THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Economic History Working Papers No: 359

# Inputs, Outputs and Living Standards in Rural China during the 1920s and 30s: A quantitative analysis

Yutong Wang, University of York,
Jingyuan Guo, Bocconi University and
Kent Deng, LSE

September 2023

Economic History Department, London School of Economics and Political Science,
Houghton Street, London, WC2A 2AE, London, UK. T: +44 (0) 20 7955 7084.

# Inputs, Outputs and Living Standards in Rural China during the 1920s and 30s A Quantitative Analysis

*Yutong Wang, [1] Jingyuan Guo[2] and Kent Deng[3]*

**JEL Codes:** N35, N55, C51

**Keywords:** Great Divergence, little divergence, primary-source data, inputs and outputs, living standards

**Abstract**

Since Kenneth Pomeranz's *Great Divergence* that was published in 2000, the scholarly debate has been focused on when the divergence was likely to begin. But a lack of real data for the Pomeranz framework has been noticeable.

For our purpose, real data are imperative. The primary-source data this study uses are from the first large-scale modern survey of the rural economy in China in the 1920s and 30s to establish correlations between inputs, outputs and living standards in China's rural sector. This study views China's traditional growth trajectory continuing from the Qing to troubled times of the 1920s and 1930s despite considerable negative externalities from a regime change.

The present view is that given that the rural economy managed to hang on during the Republican Period despite many disadvantages Qing China would have performed at least at the 1920s-30s' level.

Our findings indicate that rural population did indeed eat quite well during the politically troubled time, supporting Pomeranz's path-breaking comparison of utility functions between China's Yangzi Delta and Western Europe. Secondly, food consumption proved incentives for improvement in labour productivity. Thirdly, China's peasants were rational operators to maximise their returns. Fourthly, China's high-yield farming depended on land and labour inputs along a production probability frontier, which explains the root cause of the Great Divergence. Finally, there was a 'little divergence' inside China which was dictated by rice production, which justifies the Yangzi Delta as the best scenario.

[1] Department of History, University of York, UK.
[2] Department of Finance, Bocconi University, Italy.
[3] LSE.

## I. Introduction and Motivations

### I.1. Great Divergence Debate

Granted, the notion of a Sino-European developmental dichotomy has its long tradition and wide range. One may cite Marx's 'Asiatic mode of production',[4] the Weber's Protestantism-cum-capitalism,[5] North's property rights for capitalism,[6] Jones's growth exceptionalism,[7] Mokyr's mindset determinism,[8] or Vries's state-capacity determinism,[9] name but a few. These works probe the root cause for the Sino-European developmental dichotomy in the world/global context.

Since Kenneth Pomeranz's *Great Divergence* published in 2000, a seminal work reigniting the debate on two distinctive growth trajectories between Western Europe and China,[10] the scholarly debate has been focused on when the divergence was likely to begin;[11] and to a less extent, where reliable data are available.[12]

---

[4] Avineri Shlomo, *Karl Marx on Colonialism and Modernisation: His Despatches [sic] and Other Writings on China, India, Mexico, the Middle East and North Africa* (N.Y.: Anchor Books, 1969); Lawrence Krader, *The Asiatic Mode of Production: Sources, Development and Critique in the Writings of Karl Marx* (Assen: Van Gorcum, 1975).

[5] Max Weber, *The Protestant Ethic and the Spirit of Capitalism* (London: Routledge, 2001); also, Liah Greenfeld, *The Spirit of Capitalism: Nationalism and Economic Growth* (Cambridge, MA: Harvard University Press, 2001).

[6] Douglass C. North, and Robert P. Thomas, *The Rise of the Western World: a New Economic History* (Cambridge: Cambridge University Press, 1973).

[7] Eric Jones, *The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia* (Cambridge: Cambridge University Press, 2003).

[8] Joel Mokyr, *A Culture of Growth* (Princeton: Princeton University Press, 2016).

[9] P. H. H. Vries, 'Governing Growth: A Comparative Analysis of the Role of the State in the Rise of the West', *Journal of World History* 13, no. 1 (2002): 67-138; and his, *State, Economy and the Great Divergence, Great Britain and China, 1680-1850* (London: Bloomsbury 2015).

[10] Kenneth Pomeranz, *The Great Divergence: Europe, China and the Making of the Modern World Economy* (Princeton, 2000).

[11] E.g. Angus Maddison, *Chinese Economic Performance in the Long Run, 960-2030 AD, 2nd Edition, Revised and Updated* (Paris: OECD Publishing, 2007); Robert C. Allen, 'Agricultural Productivity and Rural Incomes in England and the Yangtze Delta, c.1620-c.1820', *Economic History Review*, 63/3 (2009): 525-50; Stephen Broadberry, Hanhui Guan, and David Daokui Li, 'China, Europe and the Great Divergence: A Study in Historical National Accounting, 980-1850', *Journal of Economic History*, 78/4 (2018): 955-1000; Jack Goldstone, 'Data and Dating in the Great Divergence', in T. Roy and G. Riello (eds), *Global Economic History* (London: Bloomsbury, 2019), pp. 38-53.

[12] E.g. Shi Tao and Ma Guoying, 'Qingdai Qianzhongqi Liangshi Muchan Yanjiu Pingshu' (Survey of Yield per *Mu* in the First Half of the Qing Period), *Lishi Yanjiu* (*Study of History*), 2 (2010): 143-55; Peng Kaixiang, 'Lishi GDP Gusuanzhongde Jijia Wenti Chuyi' (Critique of Prices Used in Historical GDP Estimates), *Zhongguo Jingjishi Yanjiu* (*Research into Chinese Economic History*), 4 (2011): 53-60; Shi Zhihong, 'Shijiu Shiji Shangbanqide Zhongguo Liangshi Muchanliang Jiqi Zongchanliang Zai Guji' (Re-Estimation of Yields per *Mu* and the Aggregate Food Output in Early Nineteenth Century China), *Zhongguo Jingjishi Yanjiu* (*Research into Chinese Economic History*), 3 (2012): 52-66; Zhong Weimin, 'Shuju Gusuan Yu Lishi Zhenshi' (Quantitative Estimates and Historical Reality), *Shixue Yuekan* (*Historical Study Monthly*), 2 (2014): 105-14; Kent Deng and

