Working Paper No. 76/03

# Fact or Fiction?
# Re-examination of Chinese Premodern Population Statistics

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July 2003

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# Fact or Fiction? Re-examination of Chinese Premodern Population Statistics[*]

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## A. The Issue and problems

### 1. The Issue

Despite the kind of scholarly attention that has been attracted in the field of Chinese economic history in the past half a century or so, basic quantities of some basic factors have remained disagreed. Chinese population is one of them. For example, for the post-1350 period, the gap between China's own record and contemporary estimates can be as great as 200 million souls. To make the situation worse, since the late 1960s, estimation and guesstimation have gradually taken over while the Chinese official censuses have been systematically thrown away almost completely.

As a result, the picture of Chinese population during the premodern period has been messy with opinions divided widely (see Figure 1). No one can be truly sure of China's population size despite the fact that population is commonly regarded as one of the key economic factors in an economy. The problems here are neither simple nor trivial.

There are several problems here. The first one is conceptual. Scholars have a tendency, either implicitly or explicitly, to linearise population growth as much as possible. In his article entitled 'The Population Statistics of China, A.D. 2–1953' (1960), John Durand artificially chose some two dozens census points out

[*] I would like to thank Professors Eric L. Jones (Reading University, UK) and Osamu Saito (Hitotsubashi University, Japan) for their valuable comments. My LSE colleague Dr. Peter Howlett has made an irreplaceable contribution regarding the testing technique.

**Figure 1a. Current Situation of China's Population Studies (in million)**

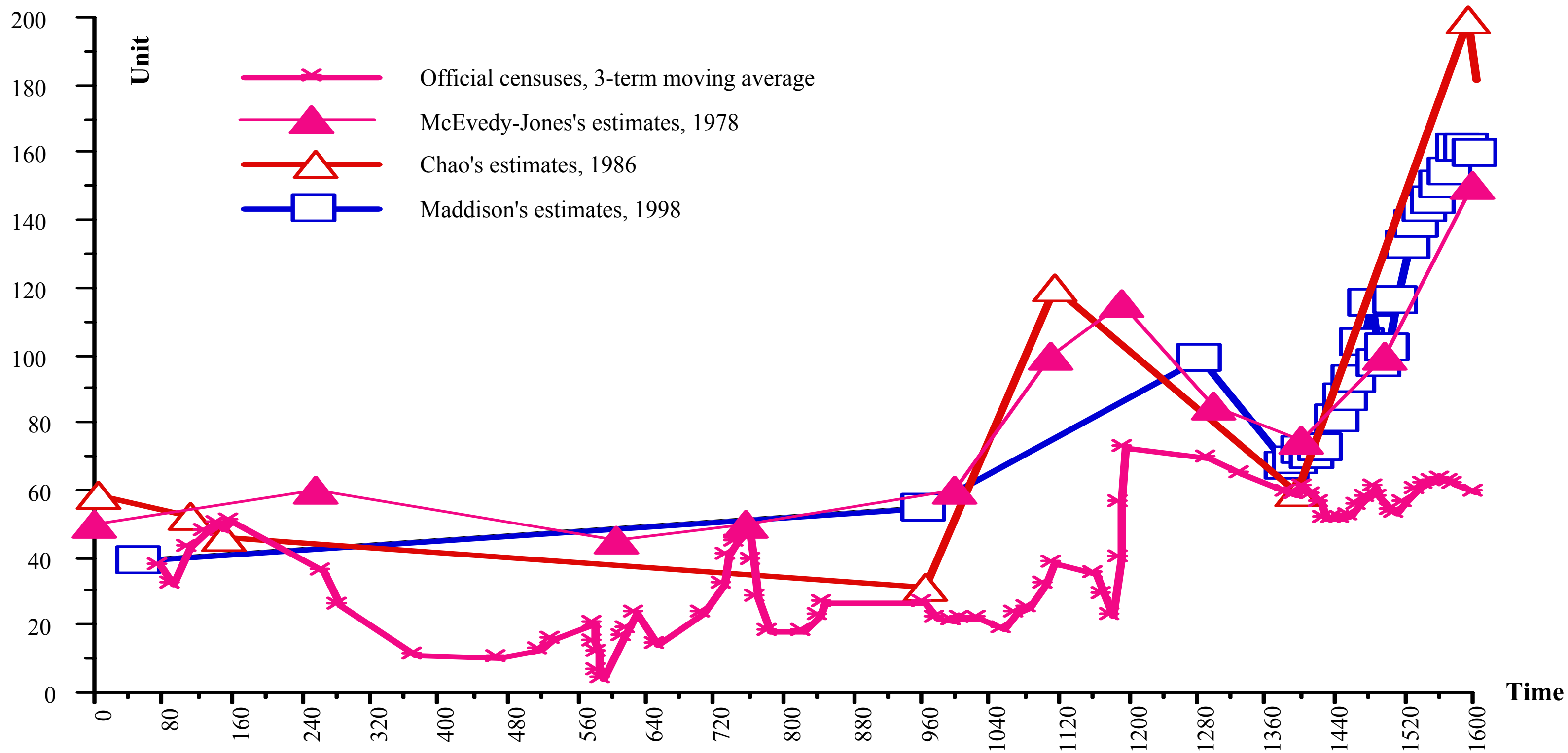
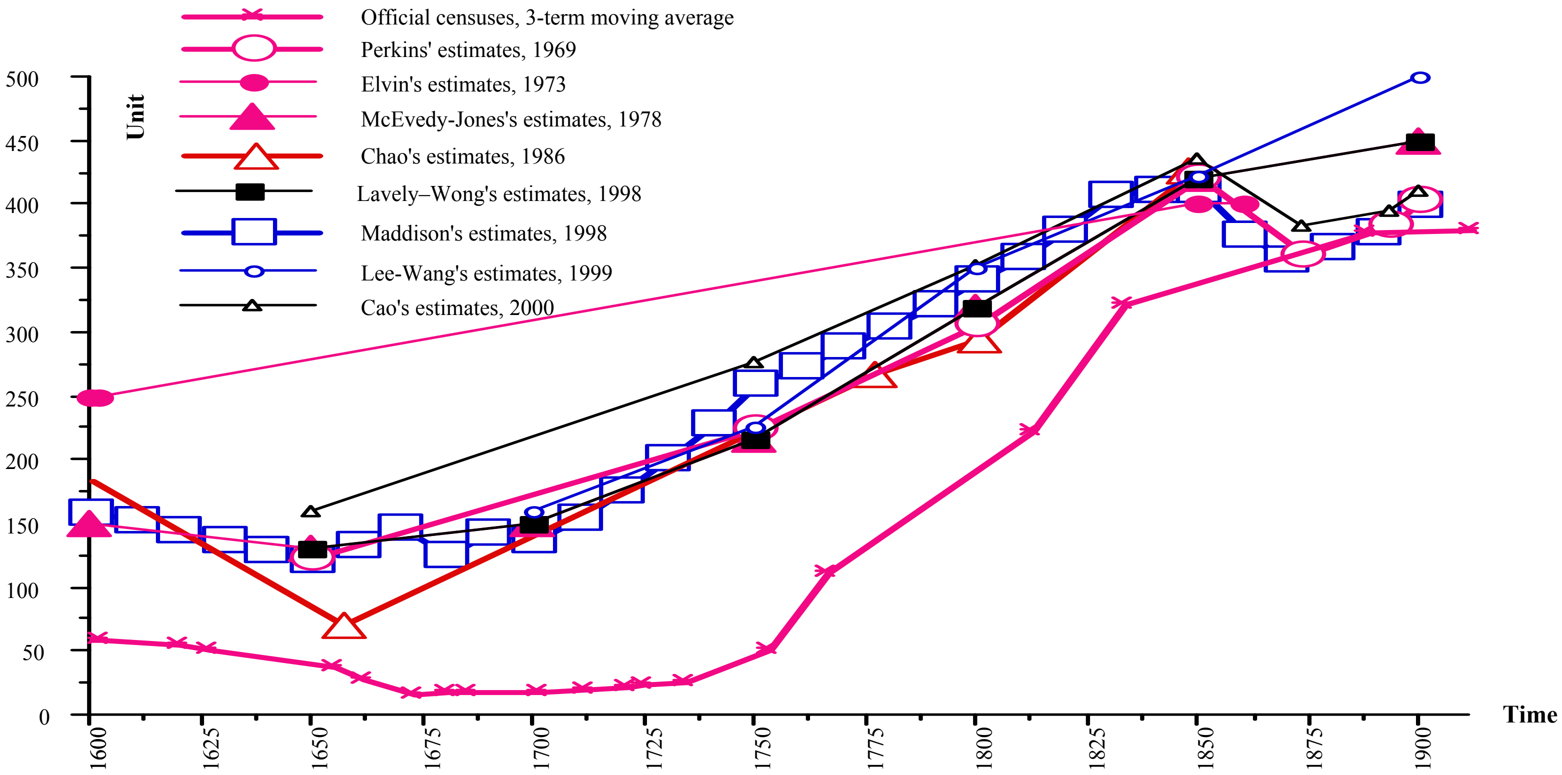


**Figure 1b. Current Situation of China's Population Studies (in million), continued**




Source: (1) 3-term moving average of the official censuses is based on Liang 1980: 4–11; see also Lu and Teng 2000: Appendix. (2) Estimates: Perkins 1969: Appendix A; Elvin 1973: 129 and 310; McEvedy and Jones 1978: 166–74; Chao 1986: 41; Lavely and Wong 1998; Maddison 1998: 267; Lee and Wang 1999: 28; Cao 2000: 690–772.

**Figure 2a. How Datum Manipulation Began**

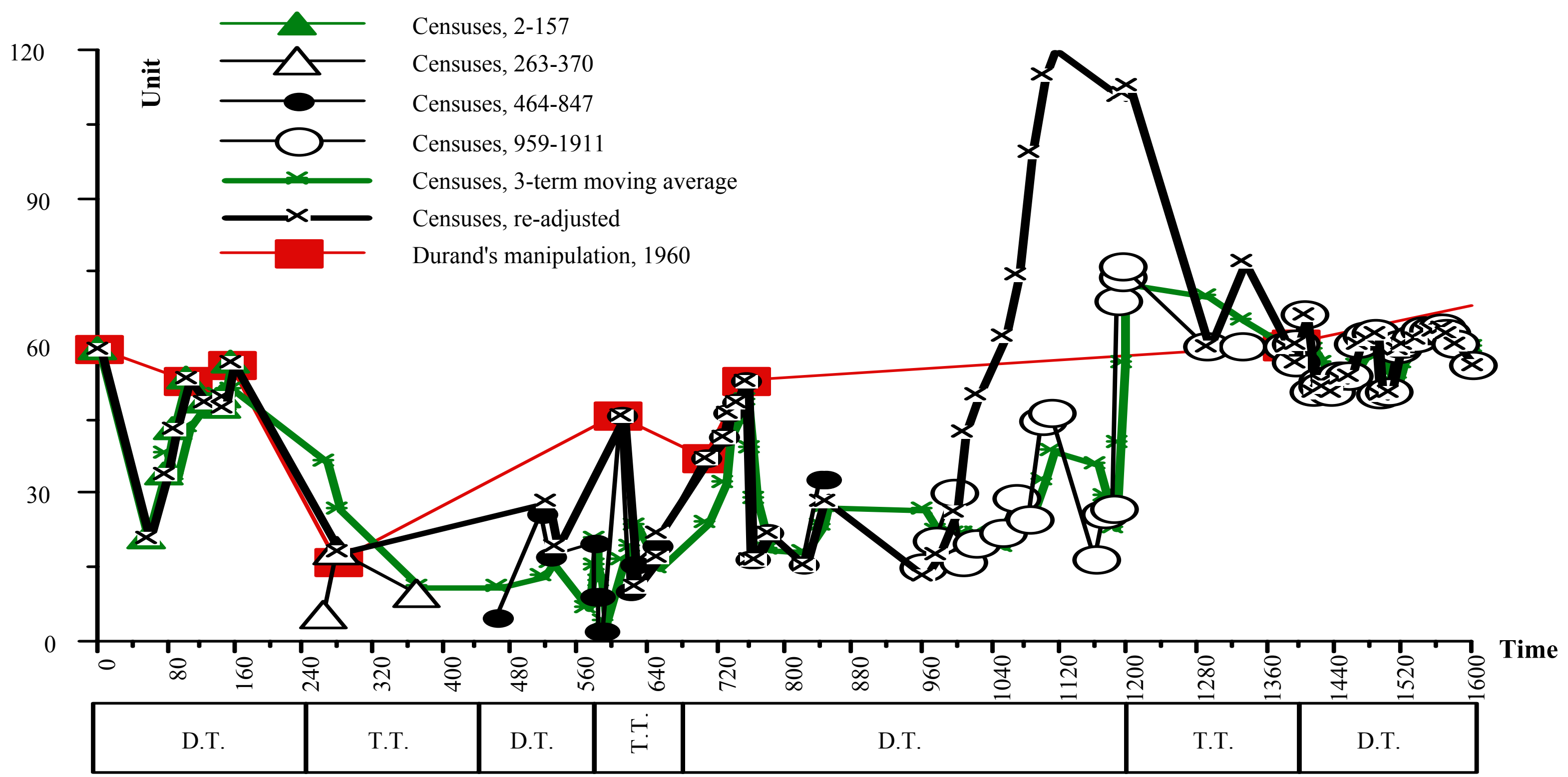
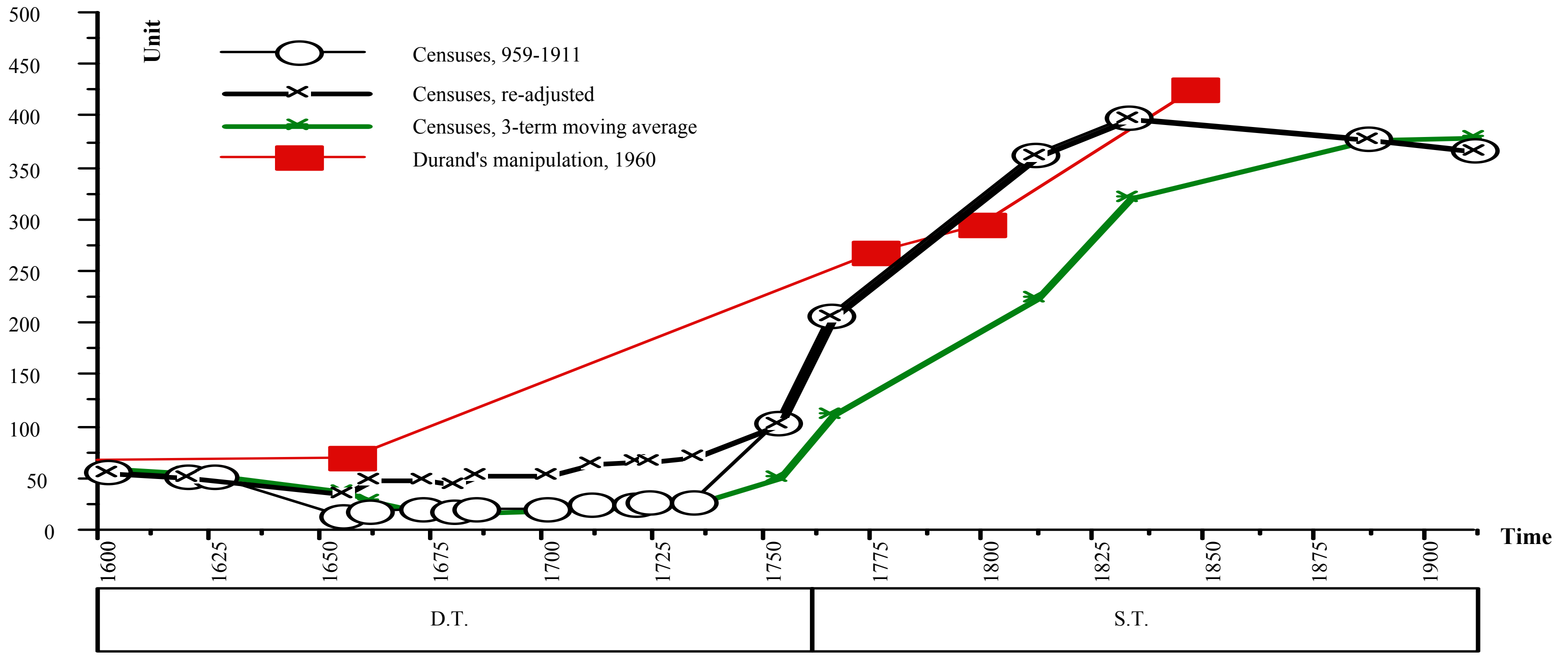


**Figure 2b. How Datum Manipulation Began, continued**




Source: Official censuses are based on Liang 1980: 4–11; and Lu and Teng 2000: Appendix. Datum manipulation: Durand 1960. Official censuses with re-adjustments, see Appendix 3.

Note: Tax regimes: T.T. – Period of the triplex taxation regime; D.T. – Period of the dual taxation regime; S.T. – Period of the single-track taxation regime. For the four periods of official censuses, see Tables 1a and 1b.

of over 100 official observations so that the drama of violent fluctuations could end on paper.[1] This means that some 70 percent of the official census figures were dropped off for the sake of a smoother curve (see Figure 2).

Durand's datum manipulation has opened the floodgate for 'free-hand' attempts to linearise the growth curve for the Chinese population. This was done radically in McEvedy and Jones joint work entitled *Atlas of World Population History* (1978) (shown in Figure 1).[2] With this approach, the official data become irrelevant. Estimates of various sorts, depending on one's own taste and propensity, simply take over (in the English language literature, see McEvedy and Jones 1978; Chao 1986, Maddison 1998 and 2002; for followers in China, see Jiang 1998: 88–9).

Although a common practice nowadays,[3] this linearisation is still a fantasy. In reality, a country's population constantly fluctuates. A linear function will need many demanding conditions to achieve in the real world. These conditions to which the human biomass is very sensitive at all times – political, socio-economic, climatic/environmental and public health – are all imperative to determine the actual population size. So, a long-term linear growth should be an exception, not the rule.[4] The linear approach for demographic estimation is

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[1] For a recent follower of Durand, see Tong 2000: 373–8.

[2] The methodology of McEvedy and Jones is deeply flawed in at least two ways. First, they view and portray the world as a convergent entity: all the main geographic regions – Europe, Africa, East Asia, South Asia Sub-continent, and the Americas – share the same smooth convex/arc-cotangent curve from 200 B.C. to 2000 A.D. (see McEvedy and Jones 1978). This arouses a strong suspicion that a European pattern is used for the rest of the world. If so, their basic approach is normative. Second, their samples are small and primary sources cited extremely limited if not completely absent (at least in the case for China). So at best, their figures for China are a result of arbitrary guess work. This arbitrariness is most clearly reflected in their handling of the population fluctuations in China's periphery regions against that of China proper: their figures vary between one and five million for the whole period from 200 B.C. to 1300 A.D., and then 10 million for 1400 to 1800; and 25 million in 1900 (McEvedy and Jones 1978: 167, 171). There is not a shred of evidence to support their claims. It seems that they not only used a European pattern to guess at China but also used the guesstimated figure for China proper to guess at China's periphery. All these imply that McEvedy and Jones's figures may have misled us in the past twenty-five years.

[3] It is worth noting that although misleading such sustainability has been one of the focal point of demographic study of China (Lee *et al*. 2002: 602–3).

[4] This is based on the assumption of a normal distribution of growth patterns for *Homo sapiens*/humans: if we have a large enough sample covering all communities over a very long

almost certainly counterfactual for the two-millennium history of China to say the very least.

The second problem is methodological. It is in principle unjustifiable and indefensible to ignore or throw away primary sources even if they seem imperfect, as there is a real danger of throwing the baby with the bath water. Unfortunately, throwing away primary data for population has been a common practice in Chinese studies. More often than not, scholars reject Chinese official census figures without any careful analysis. Rather, much has been depended on and derived from a 'gut feeling'. Not surprisingly, different gut feelings have led to different estimates and guesstimates. Customarily, those estimates and guesstimates are not vigorously tested. This methodological problem has led to inconsistency. For example, some studies have relied on data at the grassroots level to build up a larger picture for the empire, a legacy from Ho's early work (Ho 1959; for a recent follower, see Ge 2000–2: vol. 4). Their assumption is that the local statistics were more trustworthy than those publicised by the court officials. What they have not realised is that there was a direct, institutionalised link between those local figures and national aggregates. Related to the aforementioned datum manipulation by Durand, another obvious problem is related to the size of the samples. The credibility of Durand's set should thus be severely discounted.

The third problem is ideological. The Chinese empire system is regarded inefficient and backward, run by incompetent, rent-seeking bureaucrats who did nothing but cultivating long fingernails. This vision fits in well with Marxist claim that mandarins were little more than economic parasites in society. Related to this, premodern China is viewed as a society incapable of nurturing and producing anything near to 'modern science and technology' as we know of. In this context, Chinese officials have been viewed as having neither the incentives, nor technical know-how, nor institutional means to record and monitor China's population. With such a moral judgement, it becomes acceptable to discredit

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run, those groups that have managed to grow all the time and those that have become extinct would be the minority. The majority in the middle would have an on-and-off growth with constant fluctuations.

Chinese official figures of any kind as if China's official census records had no descent accuracy in their totality.[5]

As a result, it is a commonly shared view that in the long-term past, no one, not even the Chinese themselves, knew the number of people living in China. This is statistical nihilism. Quite rightly, as Lee and Wang state, China's population has been the largest but least understood in the world (1999: 29).

## 2. The impact of the problems

These problems have had a profound impact on both the mindset and practice in the field of Chinese premodern demography. Several trends have developed. First, the Chinese official population statistics have been taken as guilty before being proved innocent. Second, apart from some snap-shots (Elvin 1973; Ho 1970; Llewellyn-Jones 1975: 24–5), the mainstream is not to deal with the whole Chinese empire or the long-term history. Much attention has thus been paid to (1) a regional approach at the provincial, county or village levels (see for example Skinner 1977; Liu 1981; Wei 1996; Lee and Campbell 1997; Lee and Wang 1999) and (2) changes in short term, mainly the Ming–Qing Period (Buck 1964; Perkins 1969: Appendix A; and to a great extent Chao 1986).[6] Research attention has also been given to micro cases of clans and families (Rawski and Li 1990: 1–61, 81–109; Huang 1990; Harrell 1995). This inevitably confines such studies within a small scale and a short-term scope.[7]

Third, aware of such a messy situation, there is another tendency to avoid altogether the minefield of Chinese population, which leaves a vacuum in Chinese studies (see for example Lee 1969; Elvin 1973; Fairbank 1980; Will

[5] See McEvedy and Jones 1978: 174.

[6] For the recently renewed debate on the Ming-Qing demography, see Cao and Chen 2002, and Wang and Li 2002.

[7] No doubt, regional studies of the short-run have contributed greatly to the understanding of premodern China, its history, culture and growth pattern. However, they often overlook some underlying factors such as the prevailing long-term growth trajectory of the economy. Due to these constraints, these local and short-term studies may be less significant than suggested.

1990; Rawski and Li 1990; Wong 1997, Gates 1996; Pomeranz 2000a and 2000b).

## 3. The Roots of the Problems

The afore-mentioned problems have their common roots in both the objective domain and the subjective domain. It is no secret that some Chinese official census data do not add up, typically for the period of *c*. 1650 to 1750, which legitimises speculations.

In the subjective domain, one cannot underestimate the influence of John Fairbank who famously states that (Ho 1959: ix)

> *[The Chinese statistics] represent the value of a previous and less-quantified age. Their "statistics" are not those of the modern-minded government statistician or economist, but rather the figures put down by literary scholars or tradition-bound clerks, meant to indicate merely an order of magnitude or to meet a ritualistic need for numerical data in the records. Instead of tables the modern researcher finds lists, sometimes with totals that do not tally. Instead of new efforts at periodic measurement, one finds the quotas accepted by officials or totals handed down through earlier records.*

Fairbank's judgment has been accepted widely and blindly without necessary testing and debating among historians and Sinologists in the past half a century.[8] This is partly due to the deep distrust of the bureaucratic ability of the Chinese empire, and partly due to an obvious lack of any independent source of information to test the accuracy of the Chinese official figures.

[8] Despite Fairbank's liberal image, his view has been adopted by Chinese Marxists. For example, the radical Marxist Wang Yanan claims that 'all the demographic data contained in Chinese literature were in a complete mess' (Wang 1956: 24).

## B. Preliminary Logic Tests of Estimates

Considering the wide range of views on and estimates of the same Chinese population, what we urgently need is objective and systematic testing. Preliminary tests can be conducted from a sheer logic angle to see whether some of the methodologies/approaches and estimates can hold water. The tests are partly factual and partly hypothetical with two aspects, technical and institutional.

### 1. Logic test from the technical aspect

Historians of Chinese science and technology have told us that there was a long tradition of Chinese mathematical advancement dating from the Zhou to Eastern Han Period (till *c.* 1 century A.D.). The accumulated knowledge is embodied in one the Chinese classics entitled *The Nine Chapter of Applied Mathematics* (*Jiuzhang Suanshu*), widely available at the time when the empire was still in its infancy. This knowledge allowed the Chinese literati to deal with day-to-day tasks of measuring land of all shapes and sizes, grades of soil fertility, grain of different types, variation in tax shares and so forth (see Needham 1959; Chao 1986: ch. 4). To take the grading of soil fertility as an example, during the Han Period, there were three scales. They increased to five under the Song, nine under the Tartar Jin, ten under the early Ming. After the mid-Ming, the scales became localised which varied from 59 to over 1,000 in order to capture all the nuances of land productivity (CBW 1980: 213).

So, there is no reason to suggest that the ordinary officials were still incapable of counting people, a far easier task than measuring land, for example. It is thus unreasonable to suggest that the Chinese officials were technically retarded in managing censuses for the empire. Indeed, Ping-ti Ho's path-breaking work entitled *Studies on the Population of China, 1368–1953*, clearly demonstrates that the official census statistics at the grassroots level were rather accurate under the Ming-Qing administration. According to Ho, the official figures became dodgy only after the total collapse of the empire in 1911 with constant under-report of 20–30 percent of land under cultivation to evade taxation (Ho 1959: 129, 131). If so, the quality of official census figures should be regarded tolerable. It is worth noting that even Fairbank himself openly admitted that errors in calculations were of exception, not the norm (Ho 1959: ix). This contradicts his claim against the quality of the Chinese official data.

