

## **The biological standard of living in South China during the 19<sup>th</sup> century: Estimates using data from Australian immigration and prison records**

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### **Abstract:**

This paper is a study of the human capital of the 19<sup>th</sup> century Chinese immigrants to Australia, who mostly came from the south China provinces of Guangdong and Fujian. Human capital of these Chinese is broadly defined to include not only education or occupational skill level, but also their health or nutritional status. A measure of health status is physical stature. In general, taller people have higher income, are better educated and live longer than short people. Anthropologists, human biologists and economic historians have shown a population that is taller (or becoming taller) is a population whose health status and standard of living is higher (or rising) compared with those who are shorter. Poverty is associated with short stature; extreme chronic poverty in childhood produces stunting. Common opinion is that the Chinese in late Colonial Australia were short. US sources claim the stature of the Chinese who built the Trans-Pacific Railway was only 4-foot 10 inches (147 cm), which was very short for an adult male. While such stature might be plausible – after all, they were fleeing poverty, we are told – the archival evidence is otherwise. As this paper will show, most Chinese in Australia were around 163-166cm, which approaches the height of rural adult males in South China today, but shorter than urban Chinese. The paper makes a contribution to our understanding of the economic development of South China during the 19<sup>th</sup> century as China was increasingly integrated into the world economy, and it also contributes to our understanding of the human capital these Chinese contributed to the development of colonial and Federation Australia.

**Key words:** Chinese, Australia, Health Status, Anthropometric History, Stature, Human Capital, Employment, Migration

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## 1. Introduction

Anthropometric indices of nutrition such as physical stature are reliable indicators of human welfare or well being, including income, life expectancy, health status and labor productivity (Fogel, 1994; Steckel, 1995; Strauss and Thomas 1998). Economic historians since the late 1970s have studied the history of human physical stature as an indicator of how well the human organism was able to live in its socioeconomic and epidemiological environment (Steckel, 1979; Komlos, 1995; Komlos and Baten, 1998; Komlos and Cuff, 1998; Steckel and Floud, 1996). From trends in stature one can infer much about the changes in the level, variability and distribution of income, and how well a population was able to sustain its children and levels of economic productivity.

Human health is undoubtedly an important aspect of human capital. Without good health, education and skill development is delayed or deficient, and productive employment compromised. Poor health has profound consequences not only for the individual but for dependents, with the prospects that reduced earnings will be passed on in delayed physical and intellectual development of children. Inadequate nutrition during childhood translates into shorter stature in adulthood than might otherwise have been. Poverty correlates with short stature; extreme and sustained poverty in childhood produces stunting. Many of the southern Chinese who sought their fortunes in Australia and America were assumed to have been fleeing poverty and to be short. Common opinion is that these Chinese, who came mostly from Guangdong province, were very short. US sources claim the average stature of the Chinese who built the Transcontinental Railway was 4 foot 10 inches (147 cm)<sup>1</sup>, which was extremely short for adult men compared with today's national male mean height of 169 cm (Morgan, 2000). The US reported height is an extreme low-side outlier in the data used here.

This paper questions the belief that the Chinese immigrants to Colonial Australia were short and fleeing poverty. It is primarily a study of the stature of the Chinese immigrants who arrived from the gold rushes of the 1850s onward, and especially the Chinese who stayed in Australia after Federation in 1901 when the "White Australia Policy" put an end to any further Chinese migration. Stature, occupation and location of residence are used to examine the human capital of early Chinese Australians, not that they were considered Australian until the later part of the 20<sup>th</sup> century. The immigration policy of the Commonwealth of Australia until the 1960s was premised on the exclusion of the Chinese and all colored peoples, though the Chinese were the main target of the legislation (Choi, 1975; York, various). In studying these Chinese immigrants we are able to say something about the development of the Guangdong economy during the 19<sup>th</sup> century, a tumultuous period when China was incorporated into the world capitalist economy. In particular, we can contribute to the debate about the nature of modern economic growth in China over the past two centuries and its impact on human welfare as measured through the secular shifts in average stature. That debate turns on whether increased trade and commercialization after China's

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<sup>1</sup> National Park Service, "Chinese and the Transcontinental Railroad", [www.nps.gov/gosp/research/](http://www.nps.gov/gosp/research/) (accessed 23 Jul 2004); Robert Chugg, "The Chinese and the Transcontinental Railroad", *Brown Quarterly* 3(1), <http://borwnvboard.org/brwnqurt/01-3/01-3f.htm> (accessed 4 Aug 2004).

opening improved or impaired the livelihood of farmers in particular. Our analysis lends cautious support to optimistic perspective, that economic change in Guangdong and Jiangnan (lower Yangzi region) on balance raised incomes and improved living standards (Faure, 1986; Rawski, 1989; Pomeranz, 2000; Morgan, 2004). The height data for China presented here are the earliest so far analyzed, with the reliable observations available for the 1810s onwards, compared with past height series for Taiwan and China that begin in the 1880s (Old, 2003; Morgan, 2004). Our data are compiled from the holdings of the National Archive of Australia (NAA) and the Public Records Office of Victoria (PROV). The NAA documents governed the entry and residency of Chinese in Australia after 1901, such as the Certificate of Domicile, the Certificate of Exemption from Dictation Test and the Alien Registration Form. The PROV data comes from the prisoners registers that recorded all who were sentenced to custodial terms in the Colony (later State) of Victoria. The Australian immigration files for the Chinese, and similar records in Canada and the US, along with the prison records that also survive, are a huge untapped resource for the anthropometric history of the Chinese.<sup>2</sup> Not only are these data sources more easily accessible than the records in Chinese archives, they also extend further back in time than any of the records found in China. Analysis of the height and other data of these records would allow us to re-write not only our knowledge of the early Chinese immigrants to Australia and North America, but also enable use to re-write the history of human welfare in southern China for the decades before the First Opium War (1839-42) that forced open China and led to increased trade and commercialization.

The paper is organized in the following manner. The next section will discuss briefly the background to Chinese migration to Australia and outline the methods used to analyze the data. Part 3 will describe the PROV and NAA data. Part 4 will report and discuss the findings, and the conclusion will summarize the results and outline the future research. Due to time constraints only a descriptive outline of occupation and mobility will be presented, rather than the intended statistical and network analysis foreshadowed in the original conference abstract.