Inspired by the ongoing debate, the present study re-examines the key to Pomeranz's puzzle which is about China's relatively high living standards without either numerous revolutions in post-Renaissance Europe or a boom in technology and international trade. Indeed, China's glorious Song Period was long gone (Song: 960-1279 AD).[13]

On the other hand, along various lines, scholars have attributed China's long-term development (or a lack of it) to its agricultural sector, regarding farmland,[14] labour,[15] ecology,[16] as well as market exchange of goods and services.[17] In this context, one wonders how living standards in the Yangzi Delta and beyond were ever supported under the Malthusian grip without 'ecological relief' provided by coal, overseas trade and so forth.[18] In other words, the key to Pomeranz's Puzzle is how China's agricultural sector functioned to support relatively high living standards. And the challenge is where to find real data.

---

Patrick O'Brien, 'Why Maddison Was Wrong', *World Economics Journal*, 18/2 (2017): 21-41; Yu Kailiang, 'Qingdai Liangjia Shuju Zhiliang Jiqi Zhiduxing Yinsu Tantao' (Data Quality of the Qing Food Market Prices and Its Institutional Explanations), *Shanghai Jingji Yanjiu* (*Shanghai Economic Review*), 9 (2018): 90-99; Patrick O'Brien, *The Economies of Imperial China and Western Europe. Debating the Great Divergence* (Cham: Palgrave Macmillan, 2020); Peter M. Solar, 'China, Europe, and the Great Divergence: Further Concerns about the Historical GDP Estimates for China' *Working Papers* 0217, European Historical Economics Society (EHES), 2021; Peter M. Solar, 'China's GDP: Some Corrections and the Way Forward', *Journal of Economic History* 81/3 (2021): 943-57.

[13] See Jones, *The European Miracle*, ch. 11; John M. Hobson, *The Eastern Origins of Western Civilisation* (Cambridge: Cambridge University Press, 2004); Jack A. Goldstone, 'Efflorescences and Economic Growth in World History: Rethinking the "Rise of the West" and the Industrial Revolution', *Journal of World History* 13/2 (2002): 323-89.

[14] E.g. Kent Deng, *China's Political Economy in Modern Times: Changes and Economic Consequences, 1800-2000* (London: Routledge, 2012).

[15] E.g., Philip C. Huang, *The Peasant Family and Rural Development in the Yangzi Delta, 1350-1988* (Stanford: Stanford University Press, 1990); Philip C. Huang, 'Revisiting "the Great Divergence": Clarifying the Two Major Modes of Agriculture in China and the West', *Modern China* 49/5 (2023), online 9770042311647-531; Bozhong Li, and Jan Luiten van Zanden, 'Before the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the Beginning of the Nineteenth Century', *Journal of Economic History* 72/4 (2012): 956-89.

[16] E.g. Li Bozhong, 'Cong Fufu Bingzuo Dao Nangeng Nüzhi' (From 'Husband and Wife Tilling Together' to 'Husband Tilling And Wife Weaving'), *Lishi Yanju* (*Research into History*), 3 (1996): 99-107.

[17] Dwight H. Perkins, *Agricultural Development in China, 1368-1968* (Edinburgh: Edinburgh University Press, 1969); Richard von Glahn, *The Economic History of China: From Antiquity to the Nineteenth Century* (United Kingdom: Cambridge University Press, 2016).

[18] Pomeranz, *The Great Divergence*, pp. 8, 12, 13, 45, 66, 185.

For such a purpose, this study takes on China as a whole for scrutiny to avoid a bias towards the wealthy delta region of The Yangzi. It also moves from the conventional *circa* 1750 forward to the 1920s to 1930s, a period in which (1) positive externalities of an empire system - such as an elastic supply of land and economies of scale for trade – vanished; and (2) noticeable similarities between Western Europe and China disappeared, including various productivities, living standards, and law and order (or national security).

In addition, as agriculture dominated China's economy until recent post-Mao reforms, this research views the peasantry and peasant life as a justifiable proxy for China's national economy, due to the fact that the vast majority of the population were peasants who were engaged in land, labour and capital allocation, cropping decisions, and market engagement which in turn dictated household incomes, nutrition intake, and living standards, *ceteris paribus*.

Moreover, this study sees continuity of China's traditional growth trajectory from the Qing to the troubled times of the 1920s and 1930s when a republic (*min guo*) replaced the Empire on China's soil.[19] Since its birth in 1911 the new regime was dogged by regional separatism and large-scale civil wars backed by foreign powers, which represented unprecedented degree of negative externalities for rural wellbeing. The present view is that if the rural economy managed to hold on during the Republican Period despite many disadvantages Qing China would have performed at least at the same level.

For our purpose, real data are imperative.

[19] Regarding China's land ownership stability in the 1920s-40s, see Zhang Youyi, 'Benshiji Ersanshi Niandai Woguo Diquan Fenpei De Zaiguji' (Re-estimation of Land Rights Distribution in China in the 1920s and 1930s), *Research into Chinese Economic History*, no.2 (1988): 3-10; Hu Yingze, 'Lishi Shiqi Diquan Fenpei De Lilun, Gongju Yu Fangfa' (Theories, Tools and Methods of Land Rights Distribution Research in Chinese History), *Open Times*, no. 4 (2018): 168-184.

I.2. Estimates and their problems

China's historical data from primary sources did exist but were unsystematic and of low quality despite the grandeur image of the Empire built upon a literate-meritocratic bureaucracy unrivalled elsewhere in the premodern world.[20] To illustrate the problem, one can look at cadastral surveys, currencies, and wages, all relevant to China's national income accounting.

Firstly, the cadastral survey unit *mu* for farmland was a complete mess on two counts: (1) '6 paces x 6 paces' (called *bu*) was set as the official common denominator for a *mu* (literally 'one plot'). But the pace length varied from person to person. Disputes between the taxman and taxpayers were inevitable. And, (2) even if the authorities had a universal pace length, there were about 10 sizes for a *mu*, ranging from 240 *bu* to 1200 *bu*.[21] The differences were five-fold. Again, disputes between the taxman and taxpayers were inevitable.