The truth is that China produced one of the most comprehensive sets of censuses in the premodern world. According to an authoritative compilation of China's official data entitled *Dynastic Data of China's Households, Cultivated Land and Land Taxation* (*Zhongguo Lidai Huko Tiandi Tianfu Tongji*) by Liang Fanfzhong, there are in all 221 major sources of demographic information (including dynastic histories, local gazetteers, government documents and general literature), covering over two thousand years.[9] This is shown in Table 1. In the table, the four periods are determined by discontinuity of censuses due to political turmoil. Clearly, from the percentage share point of view the process became more and more regulated with less interruption.

**Table 1. China's Official Censuses, 2–1911**

| Period (A.D.) | Duration (years) | Number of censuses | Average interval (years) |
|---|---|---|---|
| (1) 2–157 | 155 (9.7%) | 11 (10.6%) | 14.1 |
| (2) 263–370 | 107 (6.7%) | 5 (4.8%) | 21.4 |
| (3) 464–847 | 383 (24.0%) | 23 (22.1%) | 16.7 |
| (4) 959–1911 | 952 (59.6%) | 65 (62.5%) | 14.6 |
| Long-term | 1,597 (100%) | 104 (100%) | 15.4 |

Source: Based on Liang 1980.

Table 1 shows a well-established system to register population for taxation and army recruitment purposes, both essential for the running of the empire. The system was well entrenched at the village level. The monitoring task was part of the rotary labour services shared by villagers (often translated as 'corvée') for the

[9] Liang's approach has been followed by recent works with more attention to regional dynamics (Lu and Teng 2000; Ge 2000-2).

local communities (which is often mistaken for a task for the empire). The following table shows how such persistent communal labour services were directly linked to China's vital economic statistics at the grassroots level.

**Table 2. Population Monitoring at the Grassroots Level**

| Period | Name, nature and responsibility |
|---|---|
| Five Dynasties | *lizheng* ('warden of multiple neighbourhoods'), labour service, registering taxpayers and collecting taxes |
| Five Dynasties | *huzhang* ('warden of one neighbourhood'), labour service, registering taxpayers and collecting taxes |
| Tang | *lizheng* ('warden of multiple neighbourhoods'), labour service, registering taxpayers and collecting taxes |
| Northern Song | *lizheng* ('warden of multiple neighbourhoods'), labour service, registering taxpayers and collecting taxes |
| Tartar Jin | *lizheng* ('warden of multiple neighbourhoods'), labour service, registering taxpayers and collecting taxes |
| Yuan | *lizheng* ('warden of multiple neighbourhoods'), labour service, registering taxpayers and collecting taxes |
| Ming | *lizhang* ('warden of multiple neighbourhoods'), labour service, registering taxpayers, collecting taxes and maintaining local order |
| Qing | *jiazhang* ('warden of multiple neighbourhoods'), labour service, registering taxpayers, collecting taxes and maintaining local order |

Source: Wang *c*. 982: vol. 19, Entry 'Xianling' ('County Magistrate'); Ma 1307: vol. 12 'Zhiyi Kao' ('History of Labour services'); Anon. *c*. 1323: vol. 16, Entry 'Tianling Limin' ('Edits on Land, Civil Organisations'); Tuo 1344: vol. 46, Entry 'Hukou' ('Census'); Anon *c*. 1398: vol. 4 Entry 'Hulu' ('Laws for Households'); Wang 1858: vol. 1 'Ji Mian Yaoyi' ('Exemption of Labour'); Kun 1899: vol. 134, Entry 'Baojia' ('Neighbourhood Watch and Collective Responsibility Network').

From 1659 on the Qing tax payment was often made in a DIY fashion: (1) villagers took turns to collect the dues among themselves (called *gundan*, meaning 'passing the parcel'); (2) the dues were then submitted by a village representative at a tax collecting point in a locked chest through an open slot (called *zifeng tougui*, literally 'dropping off the dues into the chest in a sealed envelope by taxpayers themselves'). What was required from the official who minded the chest was not more than a receipt (CBW 1980: 211–2). Although this method was limited to cash payment for technical reasons, it nevertheless shows the degree of autonomy enjoyed by villages and mutual trust between the village and the state. The role of officials was to monitor the village heads, which was far more effective and cheaper than dirtying officials' own hands in dealing with villagers directly.

This simply tells us that mistakes, if any, must have been made mainly at the village level by nonofficials. If so, Fairbank has obviously blamed the wrong party for China's statistical deficiencies. But, there is a catch: according to Ho, data at the village level are pretty accurate. Therefore, logically, the official data (which were aggregates of village numbers) must be reasonably accurate. One has to take sides, either with Ho or with Fairbank; not both.

## 2. Logic test from the institutional aspect

If the problem was not of innumeracy among the literati,[10] could it be institutional? In other words, could 'getting the numbers wrong' be a result of some peculiar incentives for officials? A good example is the notorious 'Great Leap Forward' in 1958–60 when Mao and his associates systematically fabricated data in order to forge an economic miracle to 'catch up with the West' (called *chaoying ganmei*, literally 'surpassing Britain and catching up with America'). The answer is affirmative.

First, to suppose that the Chinese state and officials had the same approach as Mao did, it remains highly questionable whether or why and how such a practice could last for so long, pestering the entire history of the Chinese empire. In Mao's case, it lasted barely for two years before all the lies collapsed. In comparison, the 'Qianlong Great Leap Forward' of population growth has lasted over 26 decades to this day, taking 1736 as the starting point.[11]

Second, China had sophisticated data-collecting institutions which almost always crosschecked demographic information in order to cast taxation nets as widely as possible over its population. There were three main patterns at the authorities' disposal: (1) triplex taxation nets to cover individuals, households

[10] Except from the Yuan Mongol Period (1271/9–1368) when the illiterate were appointed to official positions.
[11] Emperor Qianlong, r. 1736–95.

and landowners, (2) dual taxation nets to cover individuals/households and landowners, and (3) a single net to cover landowners.

Regarding the time sequence, the dual nets were invented during the Han Period. It had by far the longest shelf life among the three: 1,367 years (or 64% of the entire lifespan of the Chinese Empire from 221 B.C. to 1911 A.D., see Figure 2).[12] This dual taxation system was established on three conditions: (1) a high marriage rate (which was easily over 95% for all women in all times), (2) a high landholding rate (around 70–80% of all rural households), and (3) a high degree of overlap between the total population and the total households (66–76% of the total population) (see Figure 3).[13]

Here, Circle I (Poll/Household Tax) is designated for the total population. Circle II (Land Tax) is meant for the total landowners. Section *a* covers those households with land, qualified to pay both the household tax and land tax. Section *b* is relevant to those households or individuals with no land, qualified to pay the poll tax (as during the Han, Southern, Song, Ming and early Qing periods) or the household tax only (as during the Wei, Northern and Tang dynasties). Section *c* includes those unmarried landowners who are qualified to pay the land tax only (as during the Wei, Northern and Tang dynasties).

Figure 4 shows China's triplex taxation nets during the Jin (265–420), Sui (581–618), Early Tang (618–623) and Yuan (1271–1368) for a total of 294 years.

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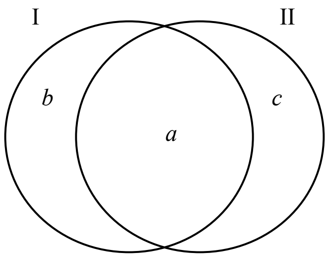
[12] The breakdown is as follows: Han (206 B.C.–220 A.D.), Wei (220–265), Southern and Northern (386–589), Late Tang (624–907), Song (960–1279), Ming (1368–1644), and early Qing (1644 – *c*. 1735).

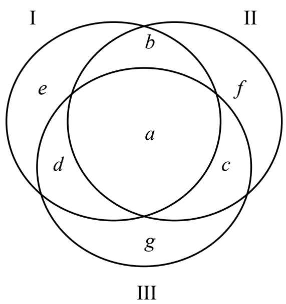
[13] Statistics show that during the 1920s and 30s after the Qing Empire collapsed the marriage rate remained a high rate of 99.9 percent (see Barclay *et al*. 1976). Even under the strict state control in the 1980s and 90s as many as 99 percent Chinese women got married before their thirtieth birthday (Duan 1999: 177, 265; Tong 2000: 302). In terms of landholding, in the 1910s and 1930s, at least 70 per cent of rural households belonged in the category of freeholders (Tawney 1964: 34, Chao 1986: ch. 8), although the acreage of landholding varied (Fei 1939: 191–4; Tawney 1964: 34–5, 38, 71; Buck 1968: 194–7; Myers 1970; Chao 1986: 107).

## Figure 3. China's Dual Tax Nets




Source: (1) For the Han Period, see Ban 82 A.D.: vol. 2 'Huidi Ji' ('Biography of Emperor Hui'), vol. 7 'Zhaodi Ji' ('Biography of Emperor Zhao'), and vol. 24 'Shihuo Zhi' ('Economy'). (2) For the Wei Period, see Chen *c.* 280 A.D.: vol. 1 'Wudi Ji' ('Biography of Emperor Wu'). (3) For the Northern Period, see Wei 554 A.D.: vol. 2 'Taizu Ji' ('Biography of Emperor Taizu'), vol. 3 'Taizong Ji' ('Biography of Emperor Taizong'), vol. 4 'Shizu Ji' ('Biography of Emperor Shizu'), and vol. 110 'Shihuo Zhi' ('Economy'); also Wei 656 A.D.: vol. 24 'Shihuo Zhi' ('Economy'). (4) For the Southern Period, see Shen 494 A.D.: vol. 6 'Wudi Ji' ('Biography of Emperor Wu'); Xiao 514–26 A.D.: ch. 'Wudi Ji' ('Biography of Emperor Wu'); Yao 636a A.D.: vol. 5 'Xuandi Ji' ('Biography of Emperor Xuan'); Yao 636b A.D.: ch. 'Liangli Zhuan' ('Biographies of Model Officials'); Li 659 A.D.: vol. 2 'Song Benji Zhong Di-er' ('Entry 2 of the Song biographies'). (5) For the Late Tang, see Liu 945 A.D.: vol. 48 'Shihuo Zhi' ('Economy'); Wang 961 A.D.: vol. 83 'Zushui Shang' ('Taxes'), vol. 84 'Zushui Xia' ('Taxes, continued'), and vol. 85 'Ding Hu Dengdi' ('Tax Classification of Households'); Ouyang 1060: vol. 52 'Shihuo Zhi' ('Economy'). (6) For the Song, see Ma 1307: vols 4–5 'Lidai Tianfu Zhizhi' ('Land Tax regimes'), and vol. 11 'Lidai Huko Dingzhong Fuyi' ('Population and Poll Tax Regimes'); Tuo 1345: vol. 174 'Shihuo Zhi Shang' ('Economy'); Xu 1809: Entry 'Shihuo Qi' ('Economy • Seven'), Entry 'Shihuo Jiu' ('Economy • Nine') and Entry 'Shihuo Shi-er' ('Economy • Twelve'). (7) For the Ming, see Zhang 1735: vol. 78 'Shihuo Er' ('Economy • Two'). (8) For the early Qing, see Anon. 1646; He 1826: vols 29–30 'Huzheng Wu' ('Taxes and Taxation Policies'); Wang 1858/1985: pp. 111–13.
Note: I – Poll/Household Tax; II – Land Tax; *a* – *c*: population groups.

## Figure 4. China's Triplex Tax Nets




Source: (1) For the Jin Period, see Fang 646 A.D.: vol. 3 'Wudi Ji' ('Biography of Emperor Wu'), and vol. 26 'Shihuo Zhi' ('Economy'). (2) For the Sui Period, see Wei 656 A.D.: vol. 24 'Shihuo Zhi' ('Economy'). (3) For the early Tang, see Du 801 A.D.: vol. 6 'Fushui' ('Taxes'). Also, Liu 945 A.D.: vol. 46 'Shihuo Zhi' ('Economy'). (4) For the Yuan Period, see Li 1370 A.D.: vol. 93 'Shihuo Zhi' ('Economy').
Note: I – Poll Tax; II – Household Tax; III – Land Tax; *a* – *g*: population groups.

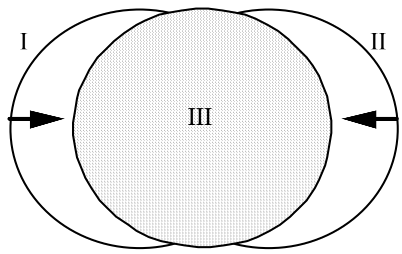
In the figure, Circle I (Poll Tax) is designed to capture the total population at the taxable age; Circle II (Household Tax), all the households; and Circle III (Land Tax), all the landowners. Section *a* represents landowners at the taxable age with a family, qualified to pay all the three taxes: the poll tax, household tax and land tax. Section *b* covers those at the taxable age with a family but without land, qualified to pay two taxes: the poll tax and household tax. Section *c* includes those landowners at the non-taxable age with a family, qualified to pay two taxes: the household tax and land tax. Section *d* deals with those single people at the taxable age with land property, qualified to pay two taxes: the poll tax and land tax. Section *e* is meant for people at the non-taxable age with no land or a family. They are tax-free. Section *f* is for families at the non-taxable age with no land, qualified to pay one tax: the household tax. Section *g* is applicable to those landowners at the non-taxable age with no family, qualified to pay one tax: the land tax. Although this triplex system was more complicated than the dual one, it worked on the same principle.

If we combine the two systems together, the total duration occupied over 78% of the lifespan of the empire. They were the undisputed dominant taxation systems in China. The point is that with the interlocking mechanisms of the poll tax and the land tax the chance to leave a large proportion of the population undetected and uncalculated was thin. We can thus assume for the time being that the Chinese official data were relatively sound most of the time.

During the Qing Period, a simplified tax system evolved in 1713 and gradually took over in around 1736, as shown in Figure 5. Circle I nets the population at the taxable age for the poll tax. Circle II covers the landowners for the land tax. Circle III aims at the landowners as the single target of poll tax-weighed and land tax-weighed single rural tax (called *tanding rudi* or *tanding rumu*).[14]

[14] It is worth noting that this *tanding rumu* regime was originated also during the Northern Song. But it did not have the chance to replace the old multiple taxes of that time (see Ge 1988).

**Figure 5. Single-Track System from 1736 on**




Source: Anon. 1735: vol. 24; Kun 1899: vol. 133 'Hubu Dingyin Tanzheng' ('Conversion of the Poll Tax, Ministry of Revenue'); Zhao 1927: vol. 121 'Shihuo Er' ('Economy • Two').
Note: I – Poll Tax; II – Land Tax; III – Poll–Land weighed Single Tax; *a–b*: population groups.

One of the reasons for the Qing government to abolish the poll tax was the decline in poll tax revenue. It was reported that before the reform the ratio between the land tax revenue to that of the poll dropped to 30:1 at the county level. So, the poll tax was no longer worth the trouble (see He 1826: vol. 30 'Huzheng Wu' ['Taxes and Taxation Policies'], Entry 'Peidingtian Faban' ['Attaching the Poll Tax to the Land Tax']. Another reason was the rampant internal migration from China's core regions to marginal lands in the west (Sichuan and Yunnan), north (Mongolia) and northeast (Manchuria) (see Tian and Chen 1986: chs 2 and 5). Table 3 shows that the changes in regional shares of Chinese population. The traditional demographic strongholds along the Yellow River and East Coast experienced weak or negative growth while the Yangzi hinterland had more than its fair share.[15]

[15] Not surprisingly, in the 1920s, as the momentum continued, the rural population mobility of the north was 145% of that of the south (Chi 1998: 73).

**Table 3. Changes in Regional Weight of Chinese Taxpayers*, 1661–1820**

| Region | 1661 | 1685 | 1724 | 1753 | 1766 | 1812 | 1820 | Rating |
|---|---|---|---|---|---|---|---|---|
| 1.Yellow River hinterland | | | | | | | | |
| Henan | 4.3 | 6.0 | 8.1 | 6.9 | 7.9 | 6.4 | 6.8 | + |
| | *(100)* | *(140)* | *(188)* | *(160)* | *(184)* | *(149)* | *(158)* | |
| Shandong | 8.4 | 9.0 | 9.0 | 12.5 | 12.2 | 8.0 | 8.4 | ± |
| | *(100)* | *(107)* | *(107)* | *(149)* | *(145)* | *(95)* | *(100)* | |
| Shanxi | 7.1 | 6.8 | 7.0 | 5.0 | 5.0 | 3.9 | 4.2 | – |
| | *(100)* | *(96)* | *(98)* | *(70)* | *(70)* | *(55)* | *(59)* | |
| Shaanxi | 11.4 | 9.4 | 8.5 | 3.7 | 3.5 | 2.8 | 3.5 | – |
| | *(100)* | *(82)* | *(75)* | *(32)* | *(31)* | *(25)* | *(31)* | |
| 2. East coastal zone | | | | | | | | |
| Jiangsu | – | 11.5 | 10.7 | 12.3 | 11.3 | 10.5 | 7.6 | – |
| | | *(100)* | *(93)* | *(107)* | *(98)* | *(91)* | *(66)* | |
| Zhejiang | 12.9 | 12.0 | 10.7 | 8.4 | 5.5 | 7.3 | 7.9 | – |
| | *(100)* | *(93)* | *(83)* | *(65)* | *(43)* | *(57)* | *(61)* | |
| Fujian | 6.9 | 6.0 | 5.7 | 4.6 | 3.9 | 4.1 | 5.3 | – |
| | *(100)* | *(87)* | *(83)* | *(67)* | *(57)* | *(59)* | *(77)* | |
| Jiangxi | 9.3 | 9.0 | 8.6 | 4.9 | 5.5 | 6.4 | 6.8 | – |
| | *(100)* | *(97)* | *(92)* | *(53)* | *(59)* | *(69)* | *(73)* | |
| Guangdong | 4.7 | 4.7 | 5.1 | 3.9 | 3.3 | 5.0 | 6.2 | + |
| | *(100)* | *(100)* | *(109)* | *(83)* | *(70)* | *(106)* | *(132)* | |
| 3. Yangzi hinterland | | | | | | | | |
| Anhui | – | 5.6 | 5.4 | 2.3 | 11.1 | 9.4 | 9.8 | + |
| | | *(100)* | *(96)* | *(41)* | *(198)* | *(168)* | *(175)* | |
| Hubei | 3.6 | 1.9 | 1.8 | 4.4 | 4.0 | 7.6 | 8.4 | ++ |
| | *(100)* | *(53)* | *(50)* | *(122)* | *(111)* | *(211)* | *(233)* | |
| Hunan | – | 1.3 | 1.3 | 4.2 | 4.2 | 5.2 | 5.3 | ++ |
| | | *(100)* | *(100)* | *(323)* | *(323)* | *(400)* | *(408)* | |
| Sichuan | 0.1 | 0.1 | 1.6 | 1.3 | 1.4 | 5.9 | 8.1 | +++ |
| | *(100)* | *(100)* | *(1,600)* | *(1,300)* | *(1,400)* | *(5,900)* | *(8,100)* | |

Source: Based on Liang F. 1980: 391–410.
Note: *The number of taxpayers is used as the proxy for the total population, % of China's total. Figures in brackets: growth indices. Symbols: – negative growth; + positive growth; ++ strong growth; +++ super growth; ± mixed growth.

So much so, in some core regions, population appeared to be stagnant in local gazetteers, which has confused modern readers (see Zheng 2000: 592–3). The increase in population mobility made taxing people less cost-effective than taxing land.

This new system of the Qing was in place for 175 years (or 8% of the empire's lifespan). Given the lack of the double check mechanism, this single-track system may have been more vulnerable to errors. But, if the state administration was efficient, errors could be minimised. Hence, the singe-track alone will not automatically warrant the lack of credibility of the data generated by the system. In effect, as generally agreed, the Qing state machinery was very efficient at least before the 1840 Opium War. Ironically, it is the official censuses data during this period that are considered more acceptable than any earlier periods in Chinese history. The new system was able to finance the Qing state for over one century (from 1713/1736 to *c*. 1850), showing a great success of the Qing tax reform. In essence, the Qing departure from the timeless poll/household and land taxes did not show any weakness of the Qing state. Rather, it shows its strength in the form of confidence, efficiency, flexibility and adaptability.

More importantly, China had the right agents for data-collecting. As the quality of censuses was a key criterion for official performance and promotion, bureaucrats had both the need and the desire to report population figures with reasonable accuracy in order to keep their hard-earned posts and get promotion under the regime of 'individual performance appraisal' (called *mokan*) which took place once very three years (see Table 4).

**Table 4. Appraisal Criteria for Chinese Meritocrats**

| Period | Appraisal criteria |
|---|---|
| Qin (221–207 B.C.) | quality of local censuses |
| Han (206 B.C.–220 A.D.) | censuses, taxation, crime control and farming |
| Sui (581–618) | up-dating census data including population figure and recording individual physical features |
| Tang (618–907) | monitoring fluctuations in population and land yield level |
| Song (960-1279) | monitoring population fluctuations, promoting and taxing agriculture, and expanding farm land |
| Yuan (1271–1368) | promoting population growth, expanding farming land, reducing lawsuits and reducing crimes |

Source: Pu 1990: 208, 377, 424; Zhang 1992b: 375, 417, 489, 513–4; Wei 1989: 195, 282.

On the other hand, fraud in census was a punishable crime as shown in Table 5.

**Table 5. Liability and Punishment regarding Fraud in Censuses**

| Period | Punishment for avoid census registration |
|---|---|
| Qin | a fine in the form of one suit of armour on the Warden of Neighbourhood Watch for each census dodger in his domain |
| Sui | exile of the Warden of Neighbourhood Watch for any incorrect census information in his domain |
| Tang | one-year prison sentence on the Warden of Neighbourhood Watch for each census dodger in his domain; three-year prison on the head of dodger's family |
| Ming | flogging 50 times the Warden of Neighbourhood Watch for each census dodger in his domain, flogging 60 times the head of dodger's family for each census dodger in the family, flogging 40 times the county magistrate for every 10 such dodgers in his domain. |

Source: Pu 1990: 289, 442–3; Zhang 1992b: 175, 376, 424, 443, 465.

Moreover, there was a special government department attached to the throne in charge of internal investigation (called *sushi*) to screen crooks (Wei 1993:162–8, 269–74, 398–402).

In this context, there was little incentive for individual officials not to get the basic figures right: the opportunity costs for them not to do so were high. In other words, individual officials had less freedom to fabricate population figures than one might think.

Although the evidence of who were promoted for running good censuses and who were punished for neglecting census duties is not readily available, those regulations and internal investigation bodies worked at least as a deterrent. This deterrent would help to reinforce certain incentives for record-keeping. It now becomes very doubtful that no one really cared about population numbers in the Chinese empire, as claimed by Fairbank.

Given that we now know not only why the taxpayers were registered but also how they were registered, is it still justifiable to assume that large proportions of the population were missed out in China's censuses as highlighted in Table 6?

**Table 6. Gap between Chinese Censuses and Modern Estimates (in million)**

| Date (A.D.) | Censuses (A) | McEvedy-Jones (B1) | Chao (B2) | Maddison (B3) | Others (B4) | A:B(1–4) |
|---|---|---|---|---|---|---|
| –1/2 | 59.6 | 53.0 | 59.0 | 59.6 | 70.0* | 0.89–1.01 |
| 105 | 53.3 | – | 53.0 | – | – | 1.00–1.01 |
| 146 | 47.6 | – | 47.0 | – | – | 1.01 |
| 606/9 | 46.0 | 50.0 | – | – | – | 0.92 |
| 1000/6 | 42.8 | 66.0 | – | – | 100.0§ | 0.43–65 |
| 1109/10 | 120.5 | 105.0 | 121.0 | – | – | 1.00–1.15 |
| 1280/91 | 59.8 | 86.0 | – | 100.0 | – | 0.60–70 |
| 1380/1 | 60.0 | – | – | 68.0 | – | 0.88 |
| 1390/1 | 56.8 | – | 60.0 | 69.0 | – | 0.82–95 |
| 1400/3 | 66.6 | 81.0 | – | 72.0 | 75.0† | 0.82–93 |
| 1450/5 | 53.8 | – | – | 88.0 | – | 0.61 |
| 1500/2 | 50.9 | 110.0 | – | 103.0 | – | 0.46–49 |
| 1550/2 | 63.3 | – | – | 146.0 | – | 0.43 |
| 1600/2 | 56.3 | 160.0 | – | 160.0 | 250.0¶ | 0.23–35 |
| 1650/7 | 38.6 | 140.0 | 72 | 123.0 | – | 0.28–54 |
| 1700/3 | 56.1 | 160.0 | – | 126.0 | – | 0.35–45 |
| 1750/3 | 102.8 | 225.0 | – | 260.0 | 270.0† | 0.38–46 |
| 1800/12 | 361.7 | 330.0 | 426.0 | 412.0 | – | 0.85–1.09 |
| 1830/3 | 398.9 | – | – | 409.0 | – | 0.98 |
| *Average* | | | | | *0.68–77* | |

Source: (A) Liang 1980: 4–11; (B1) McEvedy and Jones 1978: 166–74; (B2) Chao 1986: 41; B3) Maddison 1998: 267.[16] (B4) *Llewellyn-Jones 1975: 24–5; §Ho 1970; †for 1760, see Perkins 1969: Appendix A; ¶for 1580, see Elvin 1973: 129.
Note: (1) The A–B ratio is of the low band to avoid a double discount. (2) Many modest estimates that fall between the official figure and the radical datum reconstructions are omitted.