## 2. Background and Methods

Early Chinese migration to Australia is a well-known story (Choi, 1975; Yong, 1977; Jones, 2005; among others). The earliest Chinese arrived in the 1820 and 1830s. They were employed in the pastoral industry that had a hard time finding shepherds among the freed former convicts transported to Australia. Some pastoralists petitioned the colonial authorities to allow large-scale recruitment of Chinese workers, but the proposal was not well received among officials and was rejected. The discovery of gold in the 1850s saw many thousands of Chinese join gold rush. It also resulted in early conflict between European miners and the “celestials”, as the Chinese were sometimes then known, and the introduction of regulatory measures to restrict Chinese entry in the form of a landing or poll tax. When the rich and easily worked

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<sup>2</sup> The United States Immigration and Naturalization Service, San Francisco, holds many thousands of records for Chinese admitted to the USA from the mid-19<sup>th</sup> century. About 100,000 records also exist in the Canadian national archives. Personal communication from Professor John Komlos, University of Munich, 2003, and Professor Peter Ward, University of British Columbia, 2004.

alluvial gold petered out many Chinese returned home, but those who remain engaged in a wide range of activities. Still others arrived to engage in a variety of industries. Besides market gardening and petty retail, many Chinese were involved in the clearing of bush for agriculture and they worked the tailings of abandoned mines. In the 1880s, most of the colonies introduced restriction on the entry of Chinese. In Melbourne the Chinese entered furniture manufacturing on a large scale in the 1880s. By that time few of the Chinese who were in Australia had originally arrived as gold diggers. None of the CEDTs seen so far contain details of Chinese who arrived in the 1850s. During the 1890s depression, the Chinese furniture trade in Melbourne was the focus of claims of unfair competition that resulted in discriminatory legislation such as Factories and Shop Act (1896), which required furniture to be stamped as having been made by non-European labor.

At Federation in 1901 there were about 30,000 Chinese in Australia (Palfreeman, 1969: 5). The very first legislation passed by the Parliament of the federated colonies was the Immigration Restriction Act (1901) that sought to exclude colored immigrants from permanent settlement, specifically focused on the Chinese. Exclusion was enforced using the “language test”, a dictation test in a European language of the administering officers choosing (Palfreeman, 1969: Chapter 8). Any Chinese who visited their ancestral home and wished to re-enter Australia required an exemption from the test in the form of the Certificate of Exemption from the Dictation Test (CEDT) or risk exclusion. The test would remain in force as the basic exclusionary device until 1958 (Palfreeman, 1958, 1967; Yarwood, 1958; York, various).

*The Anthropometric Method:* Final adult height is a sensitive indicator of the net nutrition of adults during their growing years, and indirectly the impact of the economic and ecological environment on the development of the human organism (Steckel 1995, Steckel and Floud 1997).<sup>3</sup> Attained stature reflects the trade off between the amount and quality of nutrients available for growth from childhood to maturity against the demands of body maintenance, disease and work. The secular change in the average height of a human population reflects broadly the change in their biological well being as a consequence of fluctuations in the available inputs to human growth, such as food and access to health care services.

We can view height as a net output measure for human growth, whereas income is an input measure that indicates potential for acquiring the necessities of a better life rather than their acquisition and consumption. The environment rather than genetics explain the differences in average heights over time or across regions or among social classes (Schmitt and Harrison 1988, Elevelth and Tanner 1990, Bogin 1999). Ultimately, other things being equal, the secular trend in height is a measure of the change in the welfare of the population. The differences in the average height of a population correspond with fluctuations in the economy, the incidence of disease, access to public goods such as health services and education, or other environmental factors that affect available nutrition (Steckel 1995, Komlos 1994, Komlos and Baten 1998). While most anthropometric history has focused on Europe and North America

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<sup>3</sup> One of the best introductions is Cuff's (2005) Chapter 2, “Historical Anthropometrics”.

(Steckel and Floud 1997, Komlos and Cuff 1998), there is a small body of literature on Asia, including Shay (1994), Mosk (1996) and Honda (1997) on Japan; van der Eng (1995) on Indonesia; Gill (1998) on Korea; Brennan, MacDonald and Shlomowitz (1994) on India, several on Taiwan and China (Morgan 1998, 2004; Morgan and Liu, 2003; Olds 2003; Wang and Lee 1999).

### 3. Data Sources

The height data used in this paper are drawn from two sources. The earliest data are from the Register of Male Prisoners at the PROV, Melbourne (Series VPRS 515), which comprises a register of names, particulars and personal descriptions of male prisoners from 1853 onward. These registers are large leather-bound volumes of about 400-500 prisoners each on average, each prisoner record reporting the name and prisoner number, year of birth, native place, occupation, ship and date of arrival, religion, height (and sometimes build and weight), education (read or write), marks, when received, from where, the offence and the date of conviction. Later volumes include photographs. A total of 1269 records were obtained for subjects born between 1798 and 1902.

The other source is the documentary system that governed the entry and residency of Chinese in Australia held at the National Archive of Australia (NAA), such as the Certificate of Domicile (CoD), the Certificate of Exemption from the Dictation Test (CEDT) and the associated Statutory Declaration, and the Alien Registration Form (ARF). Every state office of the NAA has holdings of these certificates for Chinese, some of which are digitized and can be viewed via the NAA's web catalogue (RecordSearch at [www.naa.gov.au](http://www.naa.gov.au)). Three sets of CEDTs have been collected: the Melbourne B13/0 series, the Darwin E752 series and the Brisbane J2482 series (the later two series were accessed using the digitized online document), totaling more than 3300 subjects. The final set of data is the NAA Melbourne B78/1 series for the Alien Registration Forms that were used from c.1939, totaling 1077 subjects.

An example of a CEDT form is reproduced on this page, Fig 1. The CEDT form has a photograph and records the name, nationality, place of birth, complexion, eye color, height in feet and inches, and date issued. Many CEDTs

PAID WARRANT NO. *066* OF *26.10.1941*  
 Book No. 563 FEE-21. (One Pound.)  
 Form No. 21 COMMONWEALTH OF AUSTRALIA No. 063  
 Immigration Act 1901-1935 and Regulations.



**CERTIFICATE EXEMPTING FROM DICTATION TEST.**

I, *George Finlay Ashton Mitchell* the Collector of Customs for the State of *NEW SOUTH WALES* in the said Commonwealth, hereby certify that *Choo Tey to Jack Choo King* hereinafter described who is leaving the Commonwealth temporarily, will be exempted from the provisions of paragraph (a) of Section 3 of the Act if he returns to the Commonwealth within a period of *THREE MONTHS* from the date of departure shown below.

Date *26.10.1941* *Geo. F. A. Mitchell*  
 Collector of Customs.

DESCRIPTION.	
Nationality <i>Burmese</i>	Birthplace <i>Banbar</i>
Age <i>37 years</i>	Complexion <i>Dark</i>
Height <i>5 ft 4 inches (136 cm)</i>	Hair <i>Black</i>
Build <i>Medium</i>	Eyes <i>Brown</i>
Particular marks <i>long dark hair, nose, dark 2.6 eye, lip</i> <small>(For thumb prints, see back of this document.)</small>	

**PHOTOGRAPHS.**

Full Face —  Profile — 

Extended for *3* years by C.D.T. No. *245/38* Records No. *046/620* Collector of Customs

Date of Departure *11.1.1941* Port of Embarkation  
 Ship *Choo King* Destination *China*

Date of Return *3 OCT 1946* Ship *"NELLORE"*  
 Port *Sydney* *Ashton Mitchell*  
 INTERIOR OFFICE OF ARRIVAL *26/10/1941* Customs Officers.

also have an accompanying Statutory Declaration (SD), which was required as part of the application for a CEDT. It was usually issued by a police station or magistrate, and contained details including birth date, birth place, current and previous occupations in Australia, current and past place of residence in Australia, first arrival in Australia, vessel and date of arrival, and past absences from Australia. Included in the SD were also letters and testimonials from referees as well as police reports.