In addition, cadastral surveys were carried out infrequently. In 1072 AD, Emperor Shenzong (r. 1068-85) ordered a survey across the Song territory, the first recorded attempt after the empire was established over a millennium before.[22] Even so, out of 25 Song provinces only five were actually surveyed.[23] The surveyed rate was merely 20 percent. Not until three centuries later in 1387 was another survey carried out.[24] Three new cadastral surveys were conducted in 1578, 1654 and 1690,

[20] Q.-S. Ge, J.-H. Dai, F.-N. He, J.-Y. Zheng, Z.-M. Man, and Y. Zhao, 'Guoqu 300nian Zhongguo Bufen Shengqu Gengdi Ziyuan Shuliang Bianhua Ji Qudong Yinsu Fenxi' (Quantitative Changes and Their Dynamic Causes regarding Farmland Resources in China Proper in the Past 300 Years), *Ziran Kexue Jinzhan* (*Progress in Natural Sciences*), 13/8 (2003): 825-34; Ye Ma, Herman de Jong, and T. Chu, 'Living standards in China between 1840 and 1912', Groningen Growth and Development Center, *GGDC Research Memorandum*, vol. GD-147 (2014); Kent Deng and Patrick O'Brien, 'The Kuznetsian Paradigm for the Study of Modern Economic History and the Great Divergence with Appendices of Literature Review and Statistical Data', *Working Papers of Department of Economic History, LSE*, No. 321, January 2021.

[21] Shi, 'Re-estimation of Yield per *Mu*': 55.

[22] Zhang Tingyu, 'Ming Shi (History of the Ming Dynasty)', *Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 10, p. 7981; Wu Hui, *Zhongguo Lidai Liangshi Muchan Yanjiu* (*Grain Yields in Chinese Long-term History*) (Beijing: Agriculture Press, 1985), pp. 17-18.

[23] Tuotuo, *Song Shi* (*History of the Song Dynasty*), *Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vo. 7, p. 5716.

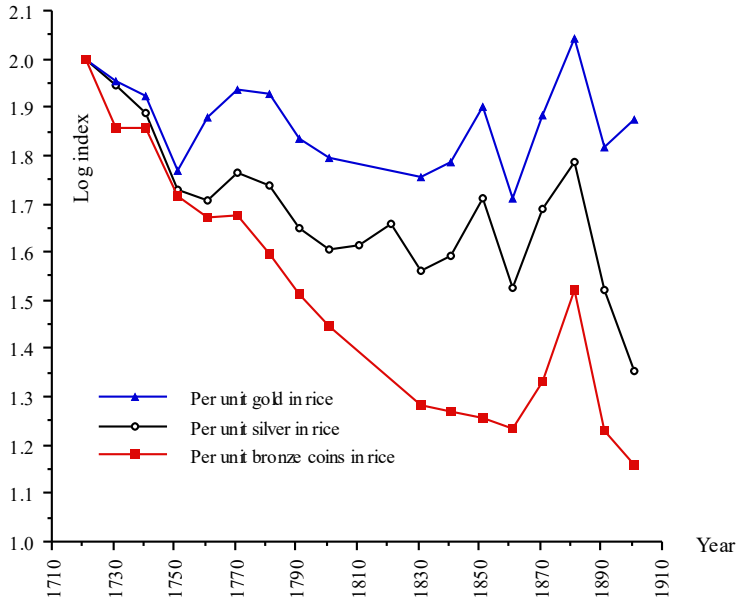
[24] Zhang, *Ming Shi* (*History of the Ming Dynasty*), p. 7981; Liang Jingming, 'Yulin Tuce Yanjiu Zongshu' (A Survey of Studies of the Fish-Scale Cadastral Registration), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 1 (2004): 135-41.

respectively with the internals of 191, 76 and 35 years.[25] Then, after 1712, cadastral survey became obsolete after Emperor Kangxi (r. 1661-1722) capped the government annual revenue for good, a policy known as 'permanent freezing the total tax revenue' (*yongbu jiafu*). From then on until 1850, the Qing revenue ceiling remained at 30 million silver *taels* per year (1,125 metric tons).[26] As a result, farmland, agricultural outputs and rural population were delinked from tax revenue.

Secondly, China's monetary systems were a mess. For example, the Qing silver currency had all 56 regional weight standards (*shiping liang*), ranging from 35.14 grams to 37.50 grams for a tael.[27] Of them, only four overlapped across the Empire.[28] On top of the silver, there was the bronze currency for daily transactions, and multiple exchange rates between the two. Meanwhile, neither silver nor bronze was table when rice was taken as a reliable benchmark (Figure 1).

[25] Zhao Erxun, *Qingshi Gao (Draft of the History of the Qing Dynasty), Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 11, p. 9260.
[26] Zhao, *Qing Shi Gao* (*Drafted History of the Qing Dynasty*), p. 9261.
[27] Zhang Huixin, Yinliangde Pingse Ji Mingcheng' (Qualities and Names of Silver), *Gugong Wenwu Yuekan* (*Palace Museum Cultural Relics Monthly*) (Taipei), 52 (1987), p. 130.
[28] These were: (1) 35.84 grams shared by Hunan's Xiangtan and Yunnan, (2) 36.00 grams shared by Tianjin and Shenyan, (3) 36.05 grams shared between Beijing, Changsha and Chongqing, and (4) 36.56 grams, also known as 'the Grand Canal Standard' (*caoping liang*), shared between Shanghai, Yangzhou, Anqing, Jiujiang and Mongol's Kulun, see Zhang, Yinliangde Pingse Ji Mingcheng' (Qualities and Names of Silver).

Figure 1. Rice-Indexed Currency Prices, 1710-1910




***Sources***: Yu Yaohua, *Zhongguo Wujia Shi (A History of Prices in China*) (Beijing: China's Price Press, 2000), pp. 903-4. The gold price is derived from silver-gold exchange rates, based on Liu Foding, Wang Yuru and Zhao Jin, *Zhongguo Jindai Jingjishi* (*A History of Economic Development in Early Modern China*) (Beijing: Tertiary Education Press, 1999), pp. 178-9.