Several points can be made here. First of all, inflation is the mainstream. But from the Chinese state point of view it is irrational that on average 23 to 32 percent of China's population were unregistered or unreported for taxes and military services. More specifically, it is unimaginable that during the Northern Song, when the empire became mature enough to nurture its 'medieval economic miracle', the state should have lost its grip on the majority of its subjects: up to 57 percent.[17] In the Ming–Qing Period, a period that is commonly recognised as an era of much improved administration, it is inconceivable to suggest that from 1500 to 1750 up to 77 percent of the population could not be detected under the

[16] For a recent attempt with the same Maddisonian approach, see Jiang 1998: 89.
[17] The Southern Song was a different story, see Deng 1999: ch. 6.

prevailing 'Neighbourhood Watch and Collective Responsibility Network'.[18] If we accept those estimates, these three regimes, the Northern Song, Ming and Qing, would have not lasted. At very least, the operations such as state granaries and famine relief would have to be a fiction (see Will and Wong 1991). China's social order would have to be at stake. In this context, it becomes ridiculous that China was at that time considered by the European contemporaries as one of the most orderly and lawful societies on earth (Maverick 1946). Those members the European elite who looked up upon China for institutional inspirations to help Europe out of chaos would have been complete fools. The truth is that there is no record of fiscal crises in 1000–1110 under the Northern Song. In the Qing case, it was only during the Taiping Rebellion in the 1850s that Qing state lost its control over China's population of that sort of proportion (Deng 1999: 165). So, logically, the recent estimates are not closer to the truth than Chinese own censuses.

Secondly, conceptually, it is hard to justify how and why Chinese officials always under-reported the population within their administrative domain. To leave a large proportion of the local residents uncounted for was irrational as it would not enhance one's career in officialdom. Indeed, given the prevailing meritocratic environment and the state preference, over-reporting, rather than under-reporting, was most likely to be the norm.[19] If the officials inclined to inflate numbers in order to get the attention from their superior, there is no reason for us to inflate the figures again to cause further distortion.

Thirdly, now back to Figure 1, most strikingly, all the estimates become convergent to the Chinese official statistics on merely four occasions: (1) *c*. 100 A.D., (2) *c*. 750, (3) *c*. 1400 and (4) *c*. 1825. Considering the prolonged incentives and regimes for the Chinese state to impose taxes on its population, it is unbelievable that overall the Chinese state did it right only four times. In other

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[18] The Qing monitoring network even reached its tentacles to the previously untapped Buddhist temples and remote non-Han regions (Zhao 1927: vol. 120 'Shihuo Zhi'). For a general history, see Zhao 2002.

[19] This tendency had its modern reincarnation during Mao's notorious 'Great Leap Forward' in the late 1950s.

words, it is hard to believe why only during these four short and isolated periods the quality of the official data suddenly improved and reached an acceptable standard. Equally, it is hard to justify that all the data in between these dates should be rejected despite the fact that they were the products of the same institution. Meanwhile, on the whole the hypothetical gap between the official data and recent estimates keeps increasing after 600 A.D. for twelve centuries. By the time the final convergence appears on paper, China's premodern era was closed to its end. This suggests that the some versions of Chinese history are severely distorted.

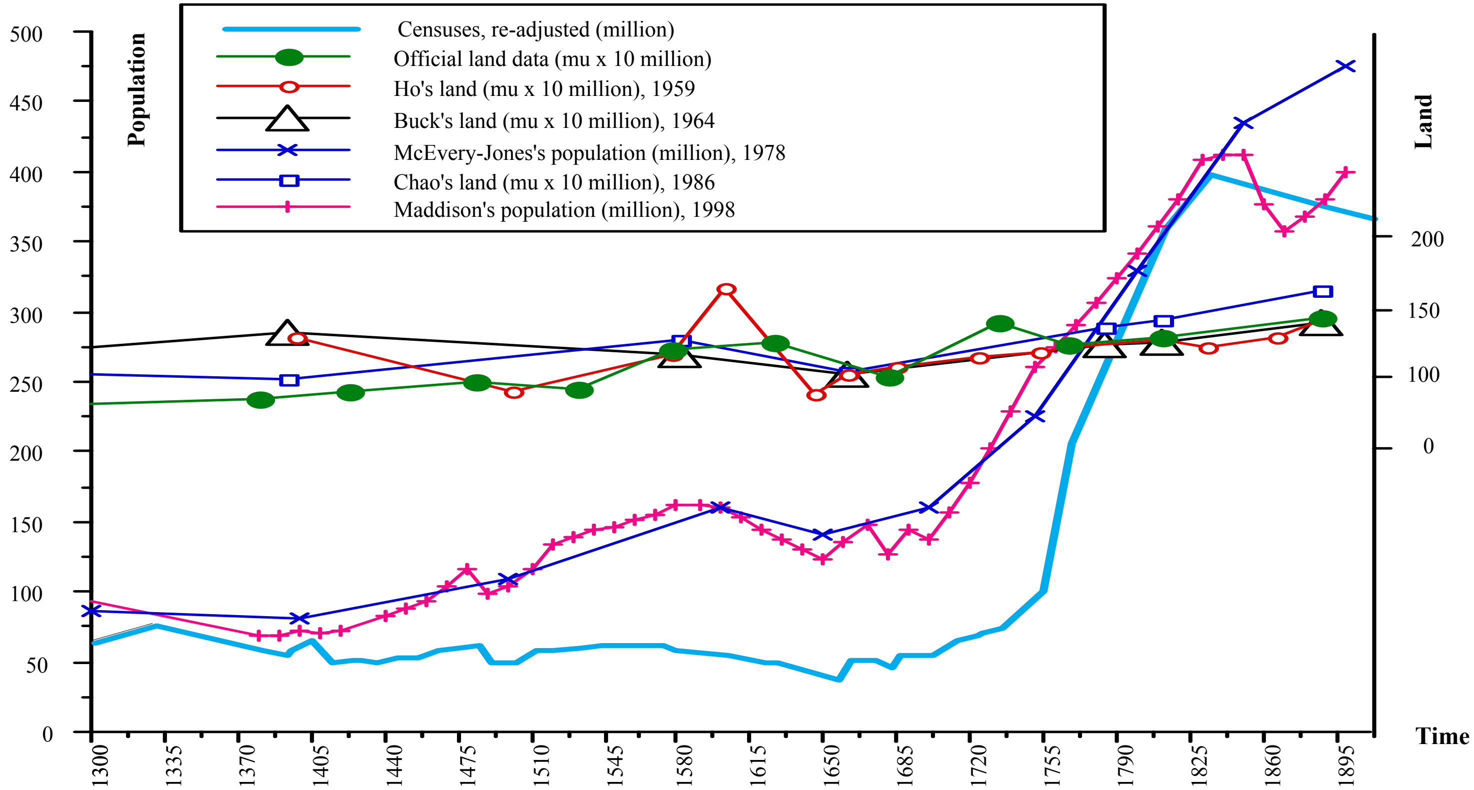
Finally, it is worth noting that although landowners' registration and poll registration were twines (until 1713) there has been much less disagreement on the credibility of the former. Indeed, official data for farming land and modern estimates of China's land under cultivation are convergent most of the time, which sharply contrasts with the datum divergence for population (see Figure 6).[20] Bear in mind that the same group of officials was in charge of both population and land registrations, this immediately raises the doubt that why and how the Chinese authorities and institutions were able to tolerate such a disparity and double standard within the same administrative framework. It would not cost the bureaucracy proportionally more to get both registrations right.

All the indications from the logic analysis tell us one thing: modern estimates are not what they have claimed for. What becomes clear also is that most estimators have overlooked the institutional implications of their works.

Our analysis shows that overall speaking, the household registration had the longest and the most complete data. This will be the starting point for our datum re-adjustment later on.

[20] Despite the fact that from China's own record of the late Ming there was an error margin of some 20 percent in the form of under-reporting (Zheng 2000: 557–8).

**Figure 6. Datum Disparity between Population and Land**




Source: For official land data, see Liang 1980: 4–10; others, see Ho 1959: 102; Buck 1964: 164; Chao 1986: 87, 89. Official census data with re-adjustments, see Appendix 3.

## C. Re-adjustment of Official Census Data and Substantial Tests

### 1. The new approach

The current study abandons the approach of reconstructing demographic data through estimation and guesstimation, as it is simply ahistorical to assume that a population should have been on the rise most of the time.[21]

So far, although our tests have been conducted in logic reasoning, they have already showed clearly how shaky Fairbankian nihilism is. Most estimates of Chinese population are not compatible with China's mathematical and organisational capabilities. They do not match China's long-lasting institutional framework and incentives, either. But, these tests on their own cannot explain why the Chinese official data themselves do not add up for some periods. So, the puzzle is still there, although the old, simplified and biased view needs to be scratched. However, if one takes a closer look, it is obvious that two kinds of censuses were generated. One was related to property (land) or possession (family); the other, to individual existence (as a human being). From our logic tests, it is reasonable to suggest that the Chinese official figures for both the landowners and the households were as accurate as they could be for a premodern society. They should be acceptable by modern readers. But for the periods when the poll tax was imposed the official figures become puzzling. This is the case for Song and Qing times. The clue here is that the Song–Qing inconsistency must have had an institutional basis. This sheds light on a way to re-examine China's official census data.

Given the relative sophistication and efficiency of the Chinese administrative network,[22] the new question to ask is *not* why the Chinese were incapable of registering their population. Rather, it is why and how they decided not to register everybody at all times. Logically, if they were able to do it but did

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[21] Boserup, the demographic optimist, has been misunderstood. She only deals with the consequence of population growth, not the growth trajectory per se (1965). Malthus's work on exponential population explosion is deeply flawed and ahistorical although his population checks did exist in history (Malthus 1798; see also Coleman and Schofield 1986; Lee 1986).

[22] I deliberately avoid the term 'bureaucracy' because of the prevailing village autonomy under China's empire system.

not, the act must have been deliberate with its own rationality. Considering that there were two parties involved in Chinese censuses, the state and autonomous communities, the right questions to ask further are (1) whether the partial registration was a result of a heavy tax burden which led to large-scale tax evasion; and (2) whether it was because the state did not want to have everyone registered to reduce administrative costs.

The excessive tax-burden scenario has been the hobby-horse of Marxists for just about anything on premodern China. The assumption has been that the tax burden in China was too high to bear most of time. China's historical evidence shows quite the opposite. Coupled with village autonomy, China's tax burden was normally light, certainly lighter than that under feudalism elsewhere. It followed what can be called the 'jackpot' principle (similar to a lottery hence the name) to collect huge aggregate revenue from a large population with a small sum per capita. The tax rate for the peasantry was in the long run under 10 percent of China's GDP (Deng 1999: 160–4).[23] This allowed China to enjoy economies of scale in taxation. By definition, such economies of scale meant that the private cost of sustaining the Chinese state was equal to that of the social cost in the Northian sense. So, it was not a zero-sum; and there were some savings to be made.

The low tax regime was the determinant of the small size of the Chinese state. Astonishingly, the early Ming and early Qing bureaucracy had in all just 30,000 officials on its payroll (Ji and Liu 1783: ch. 'Zhiguan' ['Official Posts']; Liu 1921: ch. 'Zhiguan Yi' ['Official Posts, Entry One']).[24] There were only some 300 officials in the Qing Ministry of Revenue (*hubu*, literally 'Ministry of Households') in charge of a population of 38 to 380 million over time (Zhang

[23] The Chinese state only had some short-term freedom to raise the tax burden but surely faced the danger of being toppled over by peasant rebellions (see Deng 1999: ch. 4).

[24] This means that on average one Qing official had to cover 330 square kilometres. From a European perspective, this means that to govern a country of the size of contemporary France (just over half a million $km^2$) would need only 1,634 officials; Germany, 1072 (just over 1/3 of a million $km^2$); the Great Britain (just under 1/4 of a million $km^2$) 735; and Belgium, merely 92. This would be a nirvana. The modern equivalent to this was perhaps India under the British rule (not to count the Indian administrators of all kind).

1992: 818). In terms of percentage, during the Western Han, all officials occupied 0.13–0.26 percent of China's total population. The share increased to only 0.31 percent in the following Eastern Han. Even with the strengthened state control, the share rose to 0.44 percent under the Sui and then peaked at 0.70 percent, the ceiling, during the Tang (Du 801: vol. 19; Jin and Liu 1984: 26). Later, in Yuan, Ming and Qing times, the share never passed the 0.3 percent mark (Jin and Liu 1984: 26; Qian 1995: vol. 2).[25]

Small and cheap, the Chinese state provided only basic public goods in two forms. In the material form, the state was responsible for national defence, resource allocation (such as land and water distribution), public works for flood control, public granaries for food-price control and famine relief, and passages for emigration when local land was in extremely short supply. In the spiritual and moral form, the state provision included Confucian moral guidance and judiciary over disputes and crimes.[26]

So, in the clearly defined patron (state) – client (villages/neighbourhoods) relationship, the cost of tax dodging was highly predictable and measurable. Given the low tax rate and the wide range of services provided by the state, the net gain from tax evasion was rather low, considering the cost incurred from withdrawal of those public goods. Such withdrawal formed a powerful negative sanction/deterrent against collective tax dodging by a village. There was a positive sanction/deterrent, too: the state was prepared to press criminal charges against offending village leaders. For example, under the Tang law, if guilty of default in tax payment, the head of the neighbourhood was to face two-year imprisonment (Wang *c*. 982:vol. 19 Entry 'Xianling' ['County Magistrate']).

It is worth noting that in most cases within the village the task of registering individuals, households, landowners and so forth in each village was part of the unpaid communities services in a rotary system run by, of and for the

[25] The ratio in the Qing was kept at 0.04–0.11 percent. The sudden surge of the ratio appeared under Mao's rule at 2.9–3.0 percent, many times higher than the past and clearly more rent-seeking, too (An 1998).
[26] Fairbank thus defines the Chinese Imperial state as a 'minimalist' state (Fairbank and Goldman 1998: 203).

village. This prevented to a great extent a personal control over the village affairs which was a real danger during the Song under the 'village accountant system' (called *xiangsi*, literally 'manager of the village affairs').[27] So, clearly the mechanism against tampering village registration was in place. In addition, individual attempts for tax evasion would certainly face collective sanction within the neighbourhood watch unit. In this context, tax evasion had very limited bearing on the inconsistency in China's official census figures.

On the other hand, it was in the village's own interest to keep a good population record for the sake of local law and order, a factor that has often been overlooked.[28] From the villagers' point of view, community vigilance to prevent crimes was an important factor. To take the annual task of 'crop patrol' (called *kanqing*, literally 'crop-watching') as an example, it required the full participation of all able-bodied villagers to minimise the risk of crop theft by neighbouring communities. This alone necessitated village's own population registration. Hence, the village head could expect reasonable cooperation from his follow villagers in the internal censuses. It represented significant savings on the state, too. It was thus encouraged by the state. Such an arrangement benefited both parties, the state and the village.

Now, the true reason for not to register everyone at all times had to be resulted from certain state policies. But from the angel of China's state-building and empire-building, as well as Chinese literature on statecraft and empire maintenance, the bureaucracy had strong fiscal motives and incentives to keep one eye on taxpayers, especially those in the farming sector who formed the main

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[27] But there is no evidence that the Song system got the censuses wrong (see Wang 1999).

[28] One only has to mention the grassroots organisation known as the 'Neighbourhood Watch and Collective Responsibility Network') called *lijia* (literally 'organised neighbourhood') or *baojia* (meaning 'Collective Responsibility for the Neighbourhood'), which is often mistaken as the evidence of the state penetration into Chinese villages. What has been overlooked is that the government had no say about which households were to be grouped in a particular *li* or *jia*. Nor did it have the power to decide who acted as the headman of the group. The grouping seems to have been voluntary; and the head, elected. All of these were deeply rooted in the local clans/lineages establishments. By definition, ordinary local clans/lineages were not a branch of the state. If so, the *lijia* resembled more a state-endorsed guild for taxes than a branch of state apparatus. After all, no one from the *lijia* administration was on the government payroll (see Zhao 2002).

tax base for the empire (see again Table 1). The reason for not registering everyone is indeed puzzling and requires some in-depth investigation.

First, as mentioned earlier, during the Qing the ratio between the land tax revenue to that of the poll was a poor 30:1 (see He 1826: vol. 30 'Huzheng Wu' ['Taxes and Taxation Policies'], Entry 'Peidingtian Faban' ['Attaching the Poll Tax to the Land Tax']. Also, from Figures 3–5, it is obvious that the main concern of the Chinese state was how to tax the landowners. This is where the lion share of the tax revenue came from. So long as the figures for landowners were reasonably accurate, the Chinese state was able to function. After landowners, the state had an option to register either all the households for the household tax or all the individuals for the poll tax (as under the dual system); or both the households and the individuals (as in the triplex situation). All depended on which system was cheaper under the low budget constraint set by the low tax regimes. It was the option between taxing the household and taxing the individual that created the choice not to count all the citizens at all times.

The reason behind this choice was to tax the household was considerably cheaper, although to tax the individual was fairer, to get the more or less same revenue. To begin with, people had to be grouped by age and sex if the tax involved labour services, as women and children were normally exempted (as under the Northern Song and early Qing). As the poll tax was more complicated and involved more administrative chores for the Chinese state, it was a choice between low cost (from taxing the household) and high equality (from taxing the individual). One of the consequences of the low cost option was not to register everyone at all times. This had little to do with bureaucratic incompetence. Rather, it shows the official ability of handling delicate fiscal tasks.

**2. New methods and their results**

The current hypothesis is that the main proportion of China's official figures was as accurate as they could be. This hypothesis is based on the observation that (1) China had a lasting private landholding system and a perpetual lineage tradition, regardless of who was in power and how taxes were imposed;[29] and that (2) the government had tax dependency on the Chinese family system, regardless of the differences in ways and extents with which taxes were collected. This leads to another hypothesis that occasional inconsistency in China's official population data was a result of deliberate, rational choices between taxing the household and taxing the individual. Thus, as long as we can work out the datum differences made by these two interrelated and yet distinctive tax registrations, all the official data can be explained and re-adjust to consistency.

Methodologically therefore this study takes a minimalist approach in dealing with official figures. Any alteration of figures must have a sound empirical basis. Any re-adjustment must be highly consistent with the rest of the datum set. In other words, no guess is allowed and everything must be based on official figures.

The basis of the current re-adjustment is the house registration. This is because the information for households is available for most periods. The key to the decoding of the seeming inconsistency is the understanding of the average size of the Chinese family in the very long run. This average size can be obtained from government tax records. From all the 104 censuses (see Table 1), 54 pairs of figures are available with both the number of people and the number of households, showing the expected stability (see Appendix 1).[30] The long-term average figure is 5.30 people per household. But, what strikes us is that during the Song, the average family size shrank to 2.10 people per household, less than half of the long-term average. This is even less than the contemporary family size in Mainland China under the one child policy. Such a small household size is not enough to sustain the population (see Table 7).

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[29] China's private landholding constantly generated a centrifugal force from the extended family while the Chinese lineage provided a centripetal force. In the long run, they reached an equilibrium and hence stability.

[30] These 54 censuses occupied 52.4 percent of China's total. The size of the sample is significant.

**Table 7. Nominal Decline in Family Size during the Song**

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 1006 | 16,280,254 | 7,417,570 | 2.20 |
| 1021 | 19,930,320 | 8,677,677 | 2.23 |
| 1053 | 22,292,861 | 10,792,705 | 2.07 |
| 1066 | 29,092,185 | 12,917,221 | 2.25 |
| 1083 | 24,969,300 | 17,211,713 | 1.45 |
| 1100 | 44,914,991 | 19,960,812 | 2.25 |
| 1110 | 46,734,784 | 20,882,258 | 2.24 |
| *Average* | – | – | *2.10* |

Source: See Appendix 1.

Such low figures for the Song family sizes must have some institutional reasons. So, instead of blaming the Song officials being lazy and the Song villagers cunning, the present study finds a sound reason for this ‘irregularity’. Unlike any previous poll tax regime, the Song system only targeted males as the taxable group (called *ding*) (see Ma 1307: vol. 11 ‘Lidai Huko Dingzhong Fuyi’ [Households and Taxable Adults]; Tuo 1345: vol. 174 ‘Shihuo Zhi Shang’ [‘Economy’]; Xu 1809: ch. ‘Shihuo’ [Economy]). The Song males became taxable at the age from 20 to 59 (Yan *c*. 1843: vol. 64, Entry ‘Yongxi Yuannian’ [Edict of 984]). Therefore, only about half of the Songs were subject to the poll registration. The decline in the Song family size was undoubtedly nominal. As there is no evidence of a major change in the Chinese family structure, the real family size under the Song should not be too far from China’s long-term average.

But first, for the sake of accuracy, the seven Song censuses ought to be quarantined from the long-term bundle. Although the number of observations is now reduced to 47, it still represents a respectable percentage (49 percent of China’s total). The new result is 5.77 people per household (see Appendix 2), slightly higher than that without the quarantine. This new average of 5.77 can be used as a benchmark to re-adjust the incomplete census data. In all, 15 censuses only had household figures. By multiplying these household numbers by a factor of 5.77, their population figures can be derived (see Table 8).

**Table 8. Population derived from Household Figures, Various Years**

| Year (A.D.) | Household number (A) | Re-adjusted population (5.77 • A) |
|---|---|---|
| 520 | 5,000,000 | 28,850,000 |
| 530 | 3,375,368 | 19,475,873 |
| 626 | 2,000,000 | 11,540,000 |
| 649 | 3,000,000 | 17,310,000 |
| 650 | 3,800,000 | 21,926,000 |
| 780 | 3,805,076 | 21,955,289 |
| 839 | 4,996,752 | 28,831,259 |
| 845 | 4,955,151 | 28,591,221 |
| 959 | 2,309,812 | 13,327,615 |
| 976 | 3,090,504 | 17,832,208 |
| 996 | 4,574,257 | 26,393,463 |
| 1187* | 19,166,001 | 110,587,826 |
| 1190* | 19,294,800 | 111,330,996 |
| 1195* | 19,526,273 | 112,666,595 |
| 1330 | 13,400,699 | 77,322,033 |

Source: For household figures, see Liang 1980: 4–8.
Note: * Southern Song and Jin combined. These two regimes had different poll taxes and hence population registrations. So, the only common ground was the household registration.

With the same method, we can re-adjust the population figures of the seven quarantined Song periods based on the Song household numbers that were less distorted (see Table 9).

**Table 9. Song Census Figures Re-adjusted, 1006–1110**

| Year (A.D.) | Household number (A) | Re-adjusted population (5.77 • A) |
|---|---|---|
| 1006 | 7,417,570 | 42,799,379 |
| 1021 | 8,677,677 | 50,070,196 |
| 1053 | 10,792,705 | 62,273,908 |
| 1066 | 12,917,221 | 74,532,365 |
| 1083 | 17,211,713 | 99,311,584 |
| 1100 | 19,960,812 | 115,173,885 |
| 1110 | 20,882,258 | 120,490,629 |

Source: For household figures, see Liang 1980: 8.

So far, the re-adjustment has covered all the periods but the Qing. The problem with Qing is that official figures are for population only (with exception of 1911). Therefore, our household-based benchmark becomes less useful. The way out is to establish another benchmark for the Qing.

It is known that the Qing population was registered with the category of *dingkou* (literally 'adult population'). It is also known that till *c*. 1735 only males in the age group of 19 to 59 were liable for the poll tax although all males were registered before 19 years of age, too (E-er *c*. 1637: vol. 24 'Tianming Liunian Qiyue Shisiri' ['The Fourteenth Day of the Seventh Month of the Sixth Year of the Tianming Reign']). In this context, the Qing *dingkou* was meant for 'taxable male adults'. This was a reincarnation of the Song system. This reincarnation sheds the crucial light on the re-adjustment of the Qing population figures. So, the benchmark for the Qing has to be 2.10, the number of male adults per household during the Song, no less.

With the combination of the two benchmarks, 5.77 and 2.10, we can work out the population during the 10 periods under the Qing population from 1644 to 1735 with the following formula:

$$Q(i) = T_{qi} \bullet \frac{F_1}{F_2}$$

Where $Q(i)$ is the total population of the Qing at Period i; $T_{qi}$ is Qing taxable population at Period i; $F_1$ is the first benchmark of the long-term average household (5.77); $F_2$ is the second benchmark derived from the Song average males per household (2.10). The result is contained in Table 10.

**Table 10. Population Figures re-adjusted for the Qing, 1655–1734**

| Year (A.D.) | Taxable population (A) | Re-adjusted population (5.77/2.10 • A) |
|---|---|---|
| 1655 | 14,033,900 | 38,559,811 |
| 1661 | 19,137,652 | 52,582,977 |
| 1673 | 19,393,587 | 53,286,189 |
| 1680 | 17,094,637 | 46,969,550 |
| 1685 | 20,341,738 | 55,891,347 |
| 1701 | 20,411,163 | 56,082,100 |
| 1711 | 24,621,324 | 67,650,019 |
| 1721 | 25,616,209 | 70,383,584 |
| 1724 | 26,111,953 | 71,745,699 |
| 1734 | 27,355,462 | 75,162,388 |

After 1735, the Qing state switched back to registering everyone. The post-1735 official figures are recognized accurate (Tong 2000: 388). So, the figures for the five censuses – 1753, 1766, 1812, 1833 and 1887 – can stand as they are. The final results are integrated in Appendix 3.

These institutionally based re-adjustments differ fundamentally from any previous reconstruction of data by estimation and guesstimation. It removes the myth about China's census data.

### 3. Substantial tests of the new results

To obtain the new results is only the half battle won. Vigorously tests are imperative to prove their value. Since they are the products of the antithesis of the criticised estimation and guestimation, these new results will automatically pass the logic tests which the estimates and guestimates have failed. Hence, tests of a different kind need to be conducted, something substantial.

Three directions can be taken for the substantial tests: first, a 'feasibility test' to see whether population booms in some periods of the Chinese past were feasible; second, a 'dependent test' to see whether a population-depending factor reflected population fluctuations; third, a 'determinant test' to see whether a population-dictating factor had a correlation with population fluctuations. The first test is partly factual and partly hypothetical, while the last two are factual.

#### a. A feasibility test: Chinese fertility capability

We begin with the growth periods of the population. Most noticeably, there were two sudden spurts in the re-adjusted official data. One appeared in the Song Period. The figure began with 26.39 million in 996 and reached a pinnacle of 120.49 million in 1110 in just over a century. The second spurt took place in the Qing when the population began at 75.16 million in 1734 and ended at 398.94 million in 1833 in just under a century (see Appendix 3). During the first spurt, the annual growth rate was 1.34 percent (conventionally 13.4 ‰). During the second spurt, the rate was slightly higher, at 1.70 percent (conventionally 17.0‰). The question is whether Chinese society was capable of generating such annual growth rates. If not, our re-adjustments for the Song and Qing will fail.