The records are overwhelmingly of men, and the Chinese population was largely male after 1901 because the legislation restricted the men from bringing back to Australia their Chinese wives. Only a few women are found in the CEDT files, but the Alien Registration records contain relatively more, most of whom were students studying in Australia in the 1950s and 1960s. Table 1 summarises the records that form the basis of the analysis below. Any person of Chinese descent or part Chinese born in Australia is excluded from the database – the Darwin series contains quite a few children and young adults of both genders who were born in Australia to Chinese parents.

Figures 2-7 are simple scatter plots of the heights reported by the year of birth of the subjects for each series after cleaning the data and removal of errors (2 ft midgets and 8 ft giants). These plots are a convenient way to quickly show the spread of heights and the distribution density over time. The heights of the males, the subject of analysis, were concentrated in the range from about 152 to 179 cm. Outliers below 150cm are mostly youth who were removed from the regression analysis, though there were very few younger than 25 years except for the B78/1 AR series.

Figs 2-7 about here

Most subjects in the Victorian prison records were born between 1815 and 1845, and arrived in Australia during the early gold rush years between 1854 and 1870. These are analysed separately from the CEDT records because of the different provenance of the data and that the subjects were from a generation or more before those recorded in the CEDTs. None of these early cohorts remained or survived to be included in the CEDT series. The birth year of the CEDT series for Melbourne, Brisbane and Darwin are all centred on the period 1860-80, with record density dropping off sharply on either side. Most of them arrived in Australia between the early 1880s and 1901. The AR B78/1 series from Melbourne shows two distinct groups by year of birth, the earliest group born 1870-85 and the later group 1935-50. The earlier group are from the same cohort that arrived in Australia before Federation, who came from south China, and is merged with the three CEDT series, while the later group, who came from a diverse range of provinces and were mostly students, is excluded from this paper. The AR series contributed to the merged series is reduced from 921 males to 532 and from 129 females to just 24.

Only the adult men are used as there were insufficient women for any meaningful analysis. After removal of duplicates, the data sets were further restricted to adult men aged from 21 to 69 years of age. In 19<sup>th</sup> and early 20<sup>th</sup> century historical height data

sets those younger than 21 years have not reached final adult height, and sometimes final adult height is not attained until about 25 years. Older subjects pose two difficult problems for the researcher, which may cancel each other, though this topic is under researched. Firstly, adults begin to shrink during their fifth decade of life, the rate of shrinkage increases with age, such that males shrink about 6.0 cm from their peak by age 80 (Chandler and Block, 1991). The effect of the shrinkage is to bias downward the mean height relative to the original adult height. Secondly, there is a survivor bias that arises from the selection effect of height-related mortality risks. On average taller people have lower mortality than shorter people (Waalder, 1984; Fogel, 1994; Steckel, 1995), thus those with greater longevity are likely to have been taller than those who have already died, and their inclusion may bias the mean height upward. In the past I have usually excluded data for subjects older than 50/55 years, but many of the CEDT subjects were in their 50s or 60s by the 1920s from when the largest number of records date. Age dummy variables have been used to capture age-related effects. Based on the separate analysis of each NAA series for outliers and the expected probability of the distributed heights, I have defined the normal range of height observations to be 58-73 inches (147.3-185.4cm), though a tighter range of 152-79cm might be preferred. The height distribution histograms revealed heaping or rounding on whole inches and half inches, but such rounding and heaping tends to cancel out and usually does not bias the analysis (Steckel, 1995). The distribution did not show any truncation as is typically found in military height data where a height minimum is imposed, which distort estimates of the true mean of the population.

The characteristics of the PROV prisoner and the NAA CEDT-AR data sets are summarized in Table 2. South China accounted for 98 percent of the CEDT subjects. Only a few records recorded the actual county of birth.<sup>4</sup> They were Cantonese, drawn from Guangdong, Hongkong and Macau. Native place was not nearly so accurately recorded in the prisoner data. The native place origin was often noted simply as China, which accounted for 61.5 percent. When native place was not China it was the port they had left from in China. The ports were located in Guangdong, Hongkong and Macau, which accounted for 37 percent of the subjects.

Table 2 about here

The Chinese were concentrated in a small range of industries based on the industry groups used in Australian census classifications of the early 20<sup>th</sup> century (Keating, 1973).<sup>5</sup> Rural-based industry engaged slightly more than half of all the prisoners,

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<sup>4</sup> Most of the Chinese in Victoria came from 13 counties around Canton, in particular the “four counties” (see yap) – Sun Hoi, Toishan, Hoi Ping and Ying Ping – or “three counties” – Nam Hoi, Poon Yee and Soon Tak – and remainder from Chung Shan Tung Kuan, Chang She, Hock Shan, Gou You and Go Ming. See Yong, 1977.

<sup>5</sup> Classification of subjects according to occupation and industry is difficult due to structural changes in the economy – occupations that were skilled may become deskilled or disappear, and new occupations arise. We use the industry classification scheme based on the early Australian census as adapted by Keating (1973). We also adopt a six-class skill/class classification that comprises unskilled, semi-skilled, skilled and lower clerical, intermediate and semi-professional including owner proprietors,

mostly employed as laborers of various kinds, and nearly half of the CEDT subjects. Nearly a quarter of the prisoners were also involved in mining, but only 1.5 percent of the CEDT subjects, which reflects the structural shift in industry and opportunities for Chinese in Australia. About 40 percent of the CEDT subjects were engaged in commerce, from import-export and fruit merchants, greengrocers, shop and restaurant proprietors to hawkers of vegetables and other goods (some market gardeners were also hawkers but were classified primarily as market gardeners). Commerce only involved 16 percent of the prisoners. The distribution of major occupations of the CEDT our sample approximates the that reported for Chinese in the 1901 and 1911 census: 44 percent primary producers, 15 percent industrial occupations, and 29 percent for commercial and independent proprietors (Yong, 1977: 261).

The earliest born subject was born in 1798 and the latest in 1902, while the earliest arrivals found among the prisoner subjects came to Australia in 1831 and 1832. Among the CEDT subjects the earliest arrived in the mid-1860s, and there were none who had original come during the 1850s gold rushes. From Fig 8 we can see the two distinct arrival periods associated with each data set. Fig 8 also clearly shows the the impact of Federation on stemming new arrivals, though some were permitted to enter after 1901 under special conditions, for example, to fill specialist jobs such as a Chinese clerk for an import-export merchant, or to join their fathers or uncles to further their education in Australia before being forced to return to China.

Insert Fig 8 about here

#### 4. Results and discussion

The average height of the Chinese in the samples before controlling for year of birth, age and occupation is 64.4 inches (163.6cm) for the prisoners and 65.3 inches (165.9cm) for the CEDT subjects. Their height is far taller than the four foot 10 inches or 58 inches (147cm) that has been claimed was the height of Cantonese who went to the United States in the 1870s. In fact, 58 inches is  $>3SD$  below the mean and is the minimum height of any subject included in our data here. The change in average height by decade from 1790 to 1909 is summarized for each of the two series in Table 3, though the first and last decades of each series have too few observations for any reliable estimates to be made using regression below. From the data for the prisoners we can see that over the decades from 1810-19 to 1870-79 the average height of the Chinese changed very little, but began to decline quite sharply in the 1880s, though the number of records are few. Similarly with the CEDT data heights were static from the 1850s through 1880s.

