5%.

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