The factors to be scrutinised here are (1) Chinese marriage and children-bearing patterns and (2) Chinese life expectancies. These are the main factors to determine population growth, *ceteris paribus*.

**Table 11. Legal Age for Marriage in Pre-modern China**

| Period | Starting age to marry | Maximum age to remain unmarried |
|---|---|---|
| *c*. 11th century -771 BC (Zhou) | – | female: 20 (19); male: 30 (29) |
| 770-476 BC (Spring & Autumn) | female: 15 (14); male: 20 (19)<br>female: 14 (13); male: 16 (15)** | female: 17 (16); male:20 (19)* |
| c. 206–8 A.D. (Western Han) | – | female 15 (14)§; male: – |
| 265–316 (Western Jin) | – | female: 17 (16)†; male: – |
| 420–534 (Northern Wei) | female: 13 (12); male: 15 (14) | – |
| 550–577 (Northern Qi) | female: 14 (13); male: – | female: 20 (19)∆; male: – |
| 566–589 (Northern Zhou) | female: 13 (12); male: 15 (14) | – |
| 618–733 (Tang 1) | female: 15 (14); male: 20 (19) | – |
| 734–907 (Tang 2) | female: 13 (12); male: 15 (14) | – |
| 960–1127 (Northern Song) | female: 13 (12); male: 15 (14) | – |
| 1127–1279 (Southern Song) | female: 14 (13); male: 16 (15) | – |
| 1358–1644 (Ming) | female: 14 (13); male: 16 (15) | – |
| 1635–1644 (Manchu) | female: 12; male: – | – |
| 1644–1911 (Qing) | female: 14 (13); male: 16 (15) | – |
| *Average*[31] | *female: 13.6 (12.8); male: 17 (16)* | *female: 19 (18); male: –* |
| {1911–49 (Republic)} | {female: 16; male: 18} | {–} |

Source: (1) For Zhou, see Anon. *c.* 3rd century B.C.: ch. 'Diguan' ('Land Administrators'). (2) For Spring and Autumn, see Han *c.* 233 B.C.: ch. 'Waichu Shuo'; Mo *c.* 376 B.C.: ch. 'Jie Yong'; Zuoqiu *c.* 454 B.C.: vol. 20 'Yueyu'; Xie 2000: 3; Wang *c.* 265: ch. 'Benming Jie'. (3) For Western Han, see Ban 82 A.D.: vol. 2 'Biography of Huidi'. (4) For Western Jin, see Fang 646 A.D.: vol. 3 'Wudi Ji' ('Biography of Emperor Wu'. (5) For the Northern Wei, see Xie 1998: 1–3. (6) For Northern Qi, see Li 636: vol. 8 'Houdi Ji' ('Biographies of Later Emperors'). (7) For Northern Zhou, see Linghu 636: vol. 5 'Wudi Ji' ('Biography of Emperor Wu'). (8) For Tang, see Zhang 1992b: 436. (9) For Northern and Southern Song, see Jiang 1998: 272. (10) For the Ming, see Li 1509: vol. 69 'Marriage of Among the Ordinary People'. (11) For the Manchus, see E-er *c.* 1637: vol. 9; Jueluo 1652: vol. 23, Entry 'Tiancong Jiunian Sanyue' ('The Third Month of the Nineth Year of the Tiancong Reign'). (11) For the Qing, see Wu 1648: 'Hulü Hunyin' ('Family Law, Marriages'); see also Chen 1936: ch. 4; Guo 2000: 180–4. (12) For the Republic Period, see Tong 2000: 301.

Note: Figures in parentheses are the biological age (*shisui,* literally 'true age'). *By law, the parents of the unmarried youngsters were liable to punishment. **Recommended by *Yellow Emperor's Medical Classics* (*Huangdi Neijing*, see Yang *c.* 618: ch. 'Shuwen' ('Inquiry'), Entry 'Shanggu Tianzhen Lun' ('Archaic and Innocent Issues') and *Confucius Home Instructions* (*Kongzi Jiayu*, Wang *c.* 265). §By law, those who were above this age and remained unmarried were taxed 5 times above the normal rate. †By law, unmarried girls over 17 years of age (biologically 16 yeras) were to be married out under the compulsory arrangements by officials. ∆By law, any maid at this age should be reported to the provincial authorities; concealment was punishable by death sentence to the parent.

[31] According to a BBC documentary on Virgin Mary (on BBC1, 24 December 2002), during Mary's time, with their sexual characteristics visible, girls in the Middle East were considered 'ready to marry' at 12.5 to 13 years of age. So, the ancient Chinese were not alone.

Traditionally, and commonly agreed, the Chinese got married very early. The following table shows that the legal age for marriage was stable over the long run with the average of 12.8 years old for the female and 16 for the male.[32]

Undoubted, this legal age for marriage was based on human biology, dictated by an average threshold for sexual maturity of the Chinese girls (Duan 1999: 187). Compatible with the law, to get married at the age of 15–16 was considered normal.[33] Indeed, from *c*. 1174 to *c*. 1875, some 60 percent of China's total population were above 15 years of age and married (Jiang 1998: 256). The pattern continued: according to a survey of 1912, the married proportion in society occupied 62.8 percent of China's total population (Jiang 1998: 279). It was not unusual for women to become grandmothers at their thirtieth.[34]

But, counting the legal age for Chinese marriages can be misleading, as a recent study shows that from *c*. 1174 to *c*. 1875 on average as high as 38 percent of all the marriages were made up by couples under the legal age. In 1912, of all married couples 37.2 percent were under the legal age (Jiang 1998: 279). Therefore, the socially acceptable age for marriages in premodern China was lower than the biological age of sexual maturity (Jiang 1998: 256). This shows the urge in society for marriages.

Despite a certain degree of unbalance between sexes due to the notorious practice of female infanticide, not only did marriages in China start early, but also they were universal.[35] Childless young widows were customarily remarried, too (Wolf and Huang 1980: 133–42, 227–8; 258–9). The unbalance in between the two sexes was well compensated by the practice of marrying a younger wife among men of ordinary wealth with an average age gap of 10 years (and staying

[32] In comparison, during the seventeenth and eighteenth centuries, the average age for marriages amongst the English women was 26, about 10 years later than the norm in China (see Wrigley and Schofield 1981: 528–9; Coleman and Salt 1992: 15–19).

[33] The age of 16 is commonly known as *er-ba miaoling* meaning that 'a girl of 16 is at the desirable age for marriage'.

[34] It is called *siwuliusui jie shoushi, niansanshi jie bao sun*, see Wang 1936.

[35] Evidence shows that the male-to-female sex ratio during the Qing was between 1.15:1 and 1.19:1. It remained 1.22:1 in the 1910s, 1.13:1 in the 1930s and 1.12:1 in 1947 (Jiang 1998: 224–6, 229–30 259–60). It declined to 1.07:1 on average in 1949–90 (Tong 2000: 243).

single among men of the extremely poor) (Guo 2000: 221–32). Evidence shows that this was the rule rather than an exception. In nature, this was maximisation of the human resources on the female part. This means that the demand for children in Chinese society was relatively inelastic.

If we take the afore-mentioned study of Chinese marital behaviour into account, the under age marriages (38%) and legal age marriages (60%) would make an aggregate of 98 percent of the total people socially eligible for marriages.[36] There is no exaggeration to state that the Chinese were very close to the realisation of the marriage potential to the full both biologically and socially.

The life expectancies in premodern China were around 40 (as during the eighteenth century), suggesting that the population as a whole was very young, hence fertile.[37] It has been revealed that during the period of 1920–39 about 88 percent of all the marriage couples were under the age of 50 (Jiang 1998: 254). To suppose that two-thirds of these couples were under the age of 40, about 66 percent of all the married couples would be within the children-bearing age. Considering that some 60 percent of all the Chinese were married (Jiang 1998: 256), the fertile sector in the population would thus be around 40 percent of China's total. If this 40 per cent were responsible for the 1.34–1.70 percent annual growth, an annual rate of 6.7–8.5 percent birth rate had to be achieved by

[36] Statistics for the 1920s and 30s show that the marriage rate among all grown-up females was 99.9 percent (see Barclay *et al*. 1976). Even under the strict communist control in the 1980s and 90s, as many as 99 percent Chinese women got married before their thirtieth birthday (Duan 1999: 177, 265; Tong 2000: 302). In comparison, during the seventeenth and eighteenth centuries, the marriage rate amongst the English women varied from 75% to 89%, considerably lower than in China (see Wrigley and Schofield 1981: 528–9; Coleman and Salt 1992: 15–19). Such a high marriage rate was both environmentally (in terms of high infant mortality) and institutionally determined (in terms of economic returns) (see Wolf and Huang 1980: 133–8; Harrell 1995: 126–7; Bray 1997: 332–4; Wolf 2001: 136–51).

[37] It has been estimated that during 1725–99 the life expectancies in China's well-to-do southern province of Zhejiang were 37.5 years (Liu 1985: 52; see also Liu and Wu 1991: 278). In some mountainous regions in the North, there was once a practice called 'sexagenarian returning to nature' (*liushi huanja zi*). What people did was to carry the elderly at their 60th birthday to a cave and leave them there to die in peace. This was done voluntarily and presumably mainly among the very poor. Such a practice made a lot of economic sense as resources could be better allocated among the young. It also suggests that the age of 60 years old was once viewed as the ceiling of human life in some regions in China.

the fertile women who occupied about 20 percent of society. This seems not to have been too hard to accomplish.

However, a high marriage rate and a large proportion of the population at the fertile age are related to but not identical with a high birth rate. To achieve the annual rate of 1.34–1.70 percent ($R_n$), Song and Qing China must have satisfied the following equation: $R_n = R_b - (R_d + R_m)$**.** Where $R_n$ stands for the 'the annual rate of net increase of population' (conventionally called the 'annual rate of natural increase of population'); $R_b$, the 'annual crude birth rate' (or CBR, the rate of gross population increase); $R_d$, the 'annual growth rate required to maintain the population size' which offsets the population loss caused by the dead, and hence the equivalent of the death rate; and $R_m$, the 'annual growth rate required to offset the population loss caused by infant mortality', and hence the equivalent of the infant mortality rate. The equation can be re-organised as follows: $R_b = R_n + R_d + R_{m.}$

Now, the value of $R_n$ is given as 1.34–1.70%. But due to a lack of information, the key parameter $R_m$ is unknown for the Song and Qing. We have to get around this problem with the available data.

It is commonly recognised that in modern China to maintain the population *status quo*, the value of $R_d$ is 2.1–2.2 percent (or 21–22‰) (Tong 2000: 66). China's infant mortality rates for 1949 and 1960 were 20‰ and 25.4‰, respectively (Tong 2000: 107). Considering that during the whole period of 1949–60, China still had a rurally dominant population (80 percent of China's total) and there was no significant improvement in modern medical care, these rates can be taken as proxies for $R_m$ for premodern China. Moreover, both years were difficult economically for ordinary Chinese. The year 1949 was the end of twelve-year long wars. 1960 was the point when Mao's murderous Great Leap Forward collapsed with a disastrous consequence of a nation-wide famine.[38] So, a resulting 2–2.5 percent infant mortality rate can be taken as the ceiling. The

[38] China suffered heavy losses in human lives during the wars and the Maoist famine, easily 30 million for each case.

value of $R_b$ (CBR) is 5.44–6.44 percent (or 54.4–64.4‰).[39] For our purpose, as long as Chinese society was able to maintain a high net increase of population at the targeted 5.44–6.44 percent, the Song and Qing spurts were achievable. What to be looked into next are China's (1) 'general fertility rate' (GFR),[40] and (2) 'total fertility rate' (TFR).[41]

**Table 12. China's Real GFR with Spare Capacity (%), 1928–33**

| Region | Real GFR (A) | Required GFR (B)* | Spare capacity (A-B) |
|---|---|---|---|
| North China | 38.1§ | 24.5–29.0 | 9.1–13.6 |
| South China | 39.8 | 24.5–29.0 | 10.8–15.3 |
| Sichuan | 44.1 | 24.5–29.0 | 15.1–19.6 |
| Nation-wide | 38.9 | 24.5–29.0 | 9.9–14.4 |

Source: Based on Jiang 1998: 274; §see also Chen 1934: 141–5.
Note: *Required for the Song and Qing growth. Spare capacity accommodates infant mortality.

It has been established for post-1949 China that the value of GFR is 4.5 times of that of CBR. This is based on the pre-condition that the female fertile group (aged 15–40) occupies about 24 percent of China's total population during the 1950s (Yang 1987: 184), which is very similar to the estimated 20 percent for premodern times. But there is a caveat. The legal marriage age after 1949 was 20 for women and 22 for men, much later than the premodern average (see Table 11). This would automatically reduce CBR by some 26 percent should the age 40 be taken as the end of women's fertility. Still, this factor of 4.5 can be taken as a conversion rate for the Song and Qing growth. The result is 24.5–29.0 percent for GFR. From a nation-wide survey, China's real GFR in 1928 to 1933 was actually much higher than this (see Table 12).

These high GFR readings are undoubtedly determined by a high participation rate of fertile women in reproduction under China's traditional

[39] This is a 'playing safe' figure, as it may have been as low as 13‰ but not higher than 58‰ (see Harrell 1995: 9).

[40] GFR = the total number of births over the number of all the women of the fertile-age cohort times 1000‰.

[41] TFR = the sum of all fertility rates of different age cohorts, equivalent to the total number of births per woman in her entire fertile life cycle.

marriage regimes. It was almost certain that the Songs and Qings had the similar spare capacity above the required 24.5–29.0 percent mark.

On the other face of the same coin, during 1928–33 China's TFR was 6.32 (Tong 2000: 74).[42] The momentum continued: China's TFR readings were 6.47 in 1952, 6.41 in 1957, and 7.50 in 1963 (Tong 2000: 74–5). As recent as 1980, China's rural TFR remained as high as 6.0 (Yang 1987: 186).[43] These readings can be converted to the annual CBR by the following format:

$$\sqrt[n]{\frac{a \bullet b}{2}}$$

Where $n$ is the total number of fertile years for a mother on the average fertility; $a$, the constant for women's marriage rate during their fertile years; $b$, the TFR reading. The value of the denominator is determined by the two parents in the family.

From the available information, the value of $a$ is about 0.99 (99%) among all fertile women. The value of $n$ is about 25 (years, 15–40), dictated by the age of female sexual maturity (±15 years of age) and China's life expectancies (±40 years). The value of $b$ can vary from 6.32 to 7.50. The resulting annual CBR range is thus 4.67–5.39 percent (or 46.7–53.9‰) which is close to the lower band of the targeted 5.44–6.44 percent (or 54.4–64.4‰). Should the value of $n$ be lowered for the sake of a shorter life expectancy (say, ±35 years), the frequency of births will increase. The resulting CBR becomes 5.87–6.78 percent, easily on the target with some spare capacity. In theory, to hold the female sexual maturity age constant (15 years of age), China's minimum life expectancy can be as low

[42] In his extensive study of China's families (38,256 in all) in twenty-two provinces in 1929–33, J.L. Buck revealed a very similar TFR at 6.20 (see James *et al*. 2002: 596). The same reading of 6.20 was also registered by estimation (see Telford 1992). Similarly, a TFR range of 6.15 to 7.50 has been suggested for some pockets of China from 1905 to 1945 (see Wolf 2001: 136–7). Recent class-based estimates by Lee and Wang mapped 5.30 for the upper classes and 6.50 for the frontier settlers (1999: 85–7). All these figures are convergent.

[43] From the traditional view, all Chinese marriages aimed at having offspring for the sake of linage, the more the better. The present study tries to avoid such a sweeping statement, taking into account of Chinese practice of birth control and post-birth population control (see Li 1996a; Lee and Wang 1999). The empirical TFR readings show a certain degree of birth/population control as the maximum number of births could well be doubled within the human biological tolerance. A good comparison can be made with pre-industrial England where the TFR has been cited as high as 8.0–9.0, some 20 percent higher than the Chinese readings (Wilson 1984).

as 22.8 years ($n$ = 7.8) to accommodate a TFR of 7.00,[44] assuming that there is a birth each year in the fertile life cycle after the first 40-weeks' pregnancy. The shortened life expectancy only increases birth frequency.

So far, the model is on the assumption of strict monogamy. In reality, a rich man in China had more than one wife. To suppose the 10 percent of the Chinese families had polygamous marriages of two wives, three adults would share two women's TFR. The new CBR is determined by the following formula:

$$\sqrt[n]{\frac{2a \bullet b}{3}}$$

The polygamous CBR varies from 5.88–6.61 percent (when $n$ = 25) to 7.40–8.33 percent (when $n$ = 20). This is very conservative, as evidence suggests that in the early 1930s, about 24 percent of the northern rural households and 30 percent of southern rural households were wealthy enough to support a wife and a concubine (Liu 2002: 32).[45]

Still, if we combine the two marriage models together with their own percentage weights (90 percent of monogamy and 10 percent of polygamy), the new result is 4.79–5.51 percent ($n$ = 25) and 6.02–6.93 percent ($n$ = 20).

So far, we have used an average figure for the number of children a Chinese family had. Evidence indicates that the number of children was a function of a family's financial wealth: a rich family normally had more children above the national average.[46] To follow this line of argument, the better a region's economy performed, the more children were born and raised proportionally, *ceteris paribus*. Hence, to achieve the CBR of 5.87–6.78 percent in a well-to-do region should not have been a problem. The conclusion here is

[44] For the lower end of life expectancies of 31–36 years in parts of China during the seventeenth to nineteenth centuries, see Telford 1990: 133; Harrell 1995: 148; Lee and Wang 1999: 54–5. For even lower regional ratings of 21.5 and 24.6 years during China's most turbulent period in the early twentieth century, see Barclay *et al*. 1976: 620. All of these figures are not too far from the minimum of 22.8 years.

[45] In China, the number of polygamous marriages was income elastic on the male part, as males' sexual propensity maintained little charged in human biological terms. So, this percentage would almost certainly increase during good times and in well-to-do regions. The point is that the period of the 1930s was not even qualified as a golden age in Chinese history. So, in a golden age, such a percentage was almost certainly higher.

[46] This was the pattern in the Jiangnan region during the Ming–Qing Period, see Harrell 1985.

that with the socially accepted marriage practices China should have had no difficulty to generate the required population growth rate for the Song and Qing spurts.

Now, going back to Figure 1, those estimates and guesstimates that artificially backdate the Qing demographic great leap forward for some 200 years (from 1700 to 1500) to give the Chinese population growth an easier ride are unnecessary to say the least. They are almost certainly flawed.

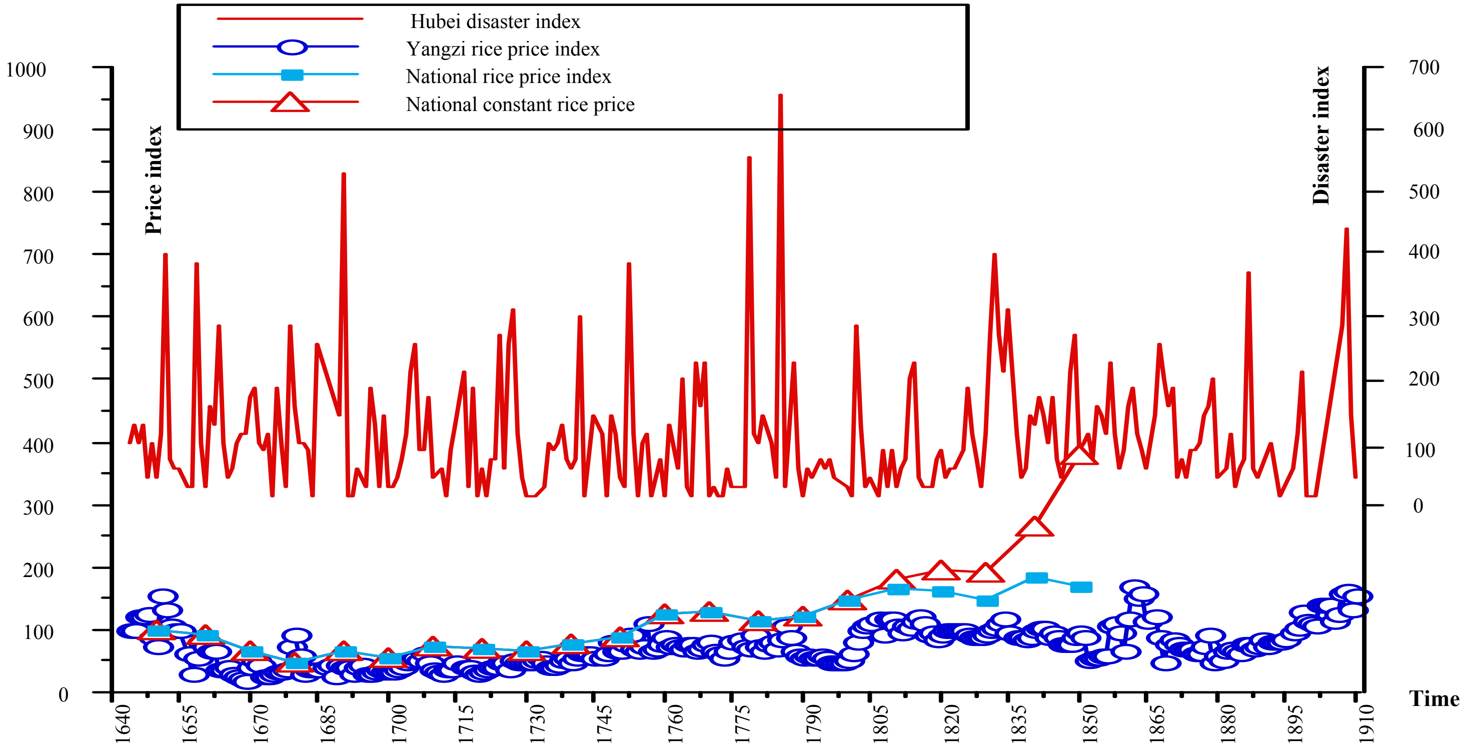
For our purposes, the test by China's birth capacity is only partial, as it does not show how the population fluctuated. In other words, the danger of a 'linear trap' is still present.

**b. Test by a 'shadowy variable': food prices**

To show the demographic resources behind China's population spurts during the Song and Qing is the easy part. To work out whether the population fluctuations were real is far more difficult. A way to examine how true such fluctuations were is to find a 'shadowy factor' in relation to the population. The assumption is that if the shadowy factor moved the same way as that of the population the demographic fluctuations were real. One of such shadowy factors is the food price. Although it is far more volatile than population, the food price reflects how the human basic needs are met. In nature, the per capita demand for food is both price and income inelastic and hence stable in both good and bad times. Therefore, the food price transcend to a great extent changes in real income. The fluctuations in food price can thus reflect the fluctuations of the population size itself.

In terms of the intercourse of the food price and the population size, when population size was relatively small, the aggregate demand for food was weak, the food price stayed low, and *vice versa*. As a market feedback, a low food price could and would encourage more population growth in China. But it took time. When population did increase eventually and hence pushed up the aggregate

**Figure 7. Hubei Disasters: Little Bearing on the Yangzi Price**




Source: The Hubei disaster index is based on Ho 1959: Appendix 4; the rice price index for the Yangzi region is based on Wang 1992; the national rice price index is based on Yu 2000: 903–4; the constant price index is based on Yu 2000: 860.

demand for food, the food price would arise. But, in the end, the population-cum-demand determined the food price, not the other way round. This was the reason why the level of the food price roughly synchronised with the stance of the Chinese population in the long run. For the current purpose, rice is chosen, as it was by far the most consumed staple food after the Song.

There has been a common illusion that in premodern China food prices were determined by disasters with the argument that disasters created food shortage and food shortage pushed the price up. This would work only if food supply was highly localised all the time. This was not applicable to the Chinese empire. During the Qing the Yangtze–Han Plain (geographically Han meaning Hubei roughly) was integrated with other parts of the empire.[47] Disasters in Hubei, a part of the Yangzi zone, had virtually no bearing on the food price in the greater Yangzi region at all. Instead, the Yangzi price was rather stable and consistent with China's national price index (see Figure 7). This allows us to move on to use the food price as a population-depending factor to continue our test.

The present study uses the most recent price series of the medium term (for one dynasty) and long term (for more than one dynasty) in order to test the long-term population fluctuations. So far, the prices series cover most of the Song, most of the Ming and entire Qing (Yu 2000; also Wang 1992 for South China).[48]

It is imperative that all the prices are converted to a constant price. Otherwise, the picture is distorted. During the Song, there was a lasting inflation due to the deregulation of monetary supply. It was during this period that bronze coins, iron ingots and paper currency were simultaneously in circulation. Measured by the price of silver, the price level increased by 350 percent in a space of 245 years with an inflation rate of 5.2 percent per decade (Yu 2000: 556–7). During the late Ming, China experience a price revolution as a result of an increasing intake of large quantities of overseas silver, about 14,300 metric

[47] The region was able to produce 2.21 million metric tons of grain of which 62 percent was surplus for marketing (Zhang 1995: 42).

[48] Therefore, regrettably, works such as R. B. Marks (1991) are not suited.