Insert Table 3

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professionals, and a final category of retired, invalid or otherwise non-economically engaged. This classification system is informed by the system used by Armstrong (1972), Nicholas and Shergold (1988) and Haines (1989). All such systems are compromises. Full details of which occupations are classified into which industry and skill/class group are available from the author.

Next we conduct regression analysis to control for within period heterogeneity in the composition of the sample. Our first model is to explore the relationship between the age at measurement and physical height. Fig 9 reports the results. Age effects become obvious after 60 years of age, with the loss of 2.1cm between 55-59 year-old group and 74-79 year-old group (occupation and year of birth have been controlled).

Our main interest is in the secular trend in height. We undertook the testing of various models for each data series, using five-year and 10-year time periods, and controlling for occupation and skill level as a proxy of social class, education and other variables. A stepped entry of regression terms was used to progressively modify the regression models. Most of the coefficients for social differences based on occupation, skill or education were not statistically significant. Due to time constraints, the tables have not been reproduced. Instead, the coefficients for the change in height is plotted to show the secular trend in height in 5-year and decade period, Figs 10-13.

The 5-year means for the prisoner data fluctuate quite sharply even for the period 1815-1869 when the numbers of records are quite healthy, whereas the 5-year means for the CEDT data are smooth. Where the period of the data sets overlap there is a high degree of similarity in the secular change, best viewed using the decal-means, though the subjects in the CEDT set are on average about 2cm taller than those in the prisoner data set. There is a decline in height during the 1840s, which coincides with the first Opium War and the subsequent internal disturbances such as the Taiping rebellions. Heights appear to rise during the 1860s, a period of relative calm, but begin to decline again from the 1870/80s. The decline from the 1880s is observed in both data sets, which is contrary to accounts that suggest the Chinese economy began to recover slowly from the early/mid-century economic downturn (Rawski 1989, Brandt 1989, etc).

Fig 10-13 about here

To place these changes in context, Fig 14 combines the prisoner and CEDT estimates with estimates previously obtained for China 1890-1930 (Morgan 2004) and Taiwan 1880-1970 (Olds 2003, Morgan and Liu 2005). Table 4 reports the mean height from the PROV and NAA series with data for mean heights in China estimated for 1915-19, clinical estimates for the mid-1920s, and estimates for those born in the 1970s measured in the mid-1990s.

Insert Fig 8

Table 4

What can we say about the results of the comparative estimates shown in Fig 8 and Table 4? The data from the CEDTs for Guangdong-born immigrant to Australia show that these Chinese are much taller than the estimates Chinese from South and Central China derived from personnel files for employees in railway and modern organization who were born in the later 1890s and the early 1900-1920s. The prisoner heights,

though, are shorter. In fact, the Guangdong-CEDT heights appear as if they would converge from 1885 onwards with the height series for the lower Yangzi from the late 1890s. Is that probable? At one level both regional economies are relatively open, engaged in trade, and highly commercialized. Before we accept such an explanation let us consider the characteristics of migrants – they are in general younger, healthier and better educated than the population in the area from which they are leaving (but less educated and capable) than the population into which they are entering. We also are unclear about whether the height in the CEDT forms were recorded in a more or less equivalent way – were people measured bare foot or in shoes? Procedural documentation has not been found in the archives. We are similarly concerned about the selection bias in our sample: were they taller because they were sojourners? In general, sojourners can be expected to be the best, the brightest and the healthiest of the population. A family is not likely to send or fund the foreign adventures of an unhealthy member. They are therefore likely to be taller than most of their cohort. This would skew any estimate of attained adult height. Does this matter? It does if we seek a precise measure of the height of the underlying population from which our sample was drawn. But it does not matter for show a trend as long as we can be confident there was not a shift over time in the selection of those who left these villages of South China. If we assume the sojourners born in the 1850-54 period were from the same villages and the population strata as those born in the 1880s, the upward change in average height is evidence of improved net nutrition over these four decades. There are good reasons to believe that is a sound assumption.

## 5. Conclusion

This brief paper sets out evidence that showed the average height of South Chinese from Guangdong Province who came to Australia in the late 19<sup>th</sup> century was taller than commonly believed. More importantly, the upward trend in stature from those born between the 1850s and the 1880s is strong evidence of positive returns to increased trade and commercialization in Guangdong around the Pearl River delta as previously argued by Faure (1985) and Rawski (1989). Contrary to the long-held pessimist view of Chinese economic growth after the opium wars, human welfare and the standard of living broadly improved, otherwise the mean height of the population would have remained static or declined. The increase was small, but the evidence is sufficiently robust to sustain the view that the standard of living was rising in Guangdong in the late 19<sup>th</sup> century, or at least in the most commercialized areas from which Chinese immigrants to Australia and other settler countries had originated.

The paper suggests the human capital of the Chinese who came to Australia in the 19<sup>th</sup> century had been under-valued and over looked, like that of the convicts before them (Nicholas and Shergold, 1988). They contributed skills to late colonial Australia, and filled niches in the economy. The CEDTs and related records have been used to tell stories about the early Chinese in Australia, but these documents have been neglected as a source for the social and economic history of Chinese in Australia and of China itself. The paper shows that historians without knowledge of Chinese language can contribute to the economic history of 19<sup>th</sup> century China using height

data obtained from CEDTs. It also suggests, as Jennifer Cushman did many years ago, that these documents produced by the White Australia policy can be used creatively to explore the Chinese experience with the Chinese-Australian community that a preoccupation with administrative policy has previously neglected (Cushman, 1984).

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Table 1. Summary of archival record sets used in the paper

Series number	Document type	Number of males	Number of females	Period covered by year born
VPRS 515, Melbourne	Prison register	1269	0	1798-1902
B13/0, Melbourne	CEDT and SD	2401	18	1844-1896
E752, Darwin	CEDT and SD	216	10	1844-1907
J2482, Brisbane	CoD and CEDT	670	4	1843-1885
B78/1, Melbourne	Alien Registration	921	129	1855-1964
Record total		5477	161	

Sources: NAA Melbourne, NAA RecordSearch digital records, PROV Melbourne

TABLE 2 is on the NEXT PAGE

Table 3. Summary height of Chinese subjects by decade of birth, cm

<b>Prisoners</b>	Mean	Minimum	Maximum	Std Dev	N
1790-99	167.0	166.4	167.6	0.90	2
1800-09	159.1	152.4	168.9	5.08	15
1810-19	163.0	137.2	180.3	6.12	85
1820-29	163.4	142.2	179.1	5.68	234
1830-39	163.9	144.8	182.9	5.63	593
1840-49	163.9	149.9	181.6	5.48	207
1850-59	163.2	152.4	177.8	5.26	56
1860-69	163.3	152.4	174.6	5.76	34
1870-79	163.2	153.7	175.3	5.61	24
1880-89	162.4	152.4	172.7	6.49	12
1890-99	161.4	157.5	164.5	2.94	6
1900-09	158.1	158.1	158.1		1
<b>Total</b>	163.6	137.2	182.9	5.64	1269
<b>CEDT-AR</b>					
1840-1849	167.5	154.9	178.4	6.92	17
1850-1859	165.7	147.3	181.6	5.24	197
1860-1869	165.7	147.8	181.6	5.42	1182
1870-1879	166.0	147.3	181.6	5.48	1818
1880-1889	166.0	149.9	181.6	5.40	448
1890-1899	164.5	152.4	177.2	6.57	28
1900-09	158.7	152.4	165.1	8.98	2
<b>Total</b>	165.9	147.3	181.6	5.46	3692