Thirdly, presumably owing to instability of currencies, waged labourers were paid chiefly in kind such as food, clothing, and shelter instead of cash.[29] The conversion of wage goods to cash is extremely difficult if not entirely impossible.

Understandably, much of the Great Divergence Debate hinges on estimation of economic multitudes on China's side, an approach that was originally tried on by Dwight Perkins and then promoted by Angus Maddison before becoming fashionable.[30] Although heuristic, in our view, estimates cannot be settled by yet more estimates no matter how hard one tries.[31]

[29] Kent Deng, and Patrick O'Brien, 'Establishing Statistical Foundations of a Chronology for the Great Divergence: A Survey and Critique of the Primary Sources for the Construction of Relative Wage Levels for Ming-Qing China', *Economic History Review* 69/4 (2016): 1071.
[30] Dwight H. Perkins, *Agricultural Development in China, 1368-1968* (Edinburgh: Edinburgh University Press, 1969); Angus Maddison, *Chinese Economic Performance in the Long Run* (Paris: OECD, 1998); Angus Maddison, *Chinese Performance in the Long Run 960-2030, 2nd Ed.* (Paris: OECD, 2007).
[31] E.g. Deng and O'Brien, 'Establishing Statistical Foundations of a Chronology for the Great Divergence'; Solar, 'China's GDP'.

The following body of text is organised as follows: Part II is on primary-source data; Part III contains empirical modelling and regression analysis; Part IV draws the final conclusions.

## II. Primary-source Data Used by This Study

### II.1. First large-scale modern survey and achievements

The set of real data for China's rural economy that this study uses was conducted by the Western standards during 1929-33 in a project known as 'land utilization in China'. The subject matter, 'land utilization', came straight from American agroeconomics in the 1920s for the 'optimum use of land' in the United States.[32] This survey was nevertheless the most ambitious undertaking in Asia at that time.[33]

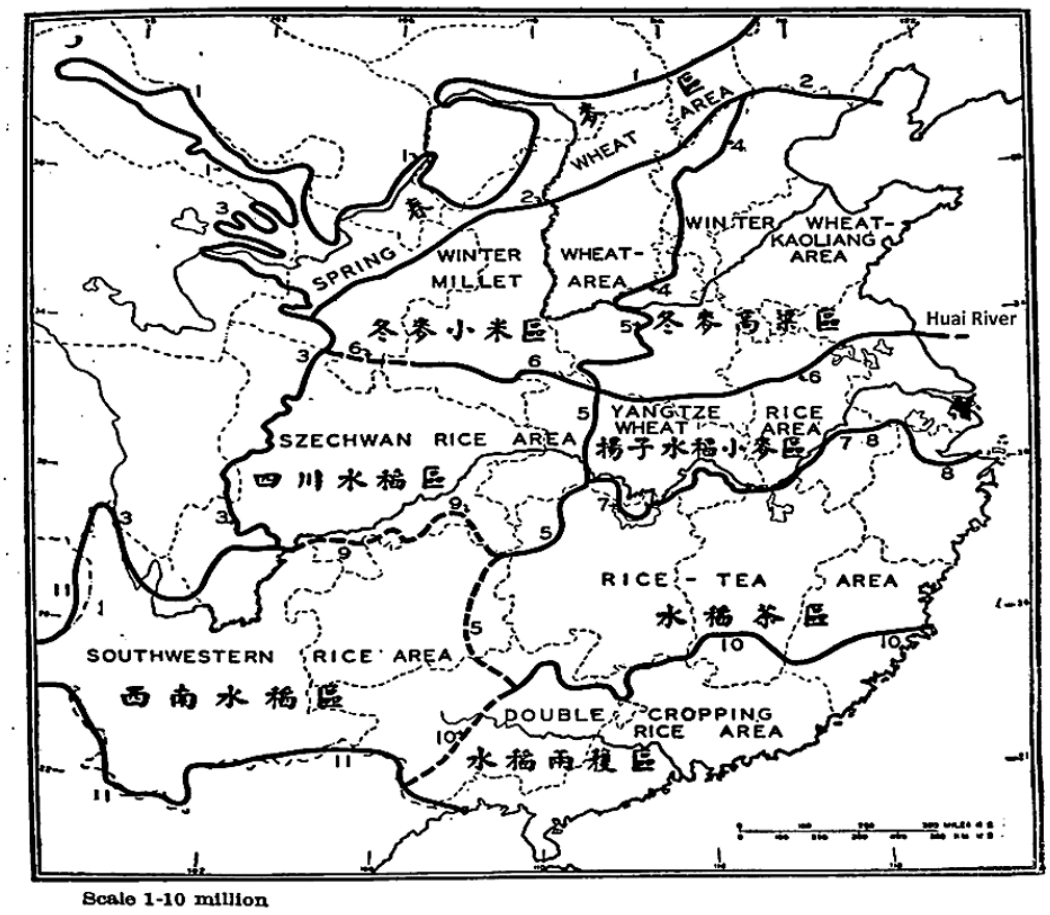
The results were published by Oxford University Press in three volumes with the titles of *Land Utilisation in China, Text, Statistics* and *Atlas*. Volume One describes the rural economy and peasants' life, synthesizing unprecedented amount of survey data in statistical tables, charts and pictures. Volume Two contains a total of 195 maps. Volume Three displays 325 statistical tables. A Chinese edition was published in 1941 a few years later. They represent the primary source data for China on such a scale and scope for the first time.

Buck's project made three major contributions. Firstly, it was the scale of the rural economy with the identification of different ecological-geographical and farming systems guided by a scientific approach for the first time on China's soil (see Figure 2).[34] Secondly, it was the scope of the rural economy regarding farming inputs (land, labour, capital and technology), cottage industries, market prices, and standards of living. In terms of standards of living, the survey probed peasant

[32] Randall E. Stross, *The Stubborn Earth: American Agriculturalists on Chinese Soil, 1898-1937* (Berkeley: University of California Press, 1986), pp. 179-180.
[33] John Lossing Buck, *Land Utilization in China* (London: Oxford University Press, 1937).
[34] Figure 2 largely agree with another work of the time by Chao-Ting Chi, *Key Economic Areas in Chinese History* (London: Allen and Unwin, 1936).

production costs, incomes, tax burden, purchasing power, savings, nutrition intake and demography. Thirdly, it was standardisation of multitudes of the rural economy: all land plots were graded by fertility, all crop yields were converted to a unit of unhusked cereal grain as the common denominator and one currency was used for all market values.