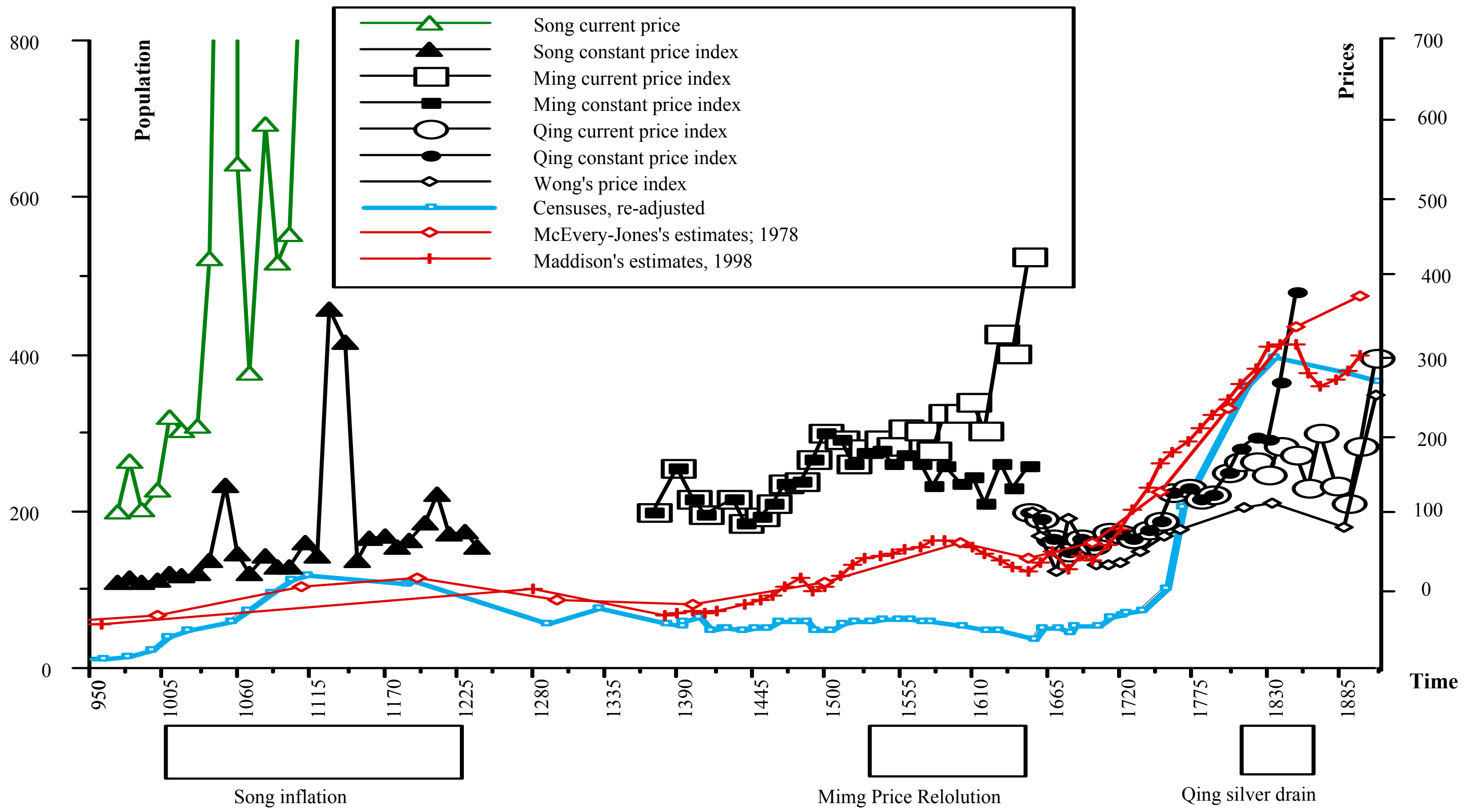
tons a year on average (Deng 1997: 176–8). As a result, in the period of 1520–1650 China's nominal price index for rice increased 2.6 times against the background of a three-fold rise in the general price level (Yu 2000: 788; Deng 1997: 176–8; for regional changes, see Wang 1992: 40–7 and Marks 1991: 102). This was a nominal price rise of 3.8 percent per decade for a total of 13 decades. In the late Qing, China's silver reserve began to drain quickly in the wake of the opium trade, around 1.5–1.7 million pounds sterling a year in the from of trade deficit with India alone, which caused a shortage in the supply of monetary silver (Deng 1997: 125). This silver drain caused appreciation of the relative price of silver to Chinese traditional bronze coins by about 150 percent from 1810 to 1840 (Yu 2000: 860). This makes a rate of 14.5 percent per decade (1.36 percent a year), higher than any previous rate. Therefore, China's food prices have to be re-adjusted to eliminate the distortion caused by the nominal price.

What has been discovered is rather astonishing: China's long-term constant price index for rice fluctuates visibly in the same direction as a shadow of that of the population size (see Figure 8).

This pattern is highly consistent with the classical and neo-classical model for a market where the producers (here rice-growers) were price takers at the mercy of the market demand, while the demand was ultimately determined by the population size.[49] Another classical and neo-classical possibility is that, when the food market becomes well integrated, a change in regional demand will not change the macro price structure. China happened to have both an ocean of small producers and a carefully monitored food market by the state.

[49] It is worth noting that the relationship between the population size and the price for food was very different from that in Tokugawa Japan where the two variables moved in the opposite directions (Feeney and Kiyoshi 1990). The sensible explanation for this is that in Japan the rice markets were fragmented and controlled by local daimyos and rice merchants. So, a local crop failure could trigger a sudden price surge at the local market. China's market net work, its price registration and reporting system, and its Grand Canal for trans-regional rice transport helped the formation and maintenance of a quasi-national market for food. So, a local crop failure had much less impact on the local price, not to mention the government efforts to maintain a nation-wide rough equilibrium with its 'Ever-Stable Granaries' (*changpingcang*, first established in 54 B.C.).

**Figure 8. Fluctuations in Population and Rice Prices**




Source: The price index series, based on Yu 2000: 556–7, 602–5, 754, 786–9, 806, 903–4; Wang 1992: 40–7. For population, China's official data with three-term moving average are based on Liang 1980: 4–11; see also Lu and Teng 2000: Appendix. For Maddison's estimates, see his work 1998: 267.
Note: Boxed periods were those years of inflation or deflation.

Now, judging from the trajectory of China's constant price index in Figure 8, it makes no economic sense that during 1500–1700, a price decline in real terms should be coupled by a vigorously rocketing population, as all the estimates/gusstimates have portrayed (McEvery-Jones and Maddison's series being taken as the example). Here, either estimates/gusstimates are incorrect or the Chinese rice marketers were irrational by selling their produce short.

**c. Test by an independent factor: disasters**

To test population fluctuations with the shadowy factor of the food price is effective but not conclusive. It can at best prove the linear school wrong (as demonstrated in Figures 7 and 8). But it cannot prove the official population data 100 percent correct. A tougher test needs to be conducted from a factor that is relatively independent from the population size. But it at the same time should confine and dictate the population.

One possibility is to use China's aggregate grain output as a proxy for the population (e.g. Fei and Liu 1977). Technically, to calculate total grain output would be hard owing to the heterogeneous nature of crops and their harvest seasons under China's highly decentralised household-cum-farming. Even if we can obtain reasonably accurate figures of total grain outputs, how to convert food to a number of people still remains a problem, as it is counterfactual to assume that all of the people would consume exactly the same way and the same amount regardless of their social status and financial wealth. The same thing can be said to any income-inelastic consumables such as salt and spices. To make it even worse, until very recently, data for China's total grain output were not recorded.

Alternative, we can look at factors that reduce population such as the infant mortality rate. But, collecting such information was again a very recent phenomenon in China. But, this concept of infant mortality does suggest another way to look at the issue: a society's incapacity to support and sustain its population. This incapacity includes what Amartya Sen called an 'entitlement crisis' (see Sen 1981). Ultimately, this incapacity is a function of disasters, which fill the bill as they are relatively independent from and yet closely related to population, or the loss of it.[50] What disasters do is to deny the basic entitlement to a large number of ordinary people in the forms of (1) plagues in crops and humans, (2) climatic changes which cause frosts, droughts and floods, (3) robbery by the corrupt native state, (4) massacre by alien conquerors, or (5) a combination of all such tragedies. In Eric Jones's phrase (1980: 17), 'the catastrophe would come in the form of warfare, famine, or epidemic, and the increased of population would suddenly be wiped out'. In this context, disasters directly contributed to the 'kinks' in China's demographic curve. Indeed, kinks, and a great many of them, were what China had as shown in Figures 2, 6 and 8.[51]

The hypothesis here is that there was a causal link between the *force majeure* of disasters and a loss of the population-supporting capacity in society. In the short run, individuals and communities alike could do very little about the *force majeure*. In other words, conceptually, the actual supply of population is to a great extent determined by this *force majeure*.

The most obvious cause of a loss of lives in premodern China was the war. It has been suggested that the Mongol and Manchu conquests were responsible for the losses of 25 and 35 million of lives, respectively (Jones 1988: 109).[52] Taping Rebellion is believed to have cut China's population by some one-sixth of China's total (see Ge *et al*. 1999: 84–111; Lu and Teng 2000: 790–802).[53]

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[50] From environmental point of view, disasters may be a result of human economic activities. But to avoid a circular argument we view disasters as an exogenous factor.

[51] For a modern version of such a kink and its demographic mechanism, see Kane 1988: chs 6–7.

[52] These would be 21 percent of the Song population (based on Chao's figure of 121 million for 1110) and 22 percent of the Ming (based on Maddison's figure of 123 million for 1600). Given the tendency to inflate China's population figures, these percentages were likely to be understated.

[53] If so, the total casualty of the Taiping Rebellion could be as high as 70 million although it is commonly cited as only 20 million (Schoppa 2000: 22). At this point, in Chinese history, the aftermath of a war or was often a famine. W.H. Mallory collected in all 1,828 famine cases for China (1926: 1–2). Although a famine does not kill a large number of people instantly, its end result is the same. So, in Chinese history, a war killed people twice. The first time was in the bloody form; and the second time, bloodless.

Natural disasters include floods, droughts, insect plagues and human epidemics. In the nineteenth century, a major natural disaster could hit a quarter to a half of China's territory (Li 1994), affecting millions (see Table 13).[54]

**Table 13. Natural Disasters and their Human Impact, 1810–88**

| Year | Types | Death toll | % in China's total |
|---|---|---|---|
| 1810 | draught, flood, earth quake | 9 million | 2.5* |
| 1811 | draught, flood, earth quake, plague | 20 million | 5.5* |
| 1849 | draught, flood, plague | 15 million | 3.8§ |
| 1857 | plague5 million | – | |
| 1876–8 | draught, flood | 10 million | – |
| 1888 | flood, earth quake | 3.5 million | 0.9† |

Source: Population figures, based on Liang 1980: 10; disasters, based on Deng 1998: 141–2.
Note: *Based on the 1812 census (Liang 1980: 10); §Based on the 1833 census (*ibid*); †Based on the 1887 census (*ibid*).

In terms of information availability, disasters were rather unique. For ideological, political and economic reasons, the Chinese paid great attention to disasters of all sorts. Incidents were painstakingly recorded at all levels. Typically, the throne saw disasters as omens against his legitimacy. Local officials had to report all sizeable disasters to the court in order to re-adjust tax burdens and apply for famine relief hence to fulfil their personal deeds.[55] The ordinary citizens had even more incentives to report disasters in order to be qualified for tax exemptions (Deng 1998: 372–86). The zeal for recording and reporting disasters was thus perpetuated by the gains for both the officials and the farmers: a Pareto optimum at which everybody wins.[56] Such incentives warrant a reasonable degree of coverage of China's disasters.

On the other hand, to record disasters was relatively straightforward. First, the concept was commonly shared by the Chinese. Second, the damage was always physical and visible and hence difficult to hind. As a result, to report a

[54] At the first glance, natural disasters seem harmful but not overwhelming: the impact was rather small in terms of the casualty rates.

[55] In J. R. McNeill's phrase, Chinese officials were taught to see a link between natural disasters and imperial politics (McNeill 1998: 37).

[56] Even some early western works show the understanding of this point (see for example, Mallory 1926: 1-2, 38-42).

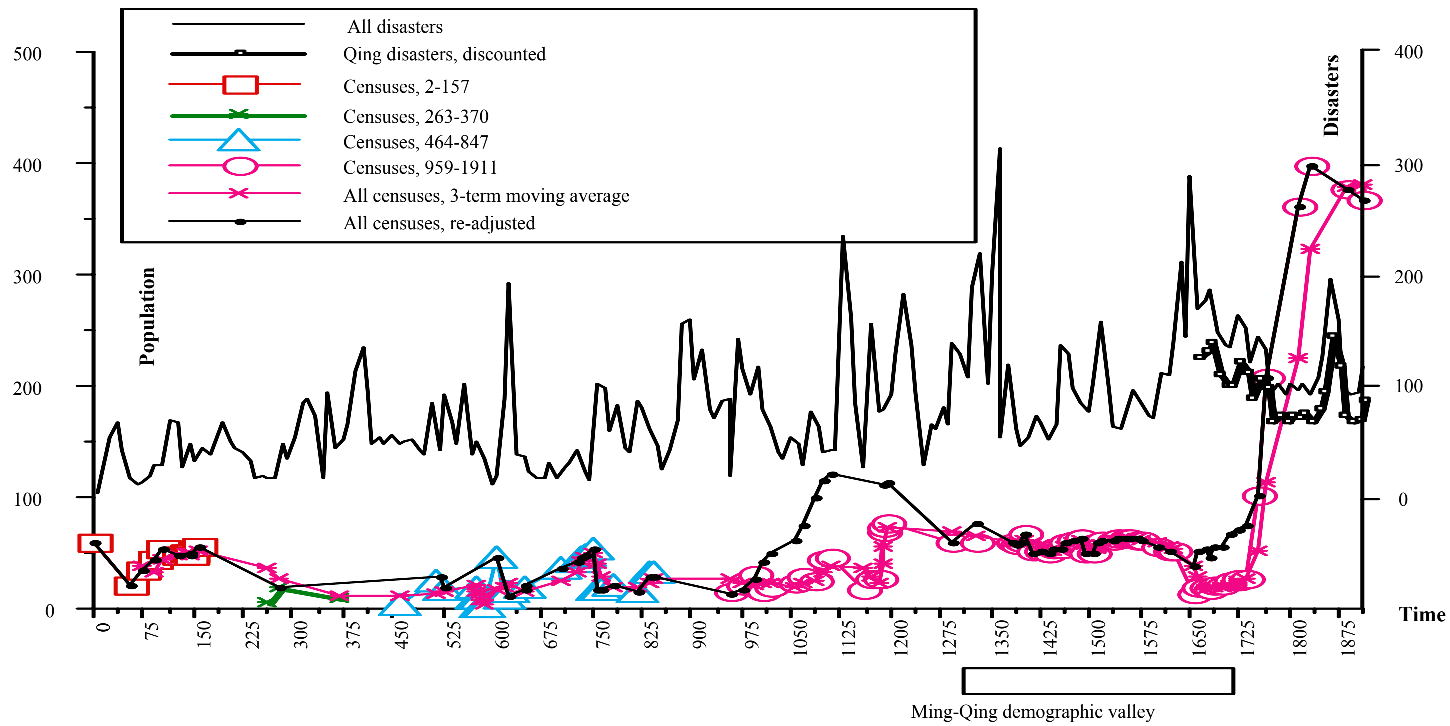
disaster requires minimal labour input and caused fewer disputes among different agents. In other words, the monitoring cost was low compared with running regular censuses. This helped the accuracy in datum collection. So, it is not surprising that the Chinese began recording disasters about three centuries earlier than their first census and 25 years before the formation of the empire (Chen 1937). Not surprisingly, either, no one has so far questioned the reliability and credibility of Chinese data for disasters. Rather, it is the norm for historians of all kinds to use them with a tacit agreement on its trustworthiness.

The disaster data collected by Chen Gaoyong in his book *Chronological Tables of Chinese Natural and Man-made Disasters* (*Zhongguo Lidai Tianzai Renhou Biao*) serves our current purpose particularly well due to its empire-wide and long-term coverage.[57] The sources that Chen tapped are very similar to Liang's: dynastic histories, local gazetteers, government documents and general literature. In the book, all the major disasters (a total of 16,495 events) across 2,159 years are recorded (from 246 B.C. to 1913 A.D.) with a long-term average of 7.6 cases per year.

When we put data for disasters and population together, a pattern emerges. In Figure 9, with very few exceptions, a rise in disasters is coupled by a dive in population (often with a time lag), and vice versa.

[57] It is worth noting that there is another book on this subject by Deng Yunte, published in the same year of 1937, entitled *Zhongguo Jiuhuang Shi* (*A History of Disaster Relief of China*). The work has two problems. First, the data for pre-Ming period were incomplete. Second, it portrays an increasing trend in the number of disasters (see Deng 1998: ch. 1). Mallory wrote about famines (Mallory 1926: 1–2). But, these famine cases were the end results of disasters, not the disasters themselves.

## Figure 9. Disasters versus Official Censuses, *c.* 50–1911




Source: Data for disasters are based on Chen 1937. Data for population, the same as Figure 2.
Note: The discount on the Qing disasters is based on an increase in farming land equivalent to some 25 percent of China's total (see Table 15).

**Table 14. Comparison of Rates of Change in Disasters and Population**

| Period (A.D.) | Period breakdown | Disasters/Population (million) | Annual rate (%) |
|---|---|---|---|
| 1. 2–157 (155 years) | | | |
| Disaster increase (a) | 4–125 | 3 → 68 (↑ 2,267%) | 2.61 |
| Demographic response (a) | 2–125 | 59.6 → 48.7 (↓ 82%) | –0.16 |
| Disaster decrease (b) | 125–154 | 68 → 32 (↓ 47%) | –2.63 |
| Demographic response (b) | 125–157 | 48.7 → 56.5 (↑ 116%) | 0.46 |
| 2. 157–519: insufficient population data, 362 years | | | |
| 3. 519–627 (disaster decrease first, 108 years) | | | |
| Disaster decrease (a) | 519–609 | 43 → 20 (↓ 47%) | –0.85 |
| Demographic response (a) | 519–609 | 28.9 → 46.0 (↑ 159%) | 0.52 |
| Disaster increase (b) | 609–627 | 20 → 193 (↑ 965%) | 13.42 |
| Demographic response (b) | 609–627 | 46.0 → 11.5 (↓ 25%) | –8.01 |
| 4. 627–758 (760 for population, 131 years) | | | |
| Disaster decrease (a) | 627–738 | 193 → 24 (↓ 12%) | –1.90 |
| Demographic response (a) | 627–742 | 11.5 → 48.9 (↑ 425%) | 1.27 |
| Disaster increase (b) | 738–758 | 24 → 102 (↑ 425%) | 6.80 |
| Demographic response (b) | 742–760 | 48.9 → 17.0 (↓ 35%) | –6.04 |
| 5. 758–959 (201 years) | | | |
| Disaster decrease (a) | 758–839 | 102 → 62 (↓ 61%) | –0.62 |
| Demographic response (a) | 760–839 | 17.0 → 28.6 (↑ 168%) | 0.66 |
| Disaster increase (b) | 839–956 | 62 → 89 (↑ 144%) | 0.31 |
| Demographic response (b) | 845–959 | 28.6 → 13.3 (↓ 47%) | –0.67 |
| 6. 969–1190 (disaster decrease first, 221 years) | | | |
| Disaster decrease (a) | 969–1110 | 142 → 42 (↓ 30%) | –0.87 |
| Demographic response (a) | 976–1110 | 17.8 → 120.5 (↑ 677%) | 1.44 |
| Disaster increase (b) | 1110–1190 | 42 → 79 (↑ 188%) | 0.79 |
| Demographic response (b) | 1110–1190 | 120.5 → 111.3 (↓ 92%) | –0.10 |
| 7. 1190–1397(1403 for population, 207 years) | | | |
| Disaster increase (a) | 1190–1365 | 79 → 314 (↑ 397%) | 0.79 |
| Demographic response (a) | 1193–1381 | 112.7 → 60.0 (↓ 53%) | –0.34 |
| Disaster decrease (b) | 1365–1397 | 314 → 47 (↓ 17%) | –6.11 |
| Demographic response (b) | 1381–1403 | 60.0 → 66.6 (↑ 111%) | 0.48 |
| 8. 1397–1477 (1484 for population, 80 years) | | | |
| Disaster increase (a) | 1397–1457 | 47 → 136 (↑ 289%) | 1.78 |
| Demographic response (a) | 1403–1464 | 66.6 → 60.5 (↓ 91%) | –0.02 |
| Disaster decrease (b) | 1457–1477 | 136 → 99 (↓ 73%) | –1.60 |
| Demographic response (b) | 1464–1484 | 60.5 → 62.9 (↑ 104%) | 0.19 |
| 9. 1477–1547 (1552 for population, 70 years) | | | |
| Disaster increase (a) | 1477–1517 | 99 → 157 (↑ 159%) | 1.16 |
| Demographic response (a) | 1484–1519 | 62.9 → 60.6 (↓ 96%) | –0.11 |
| Disaster decrease (b) | 1517–1547 | 157 → 61 (↓ 39%) | –3.20 |
| Demographic response (b) | 1519–1552 | 60.6 → 63.3 (↑ 104%) | 0.13 |
| 10. 1547–1887 (one and half swings, 340 years) | | | |
| Disaster increase (a) | 1547–1653 | 61 → 289 (↑ 474%) | 1.48 |
| Demographic response (a) | 1552–1655 | 63.3 → 38.6 (↓ 61%) | –0.48 |
| Disaster decrease (b) | 1653–1833 | 289 → 92 (↓ 32%) | –0.64 |
| Demographic response (b) | 1655–1833 | 38.6 → 398.9 (↑ 1,033%) | 1.32 |
| Disaster increase (c) | 1833–1873 | 92 → 159 (↑ 173%) | 1.38 |
| Demographic response (c) | 1833–1887 | 398.9 → 377.6 (↓ 96%) | –0.10 |

Source: the same as for Figure 9.

Note: The population data are re-adjusted official statistics. Comparable pairs are indicated by (a), (b), and (c). Arrows: directions of changes.

Further to the visual pattern, an analysis of the correlation coefficients provides a more in-depth understanding of the pattern. From the fourteen pairs of data from 1660 to 1911 the resulting correlation coefficient is a highly significant -0.85, which confirms the close but negative correlation between population and disasters.[58]

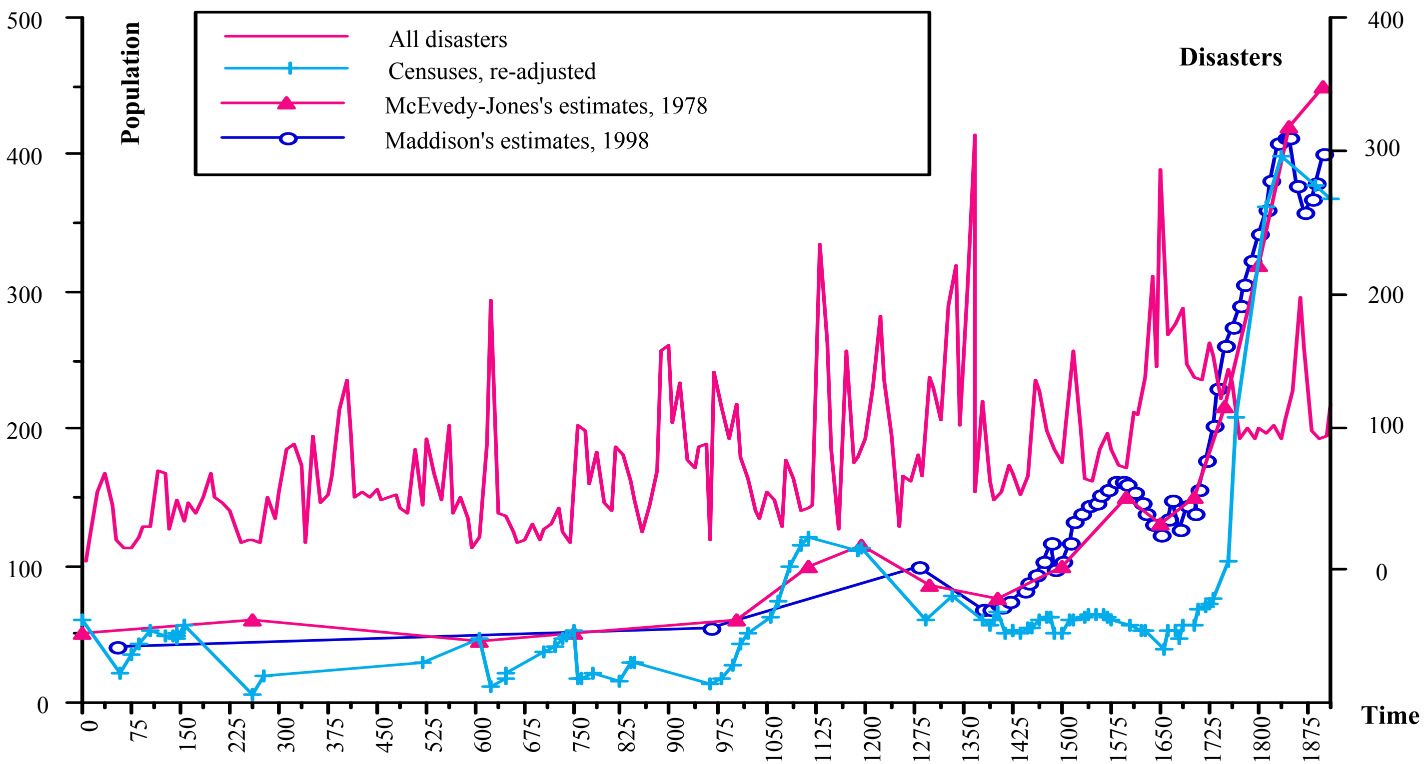
Ideally, one should work out the correlation between disasters and population for the entire Chinese history. However, the two sets of data have very few year-by-year corresponding observations, which makes the sample for correlation too small. The alternative is to compare the rates of change in corresponding periods to see whether the pattern from visual observation sustains. Table 14 contains a total of 1,507 years of 10 periods. The coverage rate is a very significant 79 percent of the lifespan of the Chinese empire (out of 1,909 years from 2 to 1911 A.D.). If the period of insufficient population data is excluded, the net coverage rate is as high as 97% (1,507 years out of 1,547 years). Here, a 'see-saw' pattern firmly confirms the *force majeure* at work, although the demographic response varied in degree.

In contrast, when we take the same approach to test McEvedy-Jones's and Maddison's sets, their numbers are immune from the *force majeure* of disasters from 1 A.D. till 1300, as the population has been portrayed as moving in the same direction with that of the disasters between 1400 and 1600. Worse even, the 'demographic valley' between *c*. 1350 and *c*. 1720 became a demographic up-hill. The shock in 1640 – 1700 caused but a small dip (see Figure 10). Here, unless there is no such thing as the *force majeure*, most of the estimates for the Chinese population of the entire pre-1800 period are in serious trouble.