Source: See Table 2

Table 2. Summary characteristics of early Chinese immigrants to Australia

Province origin	NAA CEDT		PROV Prisoners	
	Number	%	Number	%
China	74	2.0	771	61.5
Beijing	1	0.0	3	0.2
Shanghai	2	0.1	3	0.2
Guangdong	3543	95.8	378	30.1
Hong Kong	67	1.8	81	6.5
Macau	10	0.3	5	0.4
Other	1	0.0	13	1.0
Total	3698	100	1254	100
<b>Industries</b>				
Rural	1354	41.8	659	53.5
Mining, etc	48	1.5	275	22.3
Manufacturing	432	13.3	70	5.7
Commerce	1289	39.8	196	15.9
Community and business services (incl professionals)	64	2.0	10	0.8
Services (incl domestic)	3	0.1	4	0.3
Other	47	1.5	17	1.4
Total	3237	100	1231	100
Unknown	461		23	
<b>Major Occupations</b>				
Laborers	27	0.8	522	42.4
Miners	48	1.5	275	22.3
Gardeners	1284	39.7	98	7.9
Hawkers	136	4.2	38	3.1
Laundryman	334	10.3	10	0.8
Carpenters	373	11.5	36	2.9
Cooks	147	4.5	52	4.2
Shop/cafe assistants	47	1.5	1	0.1
Merchants, proprietors	177	5.5	56	4.6
Merchants (F&Veg)	369	11.4	16	1.3
Herbalists	56	1.5	2	0.2
Others	239	7.4	125	10.2
Total	3237	100	1231	100
Unknown	461		23	

Source: VPRS 515; B13/0, B78/1, E752, J2482.

Table 4 Comparative estimates of Chinese height at selected periods.

Region born	PROV, sth China born c.1840-50	CEDT, sth China born c.1870-80	Morgan (2004) born c.1915-19	Clinical estimates, 1925	Urban, born 1975 (1995 survey)	Rural, born 1975 (1995 survey)
North			169.1	169.2	172.2	170.3
East			168.2	165.1	172.0	170.3
Central			167.5		169.0	167.6
South	163.6	165.9	165.8	163.0	169.0	166.6
All China railway skilled workers			167.5			
Taiwan			166.2		170.4	

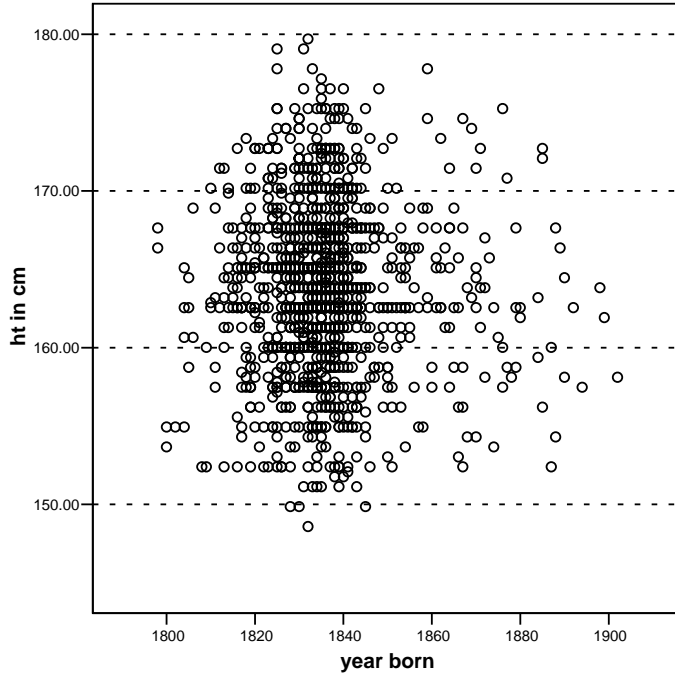


Fig 2. Simple scatter plot of the distribution of Chinese male prisoners

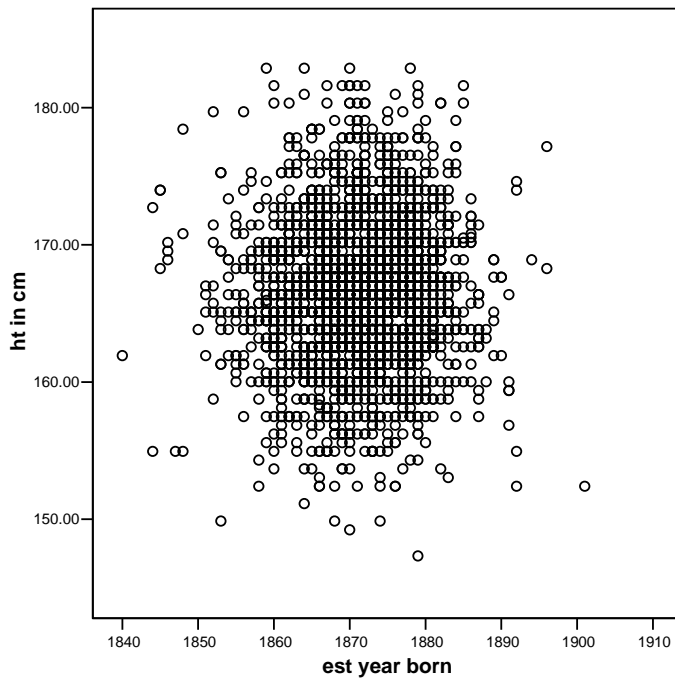


Fig 3. CEDT (Melbourne) scatter plot (male)

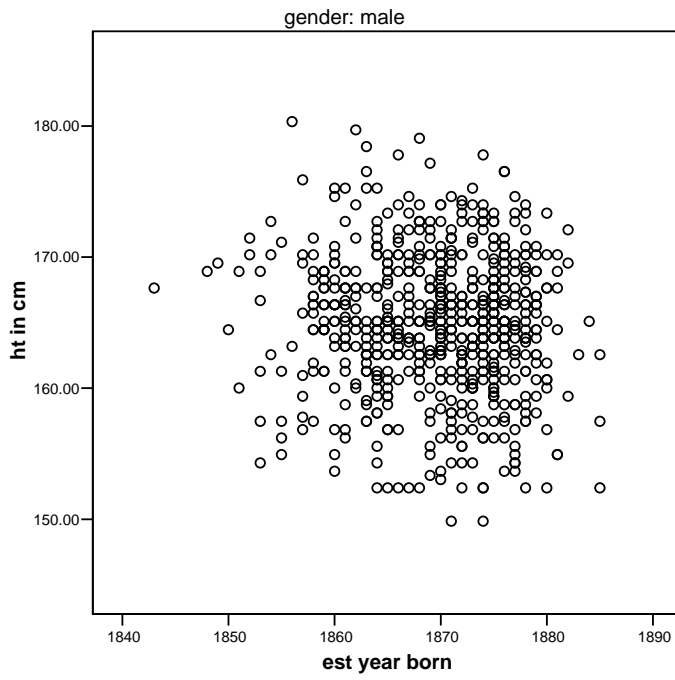


Fig 4. CEDT (Brisbane) scatter plot (male)