Figure 2. China's Cropping Geography




***Source***: John L. Buck, *Land Utilization in China, Atlas* (London: Oxford University Press, 1937), p. 9.

Buck's legacy has continued since the 1930s.[35] Five subject areas of research have been identified as: (1) economic geography, (2) rural economy, (3) national income accounting, (4) landholding property rights, and (5) indigenous market, involving

[35] Linda Gail Arrigo, 'Chinese Agriculture in the 1930s: Investigations into John Lossing Buck's Rediscovered "Land Utilization in China" Microdata', *The China Journal*, (84) 2020: 185-188.

two dozen scholars,[36] including heavy weights in economic history of China Dwight H. Perkins and Thomas G. Rawski.[37] Noted here, very few historians inside post-1949 Mainland China have followed up Buck's project, a point that we will come back later.

II.2. Credentials of Buck and credibility and quality of Buck's data

John Lossing Buck (1890-1975) himself had impeccable academic credentials for his task. He was a Cornell-trained agricultural economist and joined in 1920 Nanjing University's College of Agriculture and Forestry (CAF), an off-shore branch of Cornell University in the United States.[38] Prior to this land Utilization survey, Buck ran his own research project of *Chinese Farm Economy* which was based on 2,866 farms across 7 provinces. His findings, illustrated by 39 photos, 69 diagrams and 251 tables, earned him a Cornell PhD in 1933.[39] His PhD worked as a dry run for his China-wide survey.

Incidentally, Buck's wife Pearl S. Buck (1892-1973) a bilingual journalist who was specialised in China's grassroots society, won the 1932 Pulitzer Prize for her work *The Good Earth* on rural China. Here, some degree of collaboration and note comparing between the Bucks may also be assumed.

Buck's China-wide survey was conducted under the auspices of the Institute of Pacific Relations (IPR), an international organisation active from the late 1920s to the mid-1950s.[40] In addition, in 1925 an umbrella institution, the Pacific

[36] Paul B. Trescott, *Jingji Xue, the History of the Introduction of Western Economic Ideas into China, 1850-1950* (Hong Kong: Chinese University of Hong Kong Press, 2007), p. 179.
[37] Perkins, *Agricultural Development in China*; Thomas G. Rawski, *Economic Growth in Prewar China* (Berkeley: University of California Press, 1989).
[38] Trescott, *Jingji Xue*, p. 168.
[39] Trescott, *Jingji Xue*, pp. 169-70, 172, 174.
[40] The origin of the Institute was dated to 1919 when the American Young Men's Christian Association (YMCA) chose Honolulu as the site for a conference investigating the 'fundamental and universal' elements of Christianity that contribute to 'a common basis of understanding and motivation for the Pacific peoples.' See *Institute of Pacific Relations, Honolulu Session, June 30-July 14, 1925: History, Organisation, Proceedings, Discussions and Addresses* (United States: Institute, 1925), p. 8.

Council, was formed and embraced 109 national delegates in the Pacific region.[41] But research projects and activities were mainly directed and sponsored by IPR.[42] It is worth knowing that the IPR projects in China included 'industrialisation in Tianjin' led by Franklin L. Ho (1895-1975) and Fang Xianting (1903-1985) of Nankai University, 'industrialisation in Shanghai' by Liu Dajun (1891-1962) of Tsinghua University, as well as 'land Utilization in China' by Buck of Nanjing University.[43] IPR's enthusiasm in collecting data for China can be understood it one knows that China was at the time the last 'virgin land' for scientific surveys by the Westerners on a continental scale due to the ending of China's xenophobia which lasted until the 1900 Boxers' Riot.[44] Other surveys followed the suite but were done by the Chinese.[45] Their tacit agenda was undoubtedly nation-building for a new republic in China *à la* the West in wake of the demise of the Qing Empire.[46] However, none matched the scale and scope of Buck's project.

After the IPR sponsorship and as a principal investigator, Buck was appointed in 1934 a special advisor to the U.S. Treasury on monetary silver.[47] Noted, the Silver

---

[41] In 1925, Hawaii was an American territory, Korea was a Japanese colony, and the Philippines was an American colony, but their delegations were accorded national standing for this initial gathering. After that, the American Council merged with Hawaii while the Japanese Council absorbed Korea. The Philippines, however, retained its national standing.

[42] Paul F. Hooper, 'The Institute of Pacific Relations and the Origins of Asian and Pacific Studies', *Pacific Affairs* 61, no. 1 (1988): 98-121; Jing Zhang, *Zhongguo Taipingyang Xuehui Yanjiu (1925-1945)* (*The Institute of Pacific Relations in China, 1925-1945*) (Beijing: Social Sciences Literature Press, 2012), p. 161.

[43] Zhang, *The Institute of Pacific Relations in China, 1925-1945*, p. 161-180.

[44] As far as we can work out, only 230-250 foreigners were killed in the riot compared with the deaths of 20,000 Chinese Christians. So, the boxers were not really after foreigners. See R. C. Forsyth, *The China Martyrs of 1900* (London: Publisher unknown, 1904); Marshall Broomhall, *Martyred Missionaries of China Inland Mission* (London: Morgan & Scott and CIM, 1901); Chester C. Tan, *The Boxer Catastrophe* (New York: Columbia University Press, 1955); John K. Fairbank and Kwang-Ching Liu, *The Cambridge History of China* (Cambridge: Cambridge University Press, 1980), vol. 11, pt 2, pp. 115-30; Tang Degang, *Wanqing Qishinian, Yihetuan Yu Baguo Lianjun* (*The Last Seventy Years of the Qing, the Boxer Riot and the Eight-Nation Alliance*) (Taipei: Yuanliu Press, 1998), vol. 4; Diana Preston, *The Boxer Rebellion; The Dramatic Story of China's War on Foreigners That Shook the World in the Summer of 1900* (New York: Walker & Company, 2000).