[58] The formula used here is as follows: $r = \dfrac{\sum xy - \sum x \cdot \sum y}{\sqrt{\left\{n\sum x^2 - \left(\sum x\right)^2\right\}\left\{n\sum y^2 - \left(\sum y\right)^2\right\}}}$

Where *r* is the coefficient; x, disaster; y, population.

## Figure 10. Disasters versus Modern Population Estimates




Source: the same as Figures 1 and 9.

The patterns show in Figure 9 and Table 14 are convergent. Together, they indicate that the Chinese official data are far more credible than one might think, certainly more accurate than most modern estimates.

**4. Test of two special cases: Song and Qing**

Our analysis could end here. But there is one loose end. One must explain why and how the Songs and the Qings managed to reproduce so strongly with the high disaster readings. This requires a closer look at the disaster types.

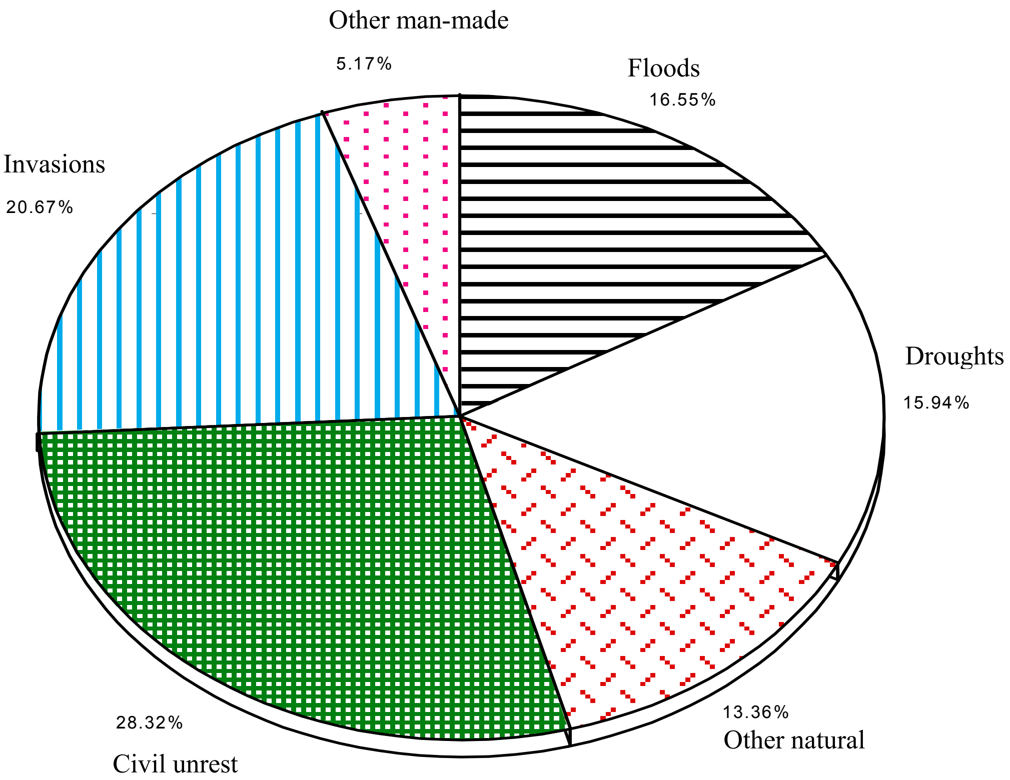
To begin with, disasters can be further grouped as the natural ones (such as floods and droughts) and the man-made ones (including foreign invasions and civil unrests). The ratio between the two groups is 1.18 to 1 (see Figure 11). And, the distribution of these two types in Chinese history was not even.

What was so unique during the Song growth (.*c* 996–1110) was a low frequency of natural disasters in conjunction with a green revolution marked by the introduction of the early-ripening rice (the Champa rice). As a war trophy from now central Vietnam in 1012, the new species was systematically promoted across China under the government's initiatives (Ho 1956). The early-ripening nature of the Champa rice, which can yield as fast as in 60 days, enabled its spread at a much higher speed than any other crop (Deng 1993: 93). From the farmers' point of view, the new variety was particularly suited for (1) marginal land cultivation and (2) payment to the state under the regime of tax in kind.[59] Fewer natural disasters and a green revolution fuelled Song's population supporting capacity. By 1125, the Songs broke all the previous demographic records of the empire. Although the growth was brutally stifled first by the Tartars who captured North China in 1127 and then by the Mongols who conquered South China in 1271 (see Figure 12), by that time the Chinese population already peaked. So, even after the deduction under the Mongols,

[59] Yielding quickly, the Champa rice was able to grow with less irrigation and fertilisers. Despite the fact that it was considered inferior in taste, it made perfect tax grain to pay the government. As the rice required less factor inputs per unit of quantity, the farmers enjoyed a tax cut in real terms.

China's population was still greater than any demographic plateau in the pre-Song era (see Figure 12).

**Figure 11. Distribution of Disasters in China, 246 B.C. – 1913 A.D.**



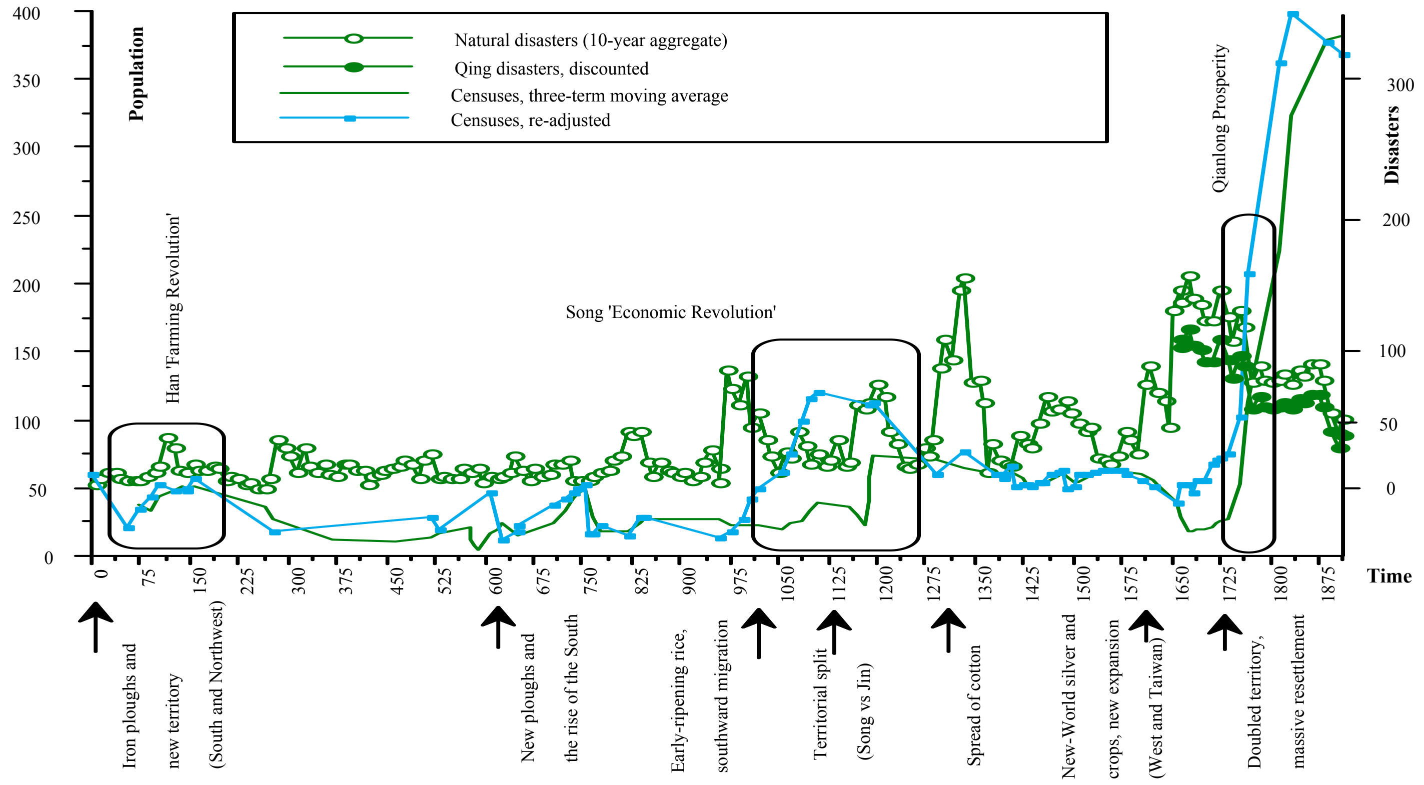

Source: Information based on Chen 1937.

After the Mongols, frequent natural disasters reigned China. The potential of the Song green revolution seems to have exhausted with diminishing returns.[60] And so was the momentum of the population growth. Not until the mid-eighteenth century did the growth pick up again.

The Qing growth (*c.* 1734–1833) was rather different but also unique. During the demographic great leap forward, the reading of natural disasters was

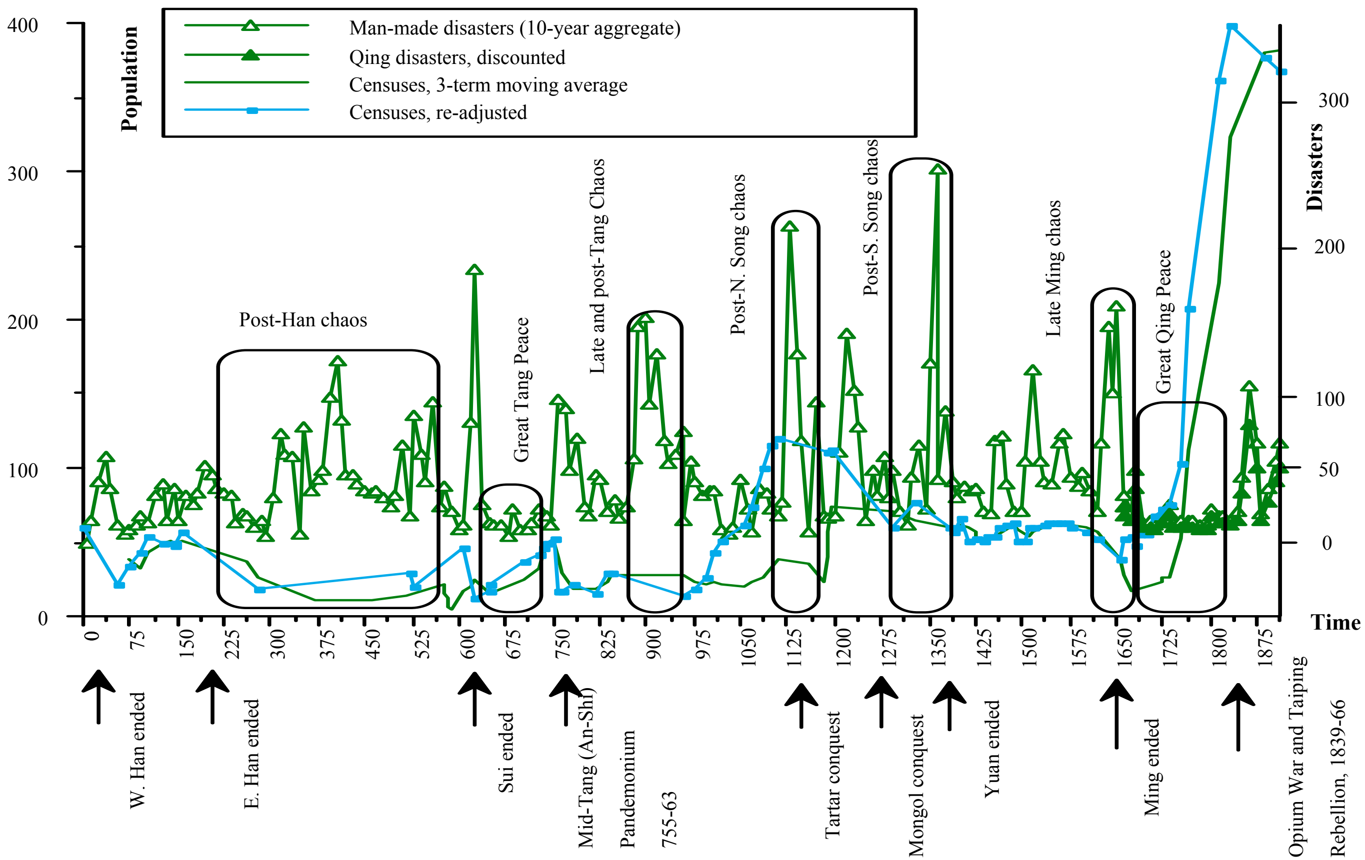
[60] In the most authoritative agricultural book of the Ming entitled *Complete Treatise on Agricultural Administration* (*Nongzheng Quanshu*), as many as 77 rice varieties are listed, including wet and dry, early-ripening, middle-ripening and late-ripening types. They covered all possible growing seasons in all rice-growing regions of China (see Shi 1979: 627–8). In this context, that the Chinese population did not explode further suggests that food was not as abundant as one might think during the Ming to fulfil the Chinese 'lineage duty' in a bigger way.

# Figure 12. Natural Disasters versus Population Fluctuations




Source: Population and disasters, based on Chen 1937 and Liang 1980. See also Lu and Teng 2000: Appendix.
Note: Arrows indicate the major resource shocks, positive or negative. The Qing discount, see Note for Figure 9. For changes in technology and resource endowments, see Bray 1984; Deng 1993.

**Figure 13. Man-made Disasters versus Population Growth**




Source: Based on Chen 1937 and Liang 1980. See also Lu and Teng 2000: Appendix.

Note: Arrows indicate the major man-made shocks. For political turmoil, see Deng 1999. For the Qing discount, see Note for Figure 9.

among the highest in Chinese history while that of the man-made disasters was among the lowest (see Figure 13). So, the Great Qing Peace from *c*. 1650 to *c*.1820 seemed to neutralise the negative impact of natural disasters. But how? The answer lies in an expansion of China's resource base which enlarged China's population-supporting capacity.

**Table 15. Additional Supply of Arable Land under the Qing**

| Region | Square kilometres | % of territory | % of main farming zones* |
|---|---|---|---|
| 1. New land | | | |
| Manchuria[61] | 1,230,000 | | |
| South Mongolia | 370,000§ | | |
| Subtotal | 1,600,000 | 17 | 50 |
| 2. Re-development | | | |
| Sichuan Basin[62] | 280,000† | | |
| Yangzi–Han Plain[63] | 400,000 | | |
| Subtotal | 680,000 | 7 | 22 |
| Total[64] | 2,280,000 | 24 | 72 |

Source: Anon. 1799: vol. 311, Entry 'Shisannian Sanyue' ('The Third Month of the Thirteenth Year under the Gaozong Reign'); Tian and Chen 1986: ch. 5; Zhang 1995; Zhang 1998.
Note: *Counting about 3,200,000 $km^2$, or 1/3 of China's total land area of 9,600,000 $km^2$. §Counting about 1/3 of Mongolia's 1,100,000 $km^2$. †Counting about 1/2 of Sichuan's territory of 560,000 $km^2$.

First of all, by 1730 the empire's territory was doubled. Although the expansion was carried out in some barren lands, it did cover some best farming zones like the black-soil region in Manchurian and the natural irrigation zone along the Great Bend of the Yellow Rive in Mongolia. The additional land supply from these two regions alone was the equivalent of some 17 percent of China's total, or 50 percent of China's main farming zones today. Efforts were also made to open up the north-western corner (known as Gansu and Xinjiang) and the south-western corner (known as Guizhou and Yunnan) of the empire for

[61] This is the same size of contemporary France, Italy and Germany combined. China lost one-third of Manchuria (440,000 $km^2$) later to Tsarist Russia under the Aihui and Beijing treaties (1858–60). By then, the Qing population growth already peaked.
[62] An equivalent of the size of New Zealand.
[63] An area greater than either Japan or Malaysia.
[64] An equivalent of Mexico or Indonesia.

farming.[65] This empire-wide scheme left only Tibet and its neighbouring Qinghai untouched. Such windfall of land resources inevitably elasticised China's land supply. In addition to this extensive growth in these frontier regions, vast internal regions were re-developed in the intensive growth fashion in the Sichuan Basin and the Yangzi–Han Plain, an equivalent of 7 percent of China's territory and 22 percent of its main farming zones. All these made up roughly a quarter of China's territory and three quarters of China's farming land, not trivial by any standards (see Table 15).

With the expansion and re-development, paradoxically, China gained an enhanced population supporting capacity and suffered more natural disasters at the same time. However, in absolute terms, the strength and density of natural disasters were reduced/diluted across the empire as a whole.

Secondly, internal migration to the new lands dramatically altered China's resource allocation at the macro level, a boost to China's capacity to support its population of the time. The number of people who immediately benefited from this new allocation was not trivial. Huge waves of migrants from the old core regions (such as Hebei, Henan, Shandong, Sshanxi, and Shaanxi) resettled elsewhere for a better life. For example, in 1712 alone the immigrants from the Shandong to Mongolia counted for over 100,000 (Zhao 1927: vol. 120 'Shihuo Zhi'; see also Jiang 1998: 96). By 1668, Manchuria alone absorbed a staggering 14 million emigrants from China proper (see Anon. 1799: vol. 311, Entry 'Shisannian Sanyue' ['The Third Month of the Thirteenth Year under the Gaozong Reign']; Zhang 1998).[66] The Qing state later imposed a ban on permanent immigration to Manchuria (1668–1860) and Mongolia (1740–1897). But there was little control over seasonal migrants in both places. Moreover, by the time when the restriction was introduced, a large number of immigrants had already settled in. In the case of redevelopment in Sichuan, the surge of

[65] By the 1820s, the new farmland in the Balikun and Yili regions of Xinjiang (also known as 'Chinese Turkeystan') alone totalled 908,500 *mu* or 121,735 hectares (Chen 1996: 265).

[66] The growth potential was yet to be fully realised in Manchuria in the end of the Qing. After the ban on immigration to Manchuria was lifted, the annual immigrants reached 600,000 to fill in the labour shortage. In 1907, the government intake quota for Heilongjiang alone was two million (Tian and Chen 1986: 110–12).

immigration began in 1713 under Emperor Kangxi's edict, commonly known as *huguang tian sichuan* (meaning 'to fill up Sichuan with the population from Hubei') (Tian and Chen 1986: 113–14; Chen 1996: ch. 8; see also Jiang 1998: 96). In 1743–8 alone, a quarter of a million migrants re-settled there (see Anon. 1799: vol. 311, Entry 'Shisannian Sanyue' ['The Third Month of the Thirteenth Year under the Gaozong Reign']; Zhang 1998). This Manchurian-Mongolia-Sichuan-bound internal migration altered China's demographic landscape (see Table 3). A recent path-breaking study shows that Manchurian-Mongolia and Sichuan have become the genetic and lineage enclaves of interior provinces of Shandong-Hebei and Hubei-Hunan, respectively (Yuan and Zhang 2002: 6–57).

In sum, by 1750 extra factor input in the form of the new land consequently enlarged the 'cake' for the Chinese, which in turn offset to a great extent the impact of disasters in relative terms. Presumably, the Chinese farming migrants in new territories rationally followed a 'Ricardian farming sequence' by taking the best land first. Their disaster risks were likely to be below the national average in absolute terms.

Thirdly, unlike the bigheaded farming drives in the communist history of the twentieth century,[67] the Qing development in those farming zones was largely sustainable. By *c*. 1730, with its 2.21 million-metric-ton-a-year grain output the Yangzi–Han Plain at least doubled its food production capacity from its previous level under the Ming (see Zhang 1995: 42). From 1750 on, the region has been the rice bowl of China (Pomeranz 2000: chs 1 and 2), responsible for regular net export of large quantities of rice, raw silk, cotton and cloth (Chen 1996: ch. 4). Farming in Manchuria also flourished. From 1750 on, it fed the Yangzi reaches with large quantities of its agricultural by-product in the form of bean-cakes as fertilizers (Elvin 1973: 214; Pomeranz 2000: 226). By then, the developments in the Yangzi region and Manchuria began to fuse together.

[67] Such as Khruschev's Siberian Campaign to grow maize for his dream of 'Goulash Communism' and Mao's 'Great Leap Forward' for his ego to catch up with the West. Both were total failures.

Fourthly, not only did China out-stretch its resource base in absolute terms, but also it enlarged the base in relative terms through adoption of new crops from overseas. Unlike the new rice variety during the Song, the new crops of this round were exclusively the drought-resistant and high-yielding types: sweet potatoes (*Ipomoea batatas*), potatoes (*Solanum tuberosum*) and maize (*Zea mays*). All introduced during the previous Ming period (1368–1644), these crops began to pay the dividend by 1750 under the Qing.[68] They successfully turned marginal lands into productive plots and contributed the increase in China's population supporting capacity. The full potential of these crops have realised only recently.[69] Therefore, the Qings almost certainly enjoyed increasing returns from the new crops.

Now, when we combine peace, new land and new crops together, a compound effect cancelled out to a great extent the negative impact from the high disaster reading for the Qing. China's population supporting capacity was perhaps doubled in real terms. Hence, a strong population growth at an annual rate of 1.70 percent was achieved. As a piece of evidence for the enlarged capacity, a large number of urban centres emerged and sustained in the core farming blocs during the Qing: 591 towns/cities in the Northern Plain (36.6 percent of China's total), 691 along the Yangzi Valley (42.8 percent), and 219 in

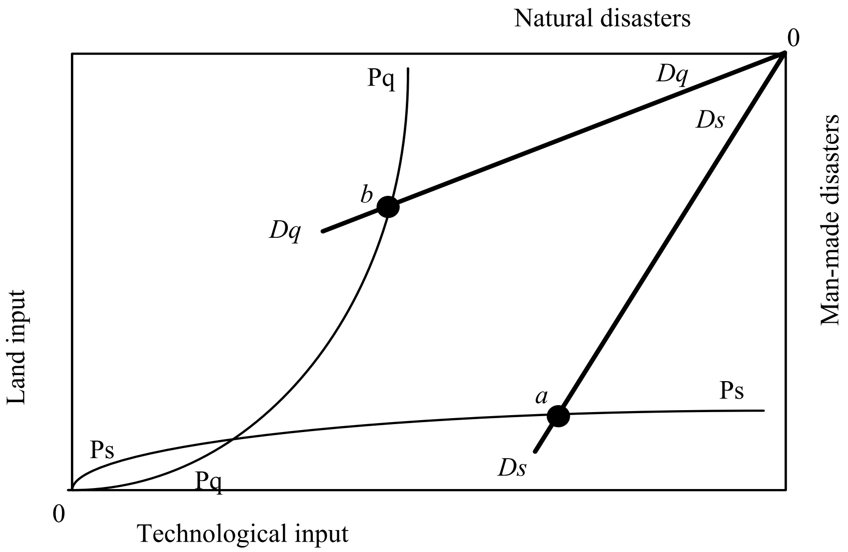
[68] Sweet potatoes were first smuggled to China from Spanish-controlled Luzon in 1593. It was disseminated rather quickly due to the technique of asexual propagation by using vine cuttings. By the end of the Ming, many places had the new crop. But this was the exception. In the case of potatoes and maize, the pay-off was delayed and the beneficiaries were the Qings. Potatoes landed in Mainland China from Taiwan around 1650 (Guo W. 1988: 383–4). It had a slow start. Not until 1700, half a century after its arrival, was it spread to the north (see Tang 1986: 278). This was because the species was more confined by soil and climatic conditions. Maize was first reported in Li Shizhen's *Compendium of Materia Medica (Bencao Gangmu*) of 1578. But until 1628, according to an expert of the time named Xu Guangqi (see Shi 1979: 629), very few Chinese had the chance to see it let alone growing it. Around the 1740s and 50s, one and half centuries later, maize began to spread widely in China. Two Qing officials, Chen Dashou, Governor of Anhui Province, and Hao Yulin, Governor of Fujian and Zhejiang and later Governor of Jiangsu and Jiangxi, were responsible for the spread of the crop (Luo 1956). For more information, see Cao 1988 and 1990.

[69] Contemporary China is one of the major producers of these crops in the world: China's output of sweet potatoes now accounts for 80 percent of the world total (Zhang and Li 1983).

mainly Fujian and Guangdong (13.6 percent). They in all counted 93 percent of China's total (Kun 1899: vols 13 and 16; Chen 1996: 398).[70]

Conceptually, the Song and Qing situation can be lighted in Figure 14. Although the Song and Qing population supporting capacities were not fully realised due to disasters, some net gains were made.

**Figure 14. Gains and Losses in the Population Supporting Capacity, Song and Qing**




Note: Ps–Ps: Population Supporting Curving of the Song biased towards technological input thanks to a green revolution; Pq–Pq: Population Supporting Curve of the Qing with both an enlarged farming land and newly adopted dry framing crops. *Ds–Ds*: Disaster Curve for the Song with the bias towards man-made disasters; *Dq–Dq*: Disaster Curve for the Qing with the bias towards natural disasters. Point *a*: intersection where the Song population supporting capacity is cut short by disasters; Point *b*: intersection where the Qing population supporting capacity is cut short by disasters.

## 5. Remarks on the tests

The results of the tests by birth rates, food prices and disasters are highly convergent. Most interestingly, mechanisms that governed China's population growth are revealed from the tests (see Figure 15).