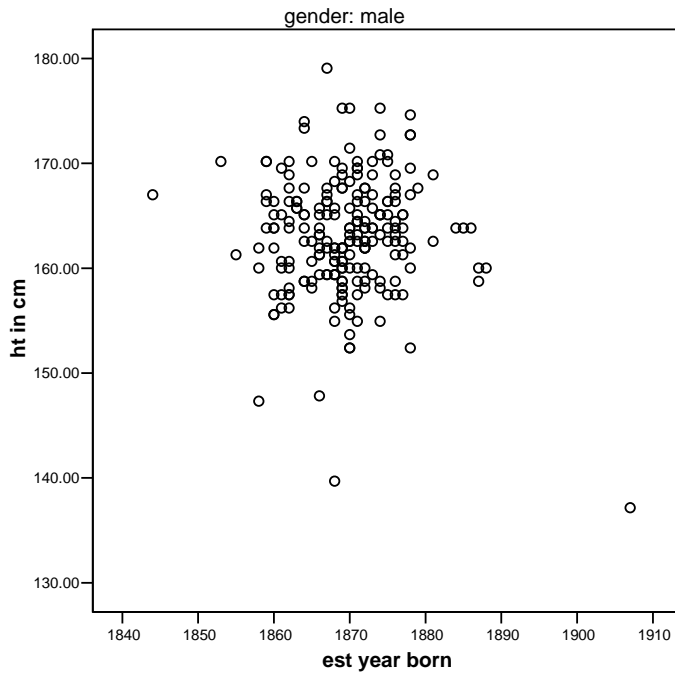


Fig 5. CEDT (Darwin) scatter plot (male)

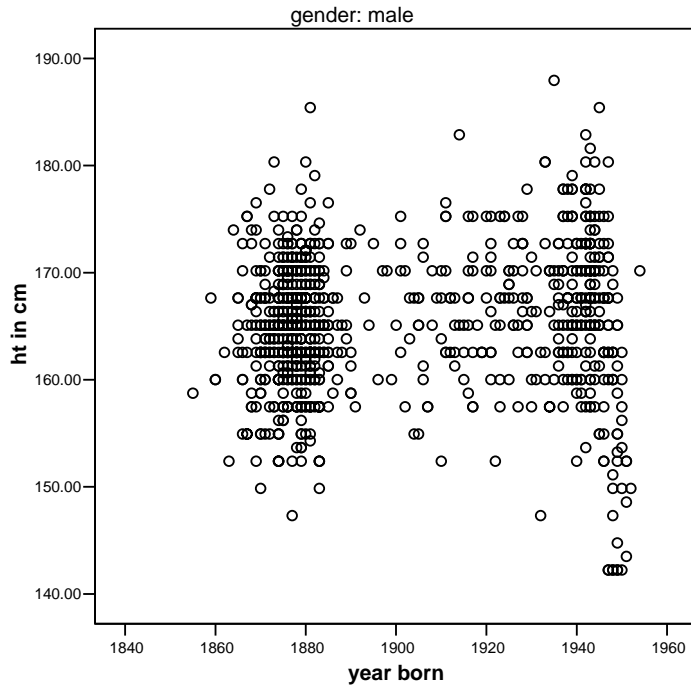


Fig 6: Alien Registration Form scatter plot (male)

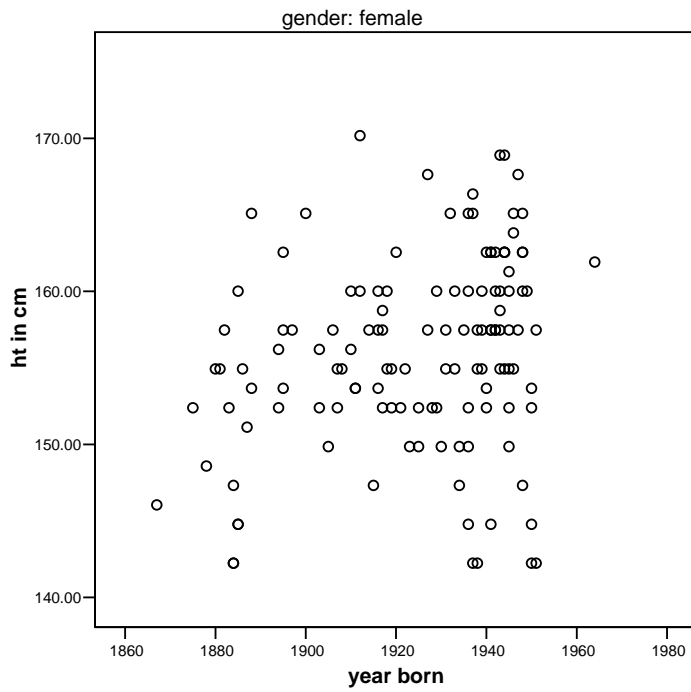


Fig 7: Alien Registration Form scatter plot (female)