[45] E.g. Zhang Jingyu, *Shehui Diaocha-Shejiahang Shikuang* (*A Social Survey on Shengjiahang*) (Shanghai: Commercial Press, 1924); Qiao Qiming, *Jiangsu Kunshan Nantong Anhui Suxian Nongdian Zhidu Zhi Bijiao* (*A Comparison of Tenancy System in Nantong and Kunshan in Jiangsu Province, and Su County in Anhui Province*) (Nanjing: Jinling Daxue Nonglinke, 1926).

[46] It is worth noting that the first Western style national election was held in China in April 1913, with a parliament of 759 representatives who elected President Yuan Shikai with 62 percent votes and Vice-President Li Yuanhong with 20 percent votes. See Li Jie, *Wenwu Beiyang* (*Achievements of the 'Northern Modern' Elite*) (Nanning: Guangxi Normal University Press, 2004), p. 109.

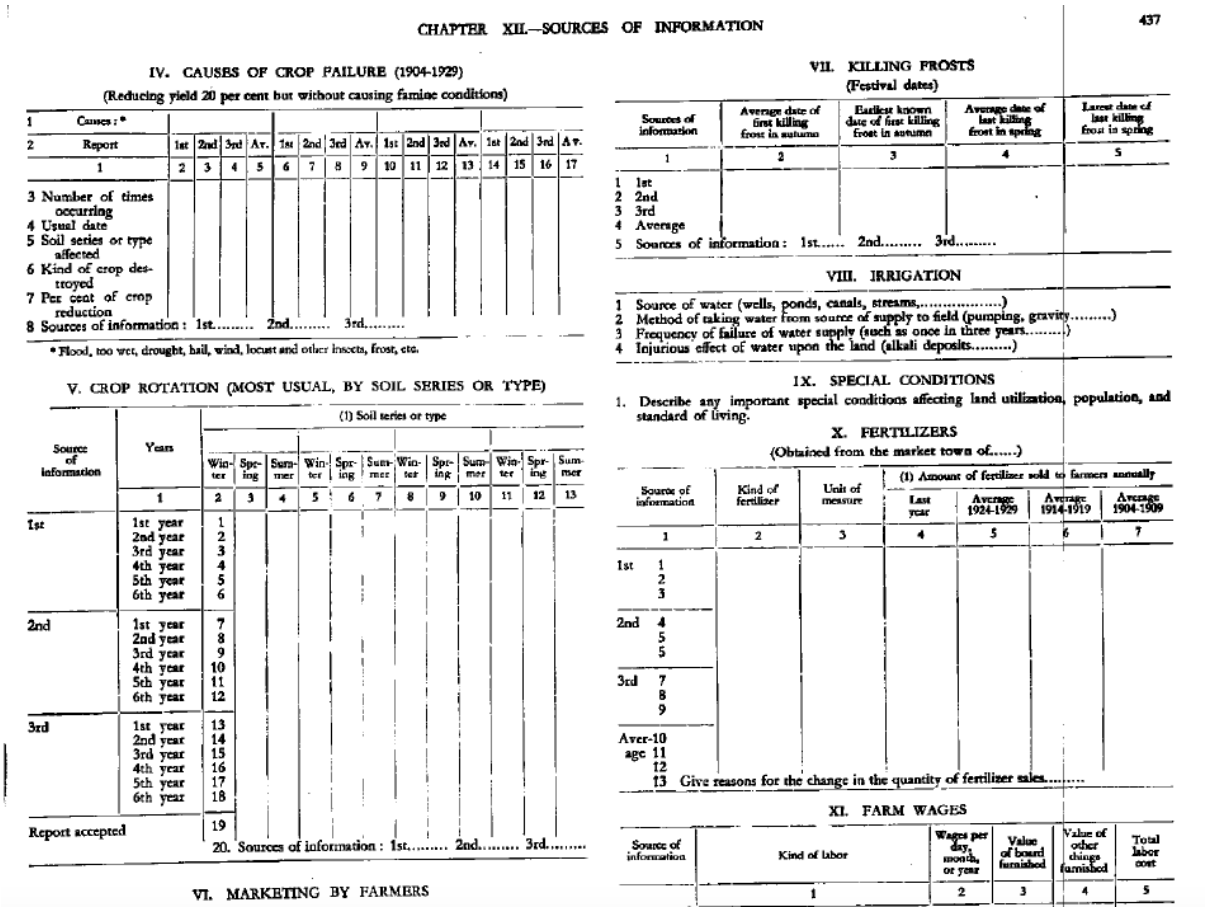
[47] Trescott, *Jingji* Xue, p. 172.

Purchase Act was passed in the same year and importation of silver in unprecedented quantities from China began. Thus, Buck's academic credentials are rather clear-cut.

Against this backdrop, Buck led the largest and more sophisticated survey *hitherto* on China's agricultural system. Over the four years (1929-33), it eventually covered 38,256 rural families in 16,786 farms across 168 counties in 22 provinces (out of a total of 22 as of 1912). It was a huge undertaking. Buck's team included four professional statisticians (Stanley W. Warren, Ardorn B. Lewis, Med Yieh, and Ming-Tsong Yang), twelve 'regional investigators' and seven 'co-authors'.[48] The 'foot soldiers' for the project were modern university students. The survey was based on 'units' on the ground, each unit being made of one hundred households in each location. Inside each unit there were different income groups. To handle the survey results, Buck hired an army of 100 abacus-clerks to perform computation, due to the technological constraint of the time. Figure 3 shows a sample questionnaire for the survey. Figure 4 contains some end-results.

[48] Trescott, *Jingji Xue*, p. 172.