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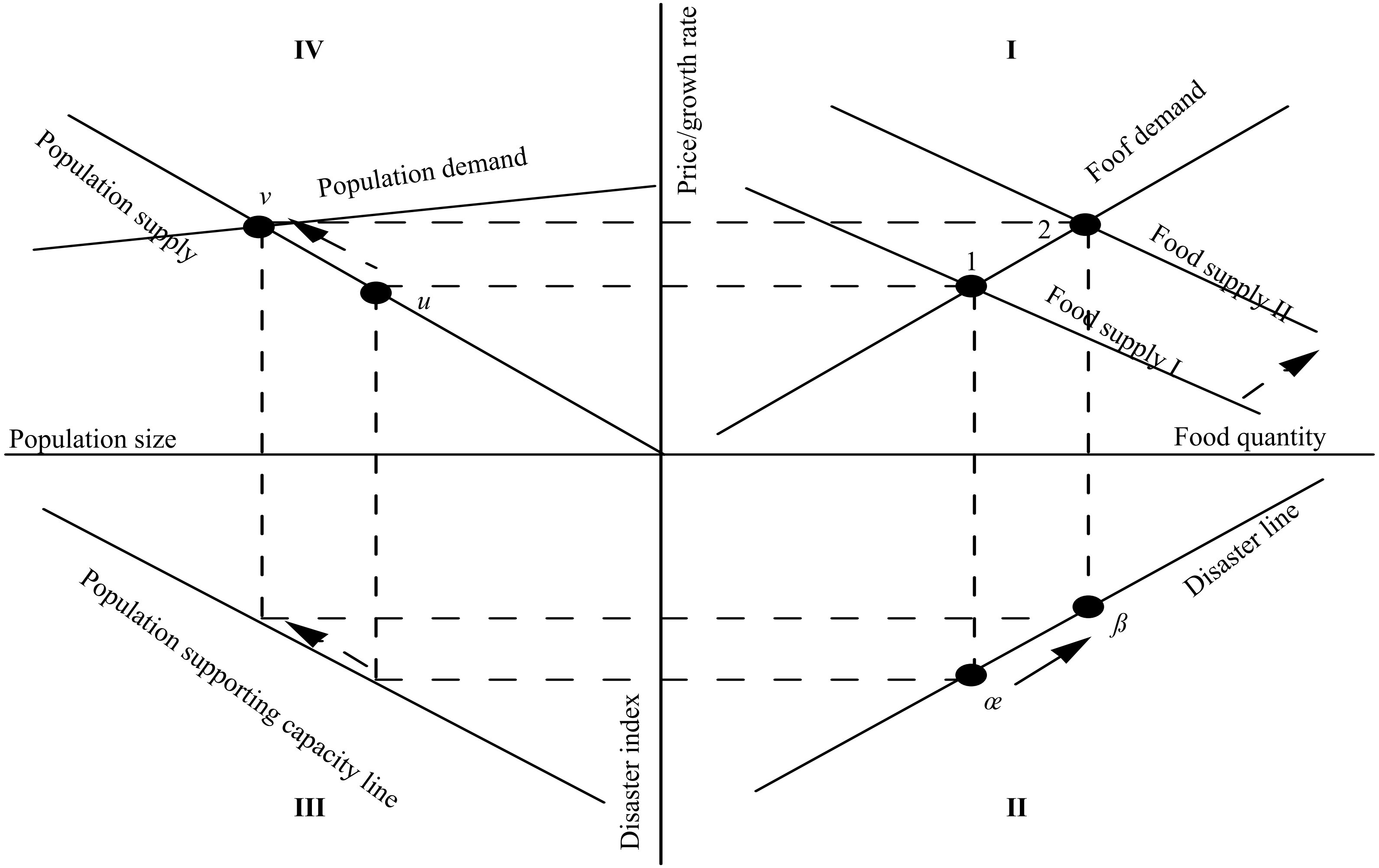
[70] It has been suggested that during the mid-Qing the urbanisation rate in the Jiangnan region of the Yangzi Delta was twice as that in the north (Li 1996b: 3; Cao 2001). So, urban centres in the south were likely to be bigger than their northern counterparts.

**Figure 15. Mechanisms of China's Demography**




Note: It is assumed that the value of all quadrants is positive or can be converted so. Solid arrow: the original push. Broken arrows: the knock-on effects.

In the figure, Quadrant I contains the food market whose demand curve is positively related to the population size. Quadrant II is where the disaster line is located. Quadrant III has the population supporting capacity line which is dictated by disasters and negatively related to the disaster index. The population supply curve and actual growth in Quadrant IV are positive related to the population supporting capacity. The demand for children is relatively inelastic although the slope does represent some control if the population size became large. The solid arrow represents the 'original push' as the *force majeure*. The broken arrows show the 'knock-on effects' on the economy. The starting point has to be where the *force majeure* is (Quadrant II). A move from *œ* to *ß* will increase society's population supporting capacity (Quadrant III). This will in turn be translated into population growth (e.g. in the form of birth rate, Quadrant IV) from *u* to *v*. The demand for food will consequently increase from Point 1 to Point 2 (Quadrant I). Meanwhile, a decrease in disasters necessarily makes the food supply more secure. So, the food supply curve will gradually shift to right-hand side. At Point 2, the economy will produce (and consume) more food with an increased price level. At all time, the food demand curve remand unchanged due to its income elasticity. The whole process can be reversed if we move from *ß* back to *œ*.

So, as long as we know this pecking order, there is no mystery about China's population pattern over time.

## D. Conclusion

This study provides a straightforward and logical solution to the alleged myth of the demographic pattern under China's empire system. The key is the understanding of the dynamics of the Chinese fiscal institutions and their functions. The results of the tests from the three angles – birth rates, food prices and disasters – are all convergent: the Chinese official census figures are by and large very accurate as long as one knows how and where to re-adjust them to make a consistent set. In contrast, modern estimates are proved very unreliable.

An immediate implication of the findings of this research will be the re-assessment of all estimates and guesstimates of Chinese population size in the past forty years. Before that, 'Fairbankian nihilism' needs to be scratched.

As so much has been depended on those estimates and guesstimates in the study of Chinese economic, social and political history, this re-assessment will almost certainly lead to substantial re-interpretation of the Chinese history. For example, the Chinese population did not have linear or continuous growth, or much 'strong' growth at all (apart from the Song and Qing). This says much about the nature of the Chinese economy. In short, over the long term, considering the marriage pattern, China in nature was a non-Boserupian land but had Song and Qing as the main Boserupian periods.

Moreover, with so many kinks in the Chinese population curve, demographic performance in China was obviously at the mercy of disasters of all kinds. Then, it becomes rather obvious that the Chinese economy reached its upper limits many times, not just in the second half of the Qing. If so, the notion of a 'high level equilibrium trap' under the Qing needs rethinking.[71] Related to this, the hypothetic surplus margin of food production, and hence the 'food security', may have been very limited in the long run in China. This sheds some new light on assessment of the standards of living among the premodern Chinese.

Furthermore, as the Chinese population acted rather responsive to disasters by allowing the human biomass to reduce as well as rise, the view that the Chinese rural economy was on the edge of 'involution' in Ming–Qing times is really questionable.[72] Indeed, if the two variables, land and technology (in the form of new crop species), were both elastic nation-wide, the alleged involution could only be regional and isolated. Also, if the population is not treated as an ever-growing quantity and land as a constant, China's man-to-land ratio was able

[71] For the trap, see Elvin 1973.
[72] For the involution, see Huang 1985 and 1990.

to re-adjust itself to reach an equilibrium in both the short and long runs.[73] Then, the notion of a Malthusian crisis during the Ming–Qing Period evaporates.[74]

In addition, the current research challenges the hypothesis that rice farming is able to out-stretch indefinitely a society's production probability frontier and hence feeds an ever-increasing number of mouths.[75] The Qing demographic quantum leap had more to do with maize and sweet potatoes for marginal lands than the magic rice which had had run out steam (even with the heroic early-ripening varieties) before the Qing.

Also, the correlation between disasters and the fluctuations in Chinese population size clearly suggests that in China a Smithian agrarian growth was the dominant type with numerous incremental improvements but without significant breakthroughs. If so, it becomes a wrong question to ask why China did not succeed in its own indigenous scientific and industrial revolutions.[76] Similarly, it is irrelevant to ask whether China was ever able to move towards capitalism and/or industrialisation. The same correlation further suggests that China was just one of the many 'traditional societies' that all behaved in a similar way when facing the *force majeure*. This puts one more nail on the coffin for Chinese exceptionalism.

Finally, as the resource windfall from the Americas provided the West with a new thrust to industrialise its economy and to dominate the globe, the resource windfall from new lands and new crops in China only helped the Chinese to fuel their population growth as they always did when conditions were favourable. If so, the clock for the 'great divergence' between China and the West will have to be set much earlier than the eighteenth and nineteenth centuries.[77] China and Western Europe may have shared some quantitative similarities. But it was the qualitative difference that really mattered in the end.

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[73] For the man-to-land ratio approach, see Chao 1986.
[74] A reliable sign of such crises was mass starvation.
[75] For the rice model, see Bray 1983 and 1986.
[76] For the scientific question, see Lin 1995.
[77] For the divergence, see Pomeranz 2000a and 2000b.

## Appendices

Here, the figures are chosen with two criteria: (1) they must be a result of an attempt to cover the whole empire; (2) they have to have both population and household entries simultaneously. In all, 54 such sets are available (64.3% of the total number of the censuses, a significant proportion).

### Appendix 1. China's Long-term dual registrations of population and households

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 2* | 59,594,978 | 12,233,062 | 4.87 |
| 57* | 21,007,820 | 4,279,634 | 4.91 |
| 75* | 34,125,021 | 5,860,573 | 5.82 |
| 88* | 43,356,367 | 7,456,784 | 5.81 |
| 105* | 53,256,229 | 9,237,112 | 5.77 |
| 125* | 48,690,789 | 9,647,838 | 5.05 |
| 144* | 49,730,550 | 9,946,919 | 5.00 |
| 145* | 49,524,183 | 9,937,680 | 4.98 |
| 146* | 47,566,772 | 9,348,227 | 5.09 |
| 157* | 56,486,856 | 10,677,960 | 5.29 |
| 280† | 18,463,863 | 2,989,840 | 6.18 |
| 609† | 46,019,956 | 8,907,546 | 5.17 |
| 705* | 37,140,000 | 6,156,141 | 6.03 |
| 726* | 41,419,712 | 7,069,565 | 5.86 |
| 734* | 46,285,161 | 8,018,710 | 5.77 |
| 742* | 48,909,800 | 8,525,763 | 5.74 |
| 755* | 52,919,309 | 8,914,709 | 5.94 |
| 760* | 16,990,386 | 1,933,174 | 8.79 |
| 764* | 16,920,386 | 2,933,125 | 5.80 |
| 820* | 15,760,000 | 2,375,400 | 6.64 |
| 1006§ | 16,280,254 | 7,417,570 | 2.20 |
| 1021§ | 19,930,320 | 8,677,677 | 2.23 |
| 1053§ | 22,292,861 | 10,792,705 | 2.07 |
| 1066§ | 29,092,185 | 12,917,221 | 2.25 |
| 1083§ | 24,969,300 | 17,211,713 | 1.45 |
| 1100§ | 44,914,991 | 19,960,812 | 2.25 |
| 1110§ | 46,734,784 | 20,882,258 | 2.24 |
| 1291† | 59,848,960 | 13,430,322 | 4.47 |
| 1381* | 59,973,305 | 10,654,362 | 5.63 |
| 1391* | 56,774,561 | 10,684,435 | 5.31 |
| 1393* | 60,545,812 | 10,652,870 | 5.68 |

## Appendix 1. China’s Long-term dual registrations of population and households, continued.

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 1403* | 66,598,337 | 11,415,829 | 5.83 |
| 1413* | 50,950,244 | 9,684,916 | 5.26 |
| 1423* | 52,763,178 | 9,972,125 | 5.29 |
| 1426* | 51,960,119 | 9,918,649 | 5.24 |
| 1435* | 50,627,569 | 9,702,495 | 5.22 |
| 1445* | 53,772,934 | 9,537,454 | 5.64 |
| 1455* | 53,807,470 | 9,405,390 | 5.72 |
| 1464* | 60,499,330 | 9,107,205 | 6.64 |
| 1474* | 61,852,810 | 9,120,195 | 6.78 |
| 1484* | 62,885,829 | 9,205,711 | 6.83 |
| 1490* | 50,307,843 | 9,503,890 | 5.29 |
| 1502* | 50,908,672 | 10,409,788 | 4.89 |
| 1510* | 59,499,759 | 9,144,095 | 6.51 |
| 1519* | 60,606,220 | 9,399,979 | 6.45 |
| 1532* | 61,712,993 | 9,443,229 | 6.54 |
| 1542* | 63,401,252 | 9,599,258 | 6.61 |
| 1552* | 63,344,107 | 9,609,305 | 6.59 |
| 1562* | 63,654,248 | 9,683,396 | 6.57 |
| 1571* | 62,537,419 | 10,008,805 | 6.25 |
| 1578* | 60,692,856 | 10,621,436 | 5.71 |
| 1602* | 56,305,050 | 10,030,241 | 5.61 |
| 1620* | 51,655,459 | 9,835,426 | 5.25 |
| 1911Δ | 368,146,520 | 71,268,651 | 5.17 |
| ***Average*** | – | – | ***5.30*** |

Source: Information based on Liang 1980: 4–10.
Note: Institutional factors: *under the dual tax regime; †under the triplex tax regime; §under the dual tax regime with special discount on population numbers; Δunder the single-track tax regime.

## Appendix 2. China's Long-term dual registrations of population and households excluding ten entries of the Song.

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 2* | 59,594,978 | 12,233,062 | 4.87 |
| 57* | 21,007,820 | 4,279,634 | 4.91 |
| 75* | 34,125,021 | 5,860,573 | 5.82 |
| 88* | 43,356,367 | 7,456,784 | 5.81 |
| 105* | 53,256,229 | 9,237,112 | 5.77 |
| 125* | 48,690,789 | 9,647,838 | 5.05 |
| 144* | 49,730,550 | 9,946,919 | 5.00 |
| 145* | 49,524,183 | 9,937,680 | 4.98 |
| 146* | 47,566,772 | 9,348,227 | 5.09 |
| 157* | 56,486,856 | 10,677,960 | 5.29 |
| 280† | 18,463,863 | 2,989,840 | 6.18 |
| 609† | 46,019,956 | 8,907,546 | 5.17 |
| 705* | 37,140,000 | 6,156,141 | 6.03 |
| 726* | 41,419,712 | 7,069,565 | 5.86 |
| 734* | 46,285,161 | 8,018,710 | 5.77 |
| 742* | 48,909,800 | 8,525,763 | 5.74 |
| 755* | 52,919,309 | 8,914,709 | 5.94 |
| 760* | 16,990,386 | 1,933,174 | 8.79 |
| 764* | 16,920,386 | 2,933,125 | 5.80 |
| 820* | 15,760,000 | 2,375,400 | 6.64 |
| 1291† | 59,848,960 | 13,430,322 | 4.47 |
| 1381* | 59,973,305 | 10,654,362 | 5.63 |
| 1391* | 56,774,561 | 10,684,435 | 5.31 |
| 1393* | 60,545,812 | 10,652,870 | 5.68 |
| 1403* | 66,598,337 | 11,415,829 | 5.83 |
| 1413* | 50,950,244 | 9,684,916 | 5.26 |
| 1423* | 52,763,178 | 9,972,125 | 5.29 |
| 1426* | 51,960,119 | 9,918,649 | 5.24 |
| 1435* | 50,627,569 | 9,702,495 | 5.22 |
| 1445* | 53,772,934 | 9,537,454 | 5.64 |
| 1455* | 53,807,470 | 9,405,390 | 5.72 |
| 1464* | 60,499,330 | 9,107,205 | 6.64 |
| 1474* | 61,852,810 | 9,120,195 | 6.78 |
| 1484* | 62,885,829 | 9,205,711 | 6.83 |
| 1490* | 50,307,843 | 9,503,890 | 5.29 |
| 1502* | 50,908,672 | 10,409,788 | 4.89 |
| 1510* | 59,499,759 | 9,144,095 | 6.51 |
| 1519* | 60,606,220 | 9,399,979 | 6.45 |
| 1532* | 61,712,993 | 9,443,229 | 6.54 |
| 1542* | 63,401,252 | 9,599,258 | 6.61 |
| 1552* | 63,344,107 | 9,609,305 | 6.59 |
| 1562* | 63,654,248 | 9,683,396 | 6.57 |
| 1571* | 62,537,419 | 10,008,805 | 6.25 |
| 1578* | 60,692,856 | 10,621,436 | 5.71 |
| 1602* | 56,305,050 | 10,030,241 | 5.61 |
| 1620* | 51,655,459 | 9,835,426 | 5.25 |
| 1911§ | 368,146,520 | 71,268,651 | 5.17 |
| ***Average*** | – | – | ***5.77*** |

Source: Information based on Liang 1980: 4–10.
Note: Institutional factors: *under the dual tax regime; †under the triplex tax regime; §under the single-track tax regime.

## Appendix 3. China's Long-term population data after re-adjustment

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 2* | 59,594,978 | 12,233,062 | 4.87 |
| 57* | 21,007,820 | 4,279,634 | 4.91 |
| 75* | 34,125,021 | 5,860,573 | 5.82 |
| 88* | 43,356,367 | 7,456,784 | 5.81 |
| 105* | 53,256,229 | 9,237,112 | 5.77 |
| 125* | 48,690,789 | 9,647,838 | 5.05 |
| 144* | 49,730,550 | 9,946,919 | 5.00 |
| 145* | 49,524,183 | 9,937,680 | 4.98 |
| 146* | 47,566,772 | 9,348,227 | 5.09 |
| 157* | 56,486,856 | 10,677,960 | 5.29 |
| 280† | 18,463,863 | 2,989,840 | 6.18 |
| 520* | 28,850,000 | 5,000,000 | - |
| 530* | 19,475,873 | 3,375,368 | - |
| 609† | 46,019,956 | 8,907,546 | 5.17 |
| 626† | 11,540,000 | 2,000,000 | - |
| 649† | 17,310,000 | 3,000,000 | - |
| 650† | 21,926,000 | 3,800,000 | - |
| 705* | 37,140,000 | 6,156,141 | 6.03 |
| 726* | 41,419,712 | 7,069,565 | 5.86 |
| 734* | 46,285,161 | 8,018,710 | 5.77 |
| 742* | 48,909,800 | 8,525,763 | 5.74 |
| 755* | 52,919,309 | 8,914,709 | 5.94 |
| 760* | 16,990,386 | 1,933,174 | 8.79 |
| 764* | 16,920,386 | 2,933,125 | 5.80 |
| 780* | 21,955,289 | 3,805,076 | - |
| 820* | 15,760,000 | 2,375,400 | 6.64 |
| 839* | 28,831,259 | 4,996,752 | - |
| 845* | 28,591,221 | 4,955,151 | - |
| 959* | 13,327,615 | 2,309,812 | - |
| 976* | 17,832,208 | 3,090,504 | - |
| 996* | 26,393,463 | 4,574,257 | - |
| 1006§ | 42,799,379 | 7,417,570 | - |
| 1021§ | 50,070,196 | 8,677,677 | - |
| 1053§ | 62,273,908 | 10,792,705 | - |
| 1066§ | 74,532,365 | 12,917,221 | - |
| 1083§ | 99,311,584 | 17,211,713 | - |
| 1100§ | 115,173,885 | 19,960,812 | - |
| 1110§ | 120,490,629 | 20,882,258 | - |
| 1187§ | 110,587,826 | 19,166,001 | - |
| 1190§ | 111,330,996 | 19,294,800 | - |
| 1195§ | 112,666,595 | 19,526,273 | - |
| 1291† | 59,848,960 | 13,430,322 | 4.47 |
| 1330† | 77,322,033 | 13,400,699 | - |
| 1381* | 59,973,305 | 10,654,362 | 5.63 |

## Appendix 3. China's Long-term population data after re-adjustment, continued.

| Year (A.D.) | Population figure (A) | Household number (B) | A:B |
|---|---|---|---|
| 1391* | 56,774,561 | 10,684,435 | 5.31 |
| 1393* | 60,545,812 | 10,652,870 | 5.68 |
| 1403* | 66,598,337 | 11,415,829 | 5.83 |
| 1413* | 50,950,244 | 9,684,916 | 5.26 |
| 1423* | 52,763,178 | 9,972,125 | 5.29 |
| 1426* | 51,960,119 | 9,918,649 | 5.24 |
| 1435* | 50,627,569 | 9,702,495 | 5.22 |
| 1445* | 53,772,934 | 9,537,454 | 5.64 |
| 1455* | 53,807,470 | 9,405,390 | 5.72 |
| 1464* | 60,499,330 | 9,107,205 | 6.64 |
| 1474* | 61,852,810 | 9,120,195 | 6.78 |
| 1484* | 62,885,829 | 9,205,711 | 6.83 |
| 1490* | 50,307,843 | 9,503,890 | 5.29 |
| 1502* | 50,908,672 | 10,409,788 | 4.89 |
| 1510* | 59,499,759 | 9,144,095 | 6.51 |
| 1519* | 60,606,220 | 9,399,979 | 6.45 |
| 1532* | 61,712,993 | 9,443,229 | 6.54 |
| 1542* | 63,401,252 | 9,599,258 | 6.61 |
| 1552* | 63,344,107 | 9,609,305 | 6.59 |
| 1562* | 63,654,248 | 9,683,396 | 6.57 |
| 1571* | 62,537,419 | 10,008,805 | 6.25 |
| 1578* | 60,692,856 | 10,621,436 | 5.71 |
| 1602* | 56,305,050 | 10,030,241 | 5.61 |
| 1620* | 51,655,459 | 9,835,426 | 5.25 |
| 1655§ | 38,559,811 | – | – |
| 1661§ | 52,582,977 | – | – |
| 1673§ | 53,286,189 | – | – |
| 1680§ | 46,969,550 | – | – |
| 1685§ | 55,891,347 | – | – |
| 1701§ | 56,082,100 | – | – |
| 1711§ | 67,650,019 | – | – |
| 1721§ | 70,383,584 | – | – |
| 1724§ | 71,745,699 | – | – |
| 1734§ | 75,162,388 | – | – |
| 1753Δ | 102,750,000 | – | – |
| 1766Δ | 208,095,796 | – | – |
| 1812Δ | 361,693,379 | – | – |
| 1833Δ | 398,942,036 | – | – |
| 1887Δ | 377,636,000 | – | – |
| 1911Δ | 368,146,520 | 71,268,651 | 5.17 |

Source: Information based on Liang 1980: 4–10.
Note: Institutional factors: *under the dual tax regime; †under the triplex tax regime; §under the dual tax regime with special discount on population numbers; Δunder the single-track tax regime.

**References**


An Lizhi. 1998. 'Hezhi Shiyang Jiumu' ('Worse than Nine Herdsmen for Ten Sheep'). *Xinhua Wenzhai* (*Xinhua Compilation*), vol. 234, no. 6 (1998): 113.

Anon *c*. 1373. *Ming Lü (Laws of the Ming Dynasty*). Reprint, 1999. Beijing: Law Press.

Anon. 1646. *Fuyi Quanshu* (*Complete Collection of Laws and Regulations on Taxes*). Reprint, 1998. Beijing: Literature Press.

Anon. 1735. *Qing Shizong Shilu* (*Veritable Records of Emperor Shizong of the Qing Dynasty*). Reprint, 1964. Taipei: Hualian Press.

Anon. 3rd century B.C. *Zhouli* (*Rite of the Zhou Dynasty*). In Sun Yirang (ed.). 1934. *Zhouli* (*Rite of the Zhou Dynasty*). Shanghai: Commercial Press.

Anon. *c*. 1323. *Tongzhi Tiaoge* (*Laws and Regulation of the Yuan*). Reprint, 1986. Hangzhou: Zhejiang Classics Press.

Baker, O. E. 1928. *Land Utilisation in China*. Chicago: University of Chicago Press.

Ban Gu. 82 A.D. *Han Shu* (*History of the Han Dynasty*). Reprint, 1982. Beijing: Zhonghua Books.

Barclay, W. G., A. J. Coale, M. A, Stoto and T. J. Trussell. 1976. 'A Reassessment of the Demography of Traditional Rural China'. *Population Index*, vol. 42, no. 4 (1976): 606–35.

Bo Shuren and Li Jiaming (eds.). 2000. *Zhongguo Lishi Dacidian Keji Shi Juan* ('Science and Technology' in *Encyclopaedia of Chinese History*), vol. 1. Shanghai: Shanghai Encyclopaedia Press.

Boserup, Ester. 1965. *The Conditions of Agricultural Growth: The economies of agrarian change under population pressure.* London: Allen and Unwin.

Bray, Francesca. 1983. 'Patterns of Evolution in Rice-Growing Societies'. *The Journal of Peasant Studies*, 1 (1983): 3–33.

Bray, Francesca. 1984. 'Section 41: Agriculture'. In Joseph Needham (ed.) *Science and Civilisation in China*, vol. 6. Cambridge: Cambridge University Press.

Bray, Francesca. 1986. *The Rice Economies – Technology and Development in Asian Societies*, Oxford: Basil Blackwell.

Bray, Francesca. 1997. *Technology and Gender: Fabrics of Power in Late Imperial China*. Berkeley: University of California Press

Buck, J. L. 1937. *Land utilization in China: a study of 16,786 farms in 168 localities, and 38,256 farm families in twenty-two provinces in China, 1929–1933*. Nanking: University of Nanking; Oxford: University of Oxfords Press.

Buck, J. L. 1964. *Land Utilization in China.* New York: Paragon Books.

Cao Shuji. 1988. 'Yumi He Fanshu Chuanru Zhongguo Luxian Xintan' ('Renewed Investigation of Routes for the Spread of Maize and Sweet Potatoes in China'). *Zhongguo Shehui Jingjishi* (*China's Socio-economic History*) no 4 (1988): 62–6.

Cao Shuji. 1990. 'Qingdai Yumi Fanshu Fenbude Dili Tezheng' ('Characteristics of Geographis Distribution of Maize and Sweet Potatoes in Qing

China'). *Lidai Dili Yanjiu* (*Geographic Studies of the Past*), vol. 2, pp. 287–303.

Cao Shuji. 2000. *Zhongguo Renko Shi Mingqing Shiqi* (*A Demographic History of China, the Qing Period*), vol. 5. Shanghai: Fudan University Press.

Cao Shuji. 2001. 'Qingdai Beifang Chengshi Renko Yanjiu' ('Urban Population of North China during the Qing Period'). *Zhongguo Renko Kexue* (*Demography of China*) 4 (2001): 15–28.