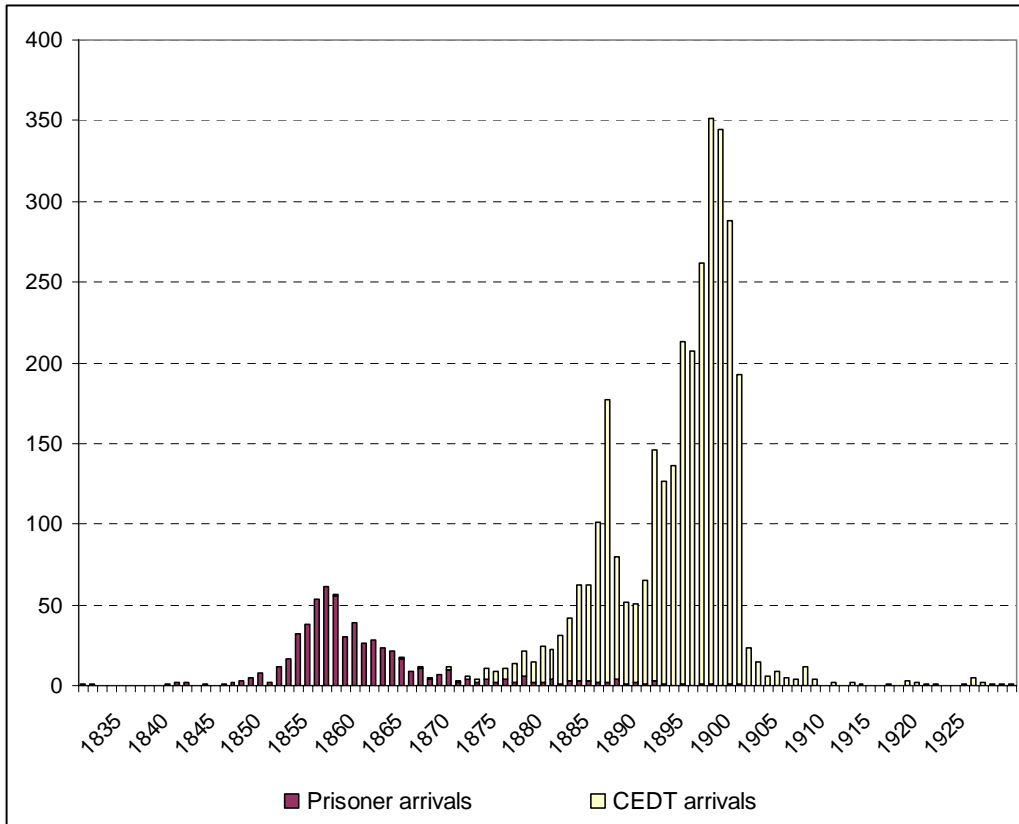


Fig 8. Year of arrival where known

Note: Year of arrival is known for only 47% of the prisoners and 87% of the CEDT subjects.

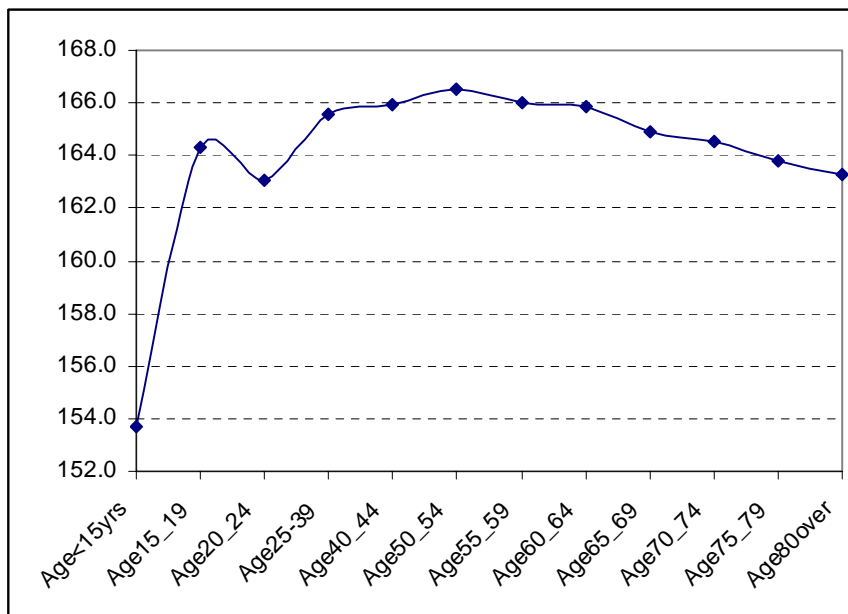


Fig 9. Regression estimates of the height-age relationship (CEDT sample)

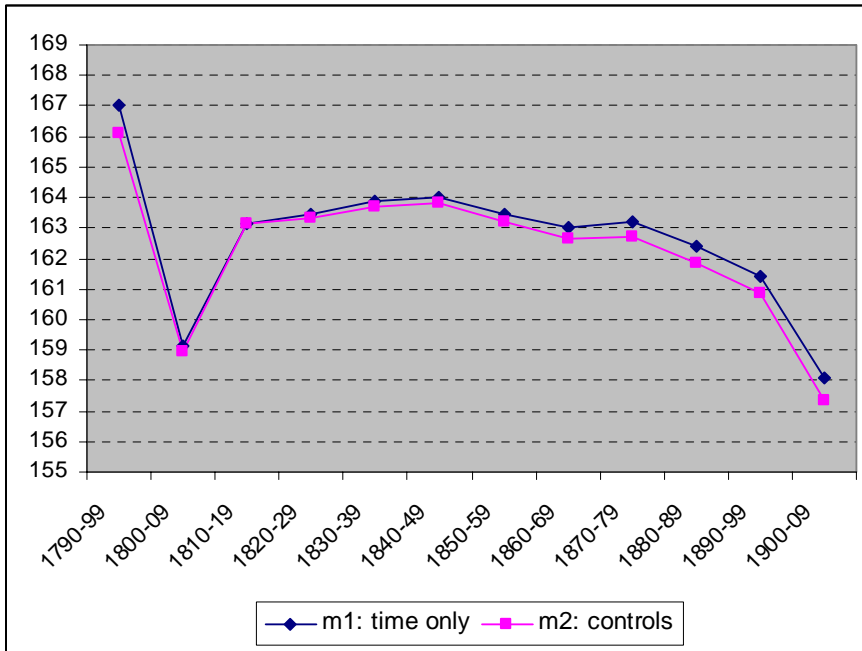


Fig 10. Estimates of secular trend in height by decade (prisoner)

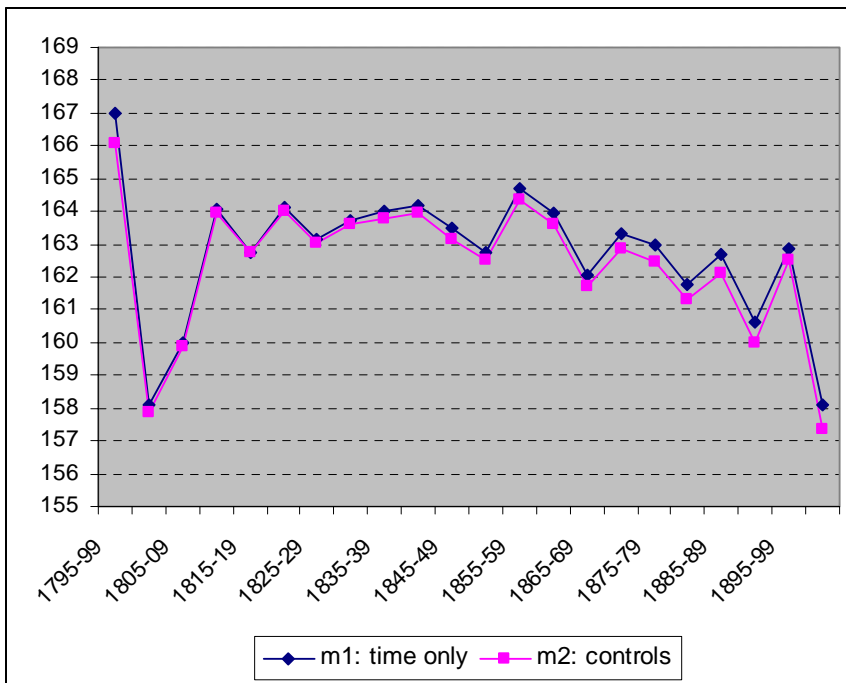


Fig 11. Estimates of secular trend in height by 5-year periods (prisoner)