Figure 3. Sample of Survey Questionnaries



CHAPTER XII.—SOURCES OF INFORMATION 437

IV. CAUSES OF CROP FAILURE (1904-1929)

(Reducing yield 20 per cent but without causing famine conditions)

| 1 Causes: * | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 Report | 1st | 2nd | 3rd | Av. | 1st | 2nd | 3rd | Av. | 1st | 2nd | 3rd | Av. | 1st | 2nd | 3rd | Av. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 3 Number of times occurring | | | | | | | | | | | | | | | | |
| 4 Usual date | | | | | | | | | | | | | | | | |
| 5 Soil series or type affected | | | | | | | | | | | | | | | | |
| 6 Kind of crop destroyed | | | | | | | | | | | | | | | | |
| 7 Per cent of crop reduction | | | | | | | | | | | | | | | | |

8 Sources of information: 1st..... 2nd..... 3rd.....

* Flood, too wet, drought, hail, wind, locust and other insects, frost, etc.

V. CROP ROTATION (MOST USUAL, BY SOIL SERIES OR TYPE)

| Source of information | Years | (1) Soil series or type | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Spring | Summer | Winter | Spring | Summer | Winter | Spring | Summer | Winter | Spring | Summer |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1st | 1st year | 1 | | | | | | | | | | | |
| | 2nd year | 2 | | | | | | | | | | | |
| | 3rd year | 3 | | | | | | | | | | | |
| | 4th year | 4 | | | | | | | | | | | |
| | 5th year | 5 | | | | | | | | | | | |
| | 6th year | 6 | | | | | | | | | | | |
| 2nd | 1st year | 7 | | | | | | | | | | | |
| | 2nd year | 8 | | | | | | | | | | | |
| | 3rd year | 9 | | | | | | | | | | | |
| | 4th year | 10 | | | | | | | | | | | |
| | 5th year | 11 | | | | | | | | | | | |
| | 6th year | 12 | | | | | | | | | | | |
| 3rd | 1st year | 13 | | | | | | | | | | | |
| | 2nd year | 14 | | | | | | | | | | | |
| | 3rd year | 15 | | | | | | | | | | | |
| | 4th year | 16 | | | | | | | | | | | |
| | 5th year | 17 | | | | | | | | | | | |
| | 6th year | 18 | | | | | | | | | | | |
| Report accepted | | 19 | | | | | | | | | | | |

20. Sources of information: 1st..... 2nd..... 3rd.....

VI. MARKETING BY FARMERS

VII. KILLING FROSTS

(Festival dates)

| Sources of information | Average date of first killing frost in autumn | Earliest known date of first killing frost in autumn | Average date of last killing frost in spring | Latest date of last killing frost in spring |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 1st | | | | |
| 2 2nd | | | | |
| 3 3rd | | | | |
| 4 Average | | | | |

5 Sources of information: 1st..... 2nd..... 3rd.....

VIII. IRRIGATION

1 Source of water (wells, ponds, canals, streams,.....)
2 Method of taking water from source of supply to field (pumping, gravity.....)
3 Frequency of failure of water supply (such as once in three years.....)
4 Injurious effect of water upon the land (alkali deposits.....)

IX. SPECIAL CONDITIONS

1. Describe any important special conditions affecting land utilization, population, and standard of living.

X. FERTILIZERS

(Obtained from the market town of.....)

| Source of information | Kind of fertilizer | Unit of measure | (1) Amount of fertilizer sold to farmers annually | | | |
|---|---|---|---|---|---|---|
| | | | Last year | Average 1924-1929 | Average 1914-1919 | Average 1904-1909 |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 1st | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| 2nd | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |
| 3rd | 7 | | | | | |
| | 8 | | | | | |
| | 9 | | | | | |
| Average | 10 | | | | | |
| | 11 | | | | | |
| | 12 | | | | | |

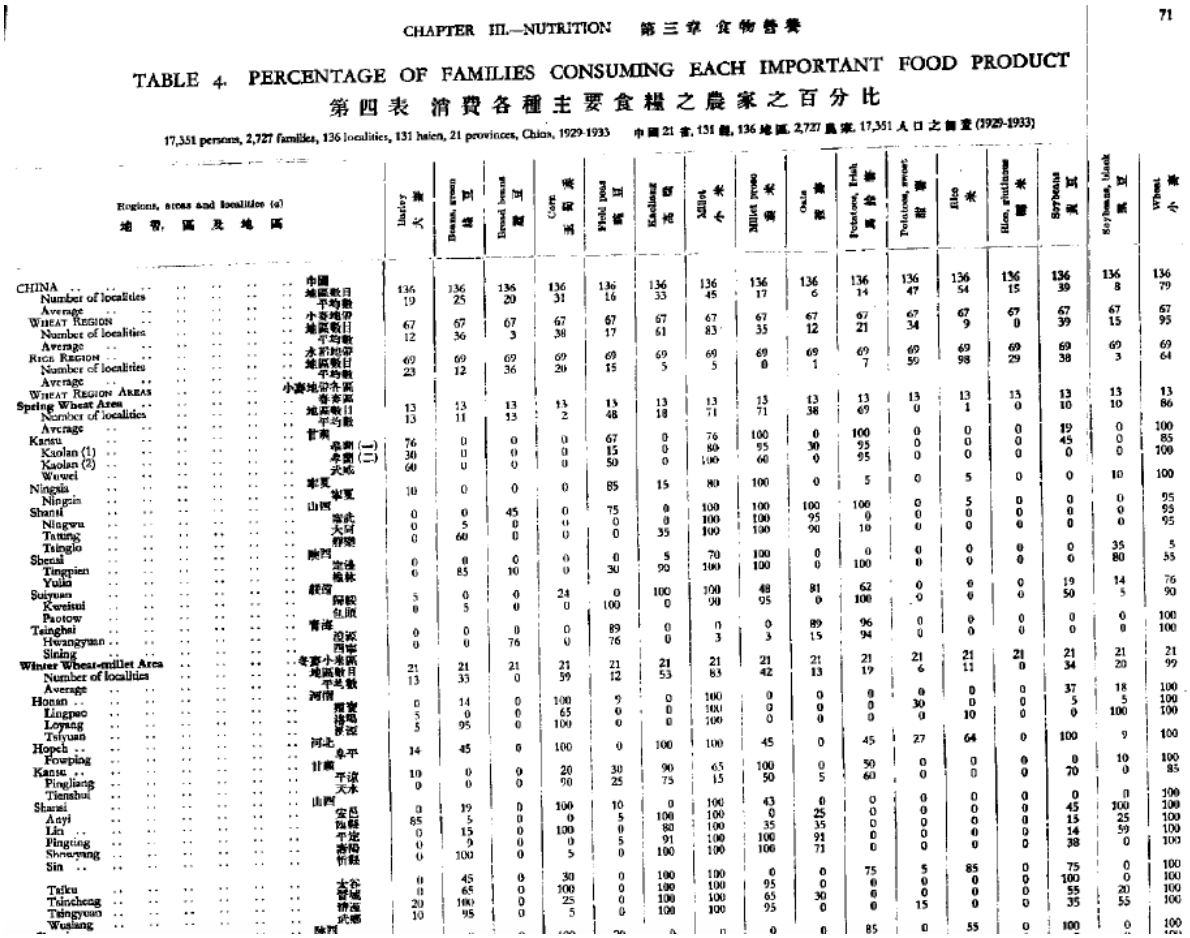
13 Give reasons for the change in the quantity of fertilizer sales.....