Cao Shuji and Chen Yixin. 2002. 'Ma-ersasi Lilun He Qingdai Yilaide Zhongguo Renko' ('Malthusianism and the Chinese Population since the Qing'). *Lishi Yanjiu* (*Research in History*) no. 1 (2002): 41–54.

CBW (Cihai Bianji Weiyuanhui, Compilatory Board of the *Encyclopaedia*). 1980. *Cihai*: *Jingji* (*Encyclopaedia*: *Economics*), ser. 3. Shanghai: Encyclopaedia Publisher.

Chao, Kang. 1986. *Man and Land in Chinese History: An Economic Analysis*, Stanford: Stanford University Press.

Chen Da. 1934. *Renko Wenti* (*Population Issues*). Shanghai: Commercial Press.

Chen Gaoyong. 1937. *Zhongguo Lidai Tianzai Renhuo Biao* (*Chronological Tables of Chinese Natural and Man-made Disasters*). Shanghai: Jinan University Press.

Chen Guyuan. 1936. *Zhongguo Hunyin Shi* (*A History of Marriages in China*). Changsha: Yuelu Shushe.

Chen Hua. 1996. *Qingdai Quyu Shehui Jingji Yanjiu* (*Regional Socio-Economic Conditions during the Qing Period*). Beijing: People's University Press.

Chen Shou. *c.* 280 A.D. *Sanguo Zhi* (*History of the Three Kingdoms*). Reprint, 1982. Beijing: Zhonghua Books.

Chi Zihua. 1998. 'Zhongguo Mingongchaode Lishi Kaocha' ('Waves of Migration in China's History'). *Xinhua Wenzhai* (*Xinhua Compilation*), vol. 238, no. 10 (1998): 73–7.

Coleman, David and John Salt. 1992. *The British Population: Patterns, Trends and Processes*. Oxford: Oxford University Press.

Coleman, David and Roger Schofield (eds.). 1986. *The State of Population Theory, forward from Malthus*. London: Basil Blackwell.

Deng Yunte. 1937. *Zhongguo Jiuhuang Shi* (*A History of Disaster Relief of China*). Reprint, 1998. Beijing: Commercial Press.

Deng, Gang. 1993. *Development versus Stagnation, Technological Continuity and Agricultural Progress in Pre-modern China*. West Port and London: Greenwood Press.

Deng, Gang. 1999. *The Premodern Chinese Economy – Structural Equilibrium and Capitalist Sterility*. London and New York: Routledge.

Du You. 801. *Tong Dian* (*Comprehensive Collection of Laws and Regulations from Ancient times till Tang*). Reprint, 1987. Taipei: Commercial Press.

Duan Jixian (Chi-hsien Tuan). 1999. *Zhognguo Renko Zaoshi Xinlun*. (*China, Population Conditioning: Historical Development of China's Population, Society and Culture*). Beijing: China's Demographic Press.

Durand, J.D. 1960. 'The Population Statistics of China, A.D. 2–1953'. *Population Studies*, no. 13 (March 1960): 209–57.

E-er Deni. *c.* 1637. *Manwen Laodang* (*The Old Manchu Archival Records*). Reprint, 1990. Beijing: Zhonghua Books.

Elvin, Mark. 1973. *The Pattern of the Chinese Past*. Stanford: Stanford University Press.
Fairbank, J. K. 1980. *The Cambridge History of China*. New York: Cambridge University Press.
Fairbank, J. K. and Merle Goldman. 1998. *China: A New History*. Cambridge [Mass]: Harvard University Press.
Fang Xuanling. 646 A.D. *Jin Shu* (*History of the Jin Dynasty*). Reprint, 1989. Beijing: Zhonghua Books.
Feeney, G. and Kiyoshi Hamano. 1990. 'Rice Price Fluctuations and Fertility in Late Tokugawa Japan'. *Journal of Japanese Studies*, 1 (1990): 1–30.
Fei, J. C. H. and T. J. Liu. 1977. 'Population Dynamics of Agrarianism in Traditional China'. In Hou Chi-ming and Yu Tzong-shian (eds.) *Modern Chinese Economic History*, pp. 23–54. Taipei: The Institute of Economics, *Academia Sinica*.
Frank, A. G. 1998. *ReOrient: Global Economy in the Asian Age*. Berkeley: University of California Press.
Gates, Hill. 1996. *China's Motor, A Thousand Years of Petty Capitalism*. Ithaca and London: Cornell University Press.
Ge Jianxiong (ed.). 2000–2. *Zhongguo Renko Shi* (*A Demographic History of China*), vols. 1 and 6. Shanghai: Fudan University Press.
Ge Jianxiong, Hou Yangfang and Zhang Fugen. 1999. *Renko Yu Zhongguode Xiandai: 1850 Nian Yilai* (*Population and China's Modernity since 1850*). Shanghai: Xuelin Press.
Ge Jinfang. 1988. 'Liangsong Tanding Rumu Qushi Lunxi' ('The poll tax-weighed and land tax-weighed single rural tax during the Northern and Southern Songs'). *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*), no. 3 (1988): 17–30.
Guo Songyi. 2000. *Lunli Yu Shenghuo, Qingdaide Hunyin Guanxi* (*Ethics and Life, Matrimonial Relationships during the Qing Period*). Beijing: Commercial Press.
Han Fei. *c*. 233 B.C. *Han Feizi* (*Master Han Fei's Book*). Reprint, 1974. Shanghai: Shanghai People's Press.
Harrell, Stevan. 1985. 'The Rich Get Children: Segmentation, Stratification, and Population in Three Chekiang Lineages, 1500–1850'. In Susan Hanley and Arthur Wolf (eds.) *Family and Population in East Asian History*, pp. 81–109. Stanford: Stanford University Press.
Harrell, Stevan. 1995. *Chinese Historical Microdemography*. Berkeley: University of California Press.
He Changling. 1826. *Huangchao Jingshi Wenbian* (*Collection of Documents of the Qing Administration*). Reprint, 1992. Beijing: Zhonghua Books.
Ho, Ping-ti. 1956. 'Early-Ripening Rice in Chinese History'. *Economic History Review*, ser. 2 (1956): 200–18.
Ho, Ping-ti. 1959. *Studies on the Population of China, 1368–1953*. Cambridge [Mass.]: Harvard University Press.
Ho, Ping-ti. 1970. 'An Estimate of the Total Population of Sung–Ching China'. *Studies Song*, vol. 1 (1970): 33–5.
Huang, Philip. 1985. *The Peasant Economy and Social Change in North China*. Stanford: Stanford University Press.

Huang, Philip. 1990. *The Peasant Family and Rural Development in the Yangzi Delta*, *1350–1988*. Stanford: Stanford University Press.
Ji Rui and Liu Tang. 1783. *Xu Tongdian* (*Complete Record of Institutions and Regulations, Continued*). Reprint, 1987. Taipei: Commercial Press.
Jiang Tao. 1998. *Renko Yu Lishi, Zhongguo Chuantong Renko Jiego Yanjiu* (*Population and History, A Study of Chinese Traditional Demographic Structure*). Beijing: People's Press.
Jin Guantao and Liu Qingfeng. 1984. *Xingsheng Yu Weiji* (*Prosperity and Crises*). Changsha: Hunan People's Press.
Jueluo Ledehong. 1652. *Qing Taizu Shilu* (*Veritable Records of Emperor Taizu of the Ming Dynasty*). Reprint, 1986. Beijing: Zhonghua Books.
Kane, Penny. 1988. *Famine in China 1959–61*, *Demographic and Social Implications*. Basingstoke: Macmillan.
Kun Gang. 1899. *Guangxu Qinding Daqing Huidian Shili* (*Collection of the Qing Administrative Records under the Order of Emperor Guangxu*). Reprint, 1991–2. Taipei: Wenhai Press.
Lavely, William and R. Bin Wong. 1998. 'Revising the Malthusian Narrative: the Comparative Study of Population Dynamics in Late Imperial China. *The Journal of Asian Studies*, vol. 57, no. 3 (1998): 714–48.
Lee, James and Campbell, Cameron D. 1997. *Fate and Fortune in Rural China: Social Organization and Population Behavior in Liaoning, 1774–1873*. Cambridge: Cambridge University Press.
Lee, James and Wang Feng. 1999. *One Quarter of Humanity: Malthusian Mythology and Chinese Realities, 1700–2000*. Cambridge [Mass.]: Harvard University Press.
Lee, James, Cameron D. Campbell and Wang Feng. 2002. 'Positive Check or Chinese Checks?' *The Journal of Asian Studies*, vol. 61, no. 2 (May 2002): 591–607.
Lee, M. P. 1969. *The Economic History of China, with Special Reference to Agriculture*. New York: AMS Press.
Lee, R. D. 1986. 'Malthus and Boserup: A Dynamic Synthesis'. In David Coleman and Roger Schofield (eds.) *The State of Population Theory, forward from Malthus*, pp. 96–130. London: Basil Blackwell.
Li Baiyao. 636. *Beiqi Shu* (*History of the Northern Qin Dynasty*). Reprint, 1972. Beijing: Zhonghua Books.
Li Bozhong. 1996a. 'Qingdai Qianzhongqi Jiangnan Renkode Disu Zengzhang Jiqi Yuanyin' ('The Low Population Growth in the Yangzi Delta and its Reason during Early and Mid–Qing Times'), *Qingshi Yanjiu* (*Study of Qing History*), 2 (1996): 10–19.
Li Bozhong. 1996b. 'Rengen Shimu Yu Mingqing Jiangnan Nongminde Jingying Guimo' ('The Practice of Ten *Mu* per Farmer and the Scale of the Traditional Peasant Economy'), *Zhongguo Nongshi* (*Agricultural History of China*), 1 (1996): 1–14.
Li Dongyang. 1509. *Daming Huidian* (*Complete Record of Law of the Great Ming*). Reprint, 1976. Taipei: Xinwenfeng Publishing Co.
Li Shizhen. 1578. *Bencao Gangmu* (*Compendium of Materia Medica*). Reprint, 1977. Beijing: People's Press.

Li Wenhai. 1994. *Zhongguo Jindai Shida Zaihuang* (*Ten Major Disasters in China, 1840–1949*). Shanghai: Shanghai People's Press.

Li Yanshou. 659. *Nan Shi* (*History of the Southern Dynasties*). Reprint, 1975. Beijing: Zhonghua Books.

Liang Fangzhong. 1980. *Zhongguo Lidai Huko Tiandi Tianfu Tongji* (*Dynastic Data of China's Households, Cultivated Land and Land Taxation*). Shanghai: Shanghai People's Press.

Lin, J. Y. 1995. 'The Needham Puzzle'. *Economic Development and Cultural Change*, 1 (1995): 269–92.

Linghu Defen. 636. *Zhou Shu* (*History of the Zhou Kingdom*). Reprint, 1971. Beijing: Zhonghua Books.

Liu Hongkang and Wu Zhongguan. 1991. *Renkou Lilun* (*Population Theories*). Chongqing: Southwest University of Finance and Economics Press.

Liu Jinzao. 1921. *Qingchao Xu Wenxian Tongkao* (*Continuation of the Comprehensive Study of Literature the Qing Dynasty*). Publisher unknown.

Liu Kexiang. 2002. 'Ershi Shiji Sanshi Niandai Tudi Jieji Fenpei Zhuangkuang Zhengti Kaocha He Shuliang Guji' ('An Overall Survey and Quantitative Estimation of Land Distribution among Different Groups during the 1930s'). *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*), no. 1 (2002): 19–35.

Liu Xu. 945 A.D. *Tang Shu* (*History of the Tang Dynasty*). Reprint, 1975. Beijing: Zhonghua Books.

Liu Zheng. 1985. 'Population Changes in China, 1949–82'. *Population Research*, vol. 2, no. 2 (1985): 1–13.

Liu, Ts'ui-jung. 1981. 'The Demographic Dynamics of Some Clans in the Lower Yangtze Area, ca. 1400-1900'. *Academia Economic Papers*, vol. 9 no. 1 (1981): 115–60.

Liu, Ts'ui-jung. 1985. 'The Demography of Two Chinese Clans in Hsiao-shan, Chekiang, 1650–1850'. In Susan B. Hanley and Arthur P. Wolf (eds.) *Family and Population in East Asian History*. Standford: Standford University Press.

Lu Yu and Teng Zezhi. 2000. *Zongguo Renko Tongshi* (*A Comprehensive Demographic History of China*), vols 1 and 2. Jinan: Shandong People's Press.

Luo Ergang. 1956. 'Yushushu Chuanru Zhongguo' ('How Maize was introduced to China'). *Lishi Yanjiu* (*Research in History*), 3 (1965): 70.

Ma Duanlin. 1307. *Wenxian Tongkao* (*Comprehensive Study of Historical Records*). Reprint, 1983. Taipei: Commercial Press.

Maddison, Angus. 1998. *Chinese Economic Performance in the Long Run*. Paris: OECD.

Maddison, Angus. 2001. *The World Economy, A Millennial Perspective*. Paris: OECD.

Mallory, W. H. 1926. *China, Land of Famine*. American Geographic Society Special Publication No. 6.

Malthus, Thomas R. 1798. *An Essay on the Principle of Population*. Reprint, 1976. New York: Norton.

Marks, R. B. 1991. ‘Rice Prices, Food Supply, and Market Structure in Eighteenth-Century South China’. *Late Imperial China*, 2 (1991): 64–116.
Maverick, Lewis A. 1946. *China: A Model for Europe*. San Antonio [Texas]: Paul Anderson.
McEvedy, Colin and Jones, Richard (eds.). 1978. *Atlas of World Population History*. Harmondsworth: Penguin Books.
McNeill, J. R. 1998. ‘China’s Environmental History in World Perspective’. In Mark Elvin and Liu Ts’ui-jung (eds.) *Sediments of Time, Environment and Society in Chinese History*, pp. 31–49. Cambridge: Cambridge University Press.
Mo Di. *c*. 376 B.C. *Mozi* (*Master Mo’s Book*). Reprint, 2000. Beijing: Huaxia Press.
Needham, Joseph. 1959. ‘Mathematics’. In Joseph Needham (ed.) *Science and Civilisation in China*, vol. 3. Cambridge: Cambridge University Press.
Ouyang Xiu. 1060. *Xin Tangshu* (*The New History of the Tang Dynasty*). Reprint, 1975. Beijing: Zhonghua Books.
Perkins, Dwight. 1969. *Agricultural Development in China, 1368–1968*. Edinburgh: Edinburgh University Press.
Pomeranz, Kenneth. 2000a. *The Great Divergence, Europe, China and The Making of the Modern World Economy.* Princeton [N.J.]: Princeton University Press.
Pomeranz, Kenneth. 2002b. ‘Political Economy and Ecology on the Eve of Industrialization: Europe, China and the Global Conjuncture’. *American Historical Review*, vol. 107, no. 2 (April 2002): 425–46.
Pu Jian. 1990. *Zhongguo Gudai Xingzheng Lifa* (*Traditional; Chinese Administration and Legislation*). Beijing: Peking University Press.
Qian Mu. 1995. *Guoshi Dagang* (*An Outline History of China*). Taipei: National Bureau of Compilation and Translation.
Rawski, T. G. and Lillian M. Li. 1990. *Chinese History in Economic Perspective*. Berkeley: University of California Press.
Schoppa, R. K. 2000. *The Columbia Guide to Modern Chinese History.* New York: Columbia University press.
Sen, Amartya. 1981. *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Clarendon Press.
Shen Yue. 494. *Song Shu* (*The History of the Song Period*). Reprint, 1974. Beijing: Zhonghua Books.
Shi Shenghan. 1979. *Nongzheng Quanshu Jiaozhu* (*Annotated Edition of the ‘Complete Treatise on Agricultural Administration*’). Shanghai: Shanghai Classics Publisher.
Skinner, William. 1977. *The City in Late Imperial China*. Stanford: Stanford University Press.
Song Lian (ed.). 1370. *Yuan Shi* (*History of the Yuan Dynasty*). Reprint, 2000. Beijing: Zhonghua Books.
Telford, Ted. 1990. ‘Patching Holes in Chinese Genealogies: Mortality in the Lineage Population of Tongcheng, 1300–1800’, *Late Imperial China*, vol. 11, no. 2 (1990): 116–36.

Tian Fang and Chen Yijun. 1986. *Zhongguo Yimin Shilue* (*Brief History of Migration in China*), Beijing: Knowledge Press.
Tong Xin. 2000. *Renko Shehuixue* (*Demographic Sociology*). Beijing: Peking University Press.
Tuo Tuo (ed.). 1344. *Jin Shi* (*History of the Jin Dynasty*). Reprint, 1985. Beijing: Zhonghua Books.
Tuo Tuo (ed.). 1345. *Song Shi* (*History of the Song Dynasty).* Reprint, 1985. Beijing: Zhonghua Books.
Wang Di. 1999. 'Lun Songdai Xianxiang Fushui Zhengshou Tizhizhongde Xiangsi' ('Function of the Village Accountant during the Song Period at the County and Village Levels'). *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*), no. 2 (1999): 11–18.
Wang Feng and Li Zhongqing (James Lee). 2002. 'Zhaidiao Renko Juedinglunde Guanghuan' ('Removal of the Halo of Demographic Determinism'). *Lishi Yanjiu* (*Research in History*) no. 1 (2002): 55–61.
Wang Pu. 961. *Tang Huiyao* (*Administrative Statutes of the Tang Dynasty*). Reprint, 1985. Beijing: Zhonghua Books.
Wang Pu. *c*. 982. *Wudai Huiyao* (*Administrative Statutes of the Five Dynasties*). Reprint, 1978. Beijing: Zhonghua Books.
Wang Qingyun. 1858. *Shiqu Yuji* (*A Personal Record of the Qing Dynasty*). Reprint, 1985. Beijing: Beijing Classics Press.
Wang Shiduo. 1936. *Bingyi Riji* (*Bingyi Diary*). Beijing: Wenyun Ge.
Wang Su. *c*. 265. *Kongzi Jiayu* (*Confucius Home Instructions*). Reprint, 1999. Changchun: Jilin People's Press.
Wang Yanan. 1956. *Makesi Zhuyide Renko Lilun Yu Zhongguo Renko Wenti* (*Marxist Demographic Theory and Chinese Demographic Problem*). Beijing: Science Press.
Wang Yumin. 1995. *Zhongguo Renko Shi* (*A Demographic History of China*). Nanjing: Jiangsu People's Press.
Wang Zhizhong and Wei Liying. 1991. *Zhongguo Xibei Shehui Jingjishi Yanjiu* (*A Socio-Economic History of the Northwestern Region of China*). Xi-an: Sanqin Press.
Wang, Yie-chien. 1992. 'Secular Trends of Rice Prices in the Yangzi Delta, 1638–1935', in T. G. Rawski and L. M. Li (eds.) *Chinese History in Economic Perspective*: 35–68, Berkeley: University of California Press.
Wei Hongyuan (ed.). 1996. *Ershi Shiji Sansishi Niandai Jidong Nongcun Shehui Diaocha Yu Yanjiu* (*Rural Society of East Hebei Province during the 1920s and 30s*). Tianjin: Tianjin People's Press.
Wei Qingyuan. 1989. *Zhongguo Zhengzhi Zhidu Shi* (*A History of Chinese Political Institutions*). Beijing: People's University Press.
Wei Qingyuan. 1993. *Zhongguo Zhengzhi Zhidu* (*Political Institutions of China*). Beijing: People's University Press.
Wei Shou. 554. *Wei Shu* (*History of the Wei Kingdom*). Reprint, 1974. Beijing: Zhonghua Books.
Wei Zheng. 656. *Sui Shu* (*History of the Sui Dynasty*). Reprint, 1989. Beijing: Zhonghua Books.

Will, Pierre-Etienne and R. B. Wong. 1991. *Nourish the People: the State Civilian Granary System in China, 1650—1850*. Ann Arbor: University of Michigan Center for Chinese Studies.
Will, Pierre-Etienne. 1990. *Bureaucracy and Famine in Eighteenth-Century China*. Translated by Elborg Forster. Standford: Standford University Press.
Wilson, Chris. 1984. 'Natural Fertility in Preindustrial England, 1600–1799'. *Population Studies*, vol. 38, no. 2 (1984), pp. 225–40.
Wolf, Arthur and Huang Chieh-shan. 1980. *Marriage and Adoption in China, 1845–1945*. Stanford: Stanford University Press.
Wolf, Arthur P. 1985. 'Fertility in Pre-Revolutionary Rural China'. In S. B. Hanley and A. P. Wolf (eds.) *Family and Population in East Asian History*. Stanford: Stanford University Press.
Wolf, Arthur. 2001. 'Is There Evidence of Birth Control in Late Imperial China?' *Population and Development Review*, vol. 27, no. 1 (2001): 133–54.
Wong, R. B. 1997. *China Transformed, Historical Change and the Limits of European Experience*. Ithaca and London: Cornell University Press.
Wong, R. Bin. 2002. 'The Search for European Differences and Domination in the Early Modern World: A View from Asia', *American Historical Review*, vol. 107, no. 2 (April 2002), pp. 447–69.
Wrigley, E.A. and R.S. Schofield. 1981. *The Population History of England, 1541–1871: A Reconstitution*. Cambridge: Cambridge University Press.
Wu Dahai. 1648. *Daqing Lüli* (*Legal Cases under the Qing Law*). Publisher unknown.
Xi Fu and E Ertai. 1637. *Qing Taizu Shilu* (*Veritable Records of Emperor Shizong of the Qing Dynasty*). Publishers unknown.
Xiao Shaoqing (ed.). 1997. *Zhongguo Zhenjiuxue Shi* (*A History of Chinese Acupuncture and Moxibustion*). Yinchuan: Ningxia People's Press.
Xiao Zixian. *c*. 526. *Nanqi Shu* (*History of the Southern Qi Dynasty*). Reprint, 1972. Beijing: Zhonghua Books.
Xie Baofu. 1998. *Beiwei Hunsang Lisu Yanjiu* (*Rituals and Rules of Marriages and Funerals during the Northern Wei Period*). Beijing: Capital University Press.
Xie Hua (ed.). 2000. *Huangdi Neijing* (*Yellow Emperor's Medical Classics with Annotations*). Beijing: Chinese Traditional Medicine Press.
Xu Guangqi. *c*. 1628. *Nongzheng Quanshu* (*Complete Treatise on Agricultural Administration*). Reprint, 1979. Shanghai: Shanghai Classics Publisher.
Xu Song. 1809. *Song Huiyao Jigao* (*Edited Administrative Statutes of the Song Dynasty*). Reprint, 1957. Beijing: Zhonghua Books.
Yan Kejun. *c*. 1843. *Quan Song Wen* (*Complete Collection of Song Records*). Reprint, 1999. Beijing: Commercial Press.
Yang Quanhe. 1985. *Fertility and Family Planning in Huaibei Plain, Anhui Province, China, 1982*. MA Thesis. Development Studies Centre, Australian National University.
Yang Shangshan. *c*. 618. *Huangdi Neijing Taisu* (*Annotated and Re-compiled Yellow Emperor's Medical Classics*). Reprint, 2000. Beijing: Scientific Literature Press.

Yang Shuqin. 1987. *Weisheng Tongjixue* (*Health Statistics*). 2nd Edition. Beijing: People's Health Press.

Yao Silian. 636a. *Chen Shu* (*The History of the Chen Dynasty*). Reprint, 1973. Beijing: Zhonghua Books.

Yao Silian. 636b. *Liang Shu* (*The History of the Liang Dynasty*). Reprint, 1973. Beijing: Zhonghua Books:

Yu Yaohua. 2000. *Zhongguo Wujia Shi* (*A Long-term History of Market Prices in Permodern China*). Beijing: China's Price Press.

Yuan Yida and Zhang Cheng. 2002. *Zhongguo Xingshi Qunti Yichuan He Renko Fenbu* (*Chinese Surnames, Group Genetics and Demographic Distribution*). Shanghai: East China Normal University Press.

Zhang Jiayan. 1995. 'Mingqing Jianghan Pingyuande Nongye Kaifa Dui Shangren Huodong He Shizhen Fazhande Yingxiang' ('Impact of Agricultural Development in the Yangtze-Han Plain on Commercial Activities and Urbanization during the Ming–Qing Period'). *Zhongguo Nongshi* (*Agricultural History of China*), no. 4 (1995): 40–8.

Zhang Jinfan. 1992a. *Qinglü Yanjiu* (*A Study of the Qing Law*). Beijing: Law Press.

Zhang Jinfan. 1992b. *Zhongguo Gudai Falü Zhidu* (*Chinese Traditional Legal Systems*). Beijing: Chinese Radio and Television Press.

Zhang Kai and Li Genpan. 1983. 'Yumi Zai Woguo Liangshi Zuowuzhong Diweide Bianhua' ('The Change of the Place of Maize in China's Domestic Crops'). *Nongye Kexue* (*Agricultural Sciences*) 2: 94–9.

Zhang Limin. 1998. 'Chuang guandong Yiminchao Jianxi' ('Advancing to Manchuria'). *Zhongguo Shehui Jingjishi Yanjiu* (*Study of Chinese Socio-Economic History*), no. 2 (1998): 57–64.

Zhang Tingyu. 1735. *Ming Shi* (*History of the Ming Dynasty*). Reprint, 1974. Beijing: Zhonghua Books.

Zhao Erxun. 1927. *Qingshi Gao* (*Draft of the History of the Qing Dynasty*). Reprint, 1977. Beijing: Zhonghua Books.

Zhao Wenlin and Xie Shujun. 1988. *Zhongguo Renko Shi* (*A Demographic History of China*). Beijing: People's Press.

Zhao Xiulin. 2002. *Zhongguo Xiangli Zhidu* (*Institutions of Villages and Neighborhoods in Traditional China*). Beijing: Social Sciences Literature Press.

Zhao Xiuling. 2002. *Zhongguo Xiangli Zidu* (*China's Village and Neighbourhood Systems*). Beijing: China's Social Science Literature Press.

Zheng Xuemeng. 2000. *Zhongguo Fuyi Zhidu Shi* (*A History of Taxes and Crovée in Premodern China*). Shanghai: Shanghai People's Press.

Zuoqiu Ming. *c*. 454 B.C. *Guo Yu* (*Histories of Eight Kingdoms*). Reprint, 1981. Beijing: Zhonghua Books.

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