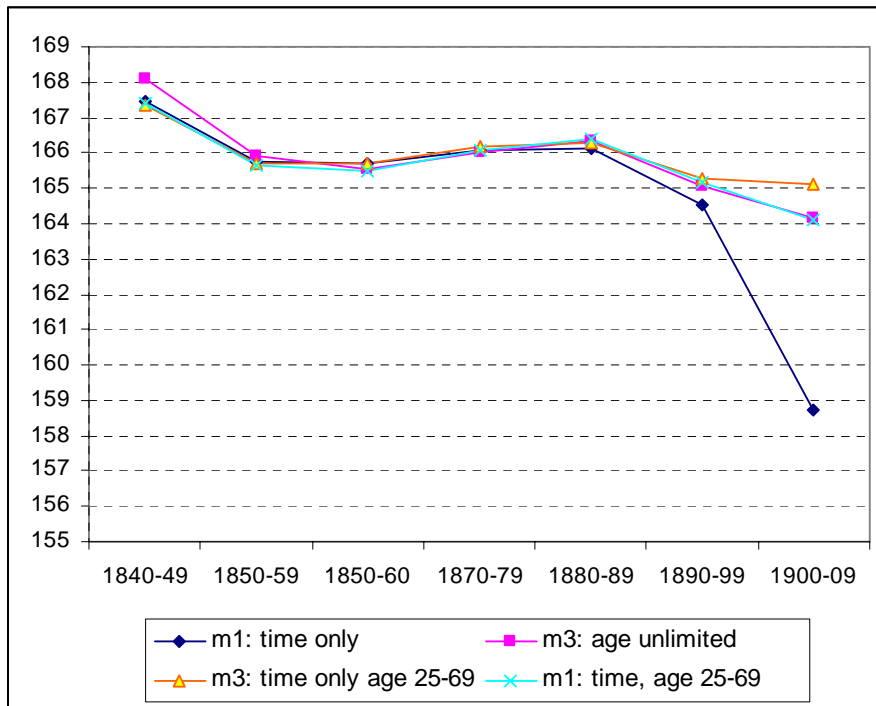


Fig 12. Estimates of secular trend in height by decade (CEDT)

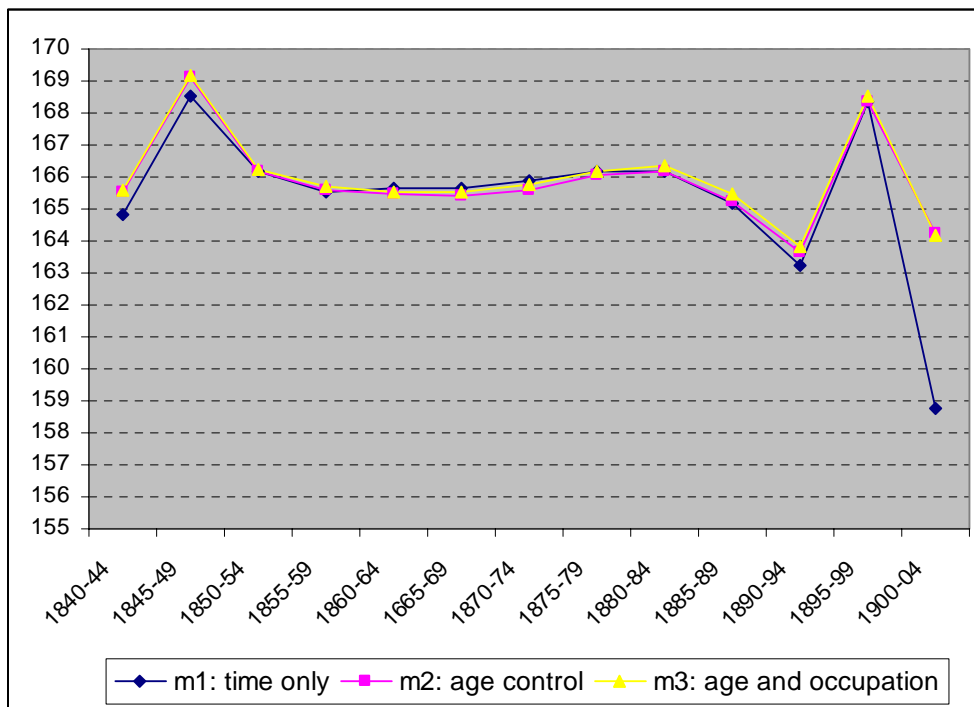


Fig 13. Estimates of secular trend in height by 5-year periods (CEDT)

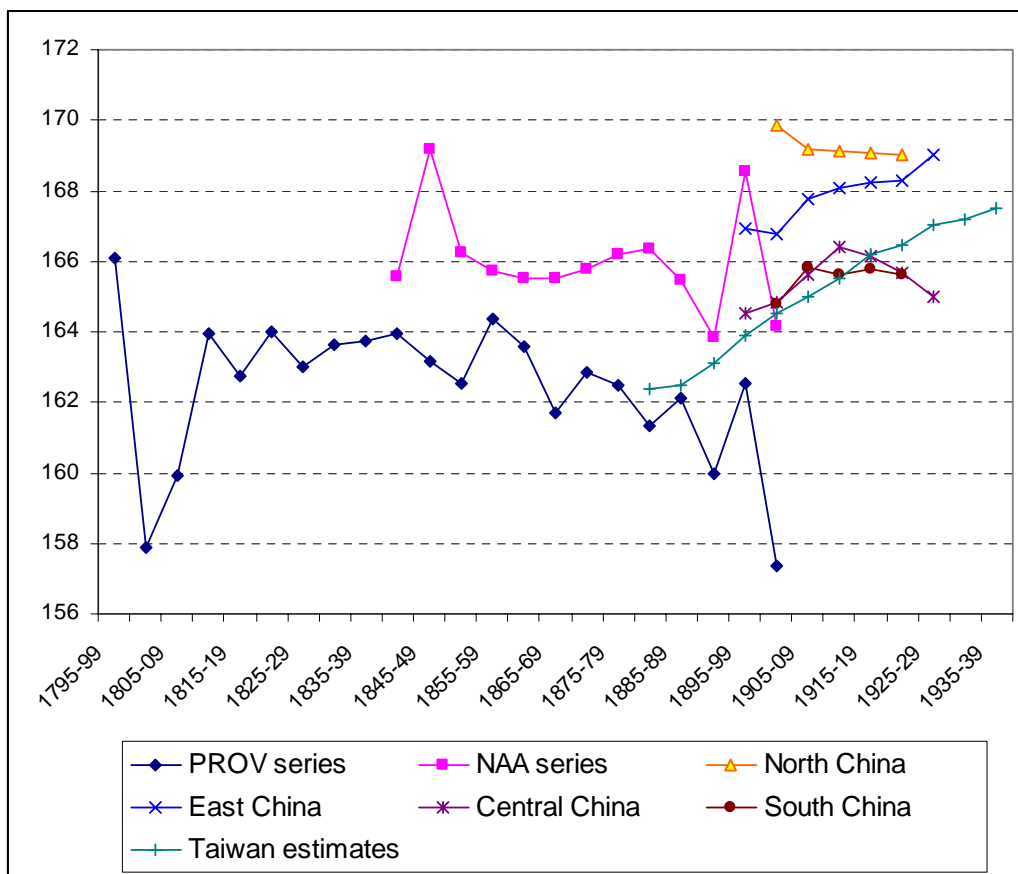


Fig 14. Comparative estimates for secular trends in the height of Chinese