XI. FARM WAGES

| Source of information | Kind of labor | Wages per day, month, or year | Value of board furnished | Value of other things furnished | Total labor cost |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |

***Source***: Buck, *Land Utilization in China*, p. 437.

Figure 4. Sample Data for Rural Food Consumption



CHAPTER III.—NUTRITION 第三章 食物營養 71

TABLE 4. PERCENTAGE OF FAMILIES CONSUMING EACH IMPORTANT FOOD PRODUCT

第四表 消費各種主要食糧之農家之百分比

17,351 persons, 2,727 families, 136 localities, 131 hsien, 21 provinces, China, 1929-1933 中國 21 省, 131 縣, 136 地區, 2,727 農家, 17,351 人口之調查 (1929-1933)

| Regions, areas and localities (a) 地帶, 區及地區 | Barley 麥大 | Beans, green 豌豆 | Broad beans 蠶豆 | Corn 玉蜀黍 | Field peas 豌豆 | Kaoliang 高粱 | Millet 粟小 | Millet, proso 黍米 | Oats 燕麥 | Potatoes, Irish 馬鈴薯 | Potatoes, sweet 甘薯 | Rice 米 | Rice, glutinous 糯米 | Soybeans 黃豆 | Soybeans, black 黑豆 | Wheat 麥小 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHINA 中國 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 |
| Number of localities 地區數目 | 19 | 25 | 20 | 31 | 16 | 33 | 45 | 17 | 6 | 14 | 47 | 54 | 15 | 39 | 8 | 79 |
| Average 平均數 | | | | | | | | | | | | | | | | |
| WHEAT REGION 小麥地帶 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| Number of localities 地區數目 | 12 | 36 | 3 | 38 | 17 | 61 | 83 | 35 | 12 | 21 | 34 | 9 | 0 | 39 | 15 | 95 |
| Average 平均數 | | | | | | | | | | | | | | | | |
| RICE REGION 水稻地帶 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Number of localities 地區數目 | 23 | 12 | 36 | 20 | 15 | 5 | 5 | 0 | 1 | 7 | 59 | 98 | 29 | 38 | 3 | 64 |
| Average 平均數 | | | | | | | | | | | | | | | | |
| WHEAT REGION AREAS 小麥地帶各區 | | | | | | | | | | | | | | | | |
| Spring Wheat Area 春麥區 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Number of localities 地區數目 | 13 | 11 | 13 | 2 | 48 | 18 | 71 | 71 | 38 | 69 | 0 | 1 | 0 | 10 | 10 | 86 |
| Average 平均數 | | | | | | | | | | | | | | | | |
| Kansu 甘肅 | | | | | | | | | | | | | | | | |
| Kaolan (1) 皋蘭 (一) | 76 | 0 | 0 | 0 | 67 | 0 | 76 | 100 | 0 | 100 | 0 | 0 | 0 | 19 | 0 | 100 |
| Kaolan (2) 皋蘭 (二) | 30 | 0 | 0 | 0 | 15 | 0 | 80 | 95 | 30 | 95 | 0 | 0 | 0 | 45 | 0 | 85 |
| Wuwei 武威 | 60 | 0 | 0 | 0 | 50 | 0 | 100 | 60 | 0 | 95 | 0 | 0 | 0 | 0 | 0 | 100 |
| Ningxia 寧夏 | | | | | | | | | | | | | | | | |
| Ningxia 寧夏 | 10 | 0 | 0 | 0 | 85 | 15 | 80 | 100 | 0 | 5 | 0 | 5 | 0 | 0 | 10 | 100 |
| Shansi 山西 | | | | | | | | | | | | | | | | |
| Ningwu 寧武 | 0 | 0 | 45 | 0 | 75 | 0 | 100 | 100 | 100 | 100 | 0 | 5 | 0 | 0 | 0 | 95 |
| Tatung 大同 | 0 | 5 | 0 | 0 | 0 | 0 | 100 | 100 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 95 |
| Tsinglo 靜樂 | 0 | 60 | 0 | 0 | 0 | 35 | 100 | 100 | 90 | 10 | 0 | 0 | 0 | 0 | 0 | 95 |
| Shensi 陝西 | | | | | | | | | | | | | | | | |
| Tingpien 定邊 | 0 | 0 | 0 | 0 | 0 | 5 | 70 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 5 |
| Yulin 榆林 | 0 | 85 | 10 | 0 | 30 | 90 | 100 | 100 | 0 | 100 | 0 | 0 | 0 | 0 | 80 | 55 |
| Suiyuan 綏遠 | | | | | | | | | | | | | | | | |
| Kweisui 歸綏 | 5 | 0 | 0 | 24 | 0 | 100 | 100 | 48 | 81 | 62 | 0 | 0 | 0 | 19 | 14 | 76 |
| Paotow 包頭 | 0 | 5 | 0 | 0 | 100 | 0 | 90 | 95 | 0 | 100 | 0 | 0 | 0 | 50 | 5 | 90 |
| Tsinghai 青海 | | | | | | | | | | | | | | | | |
| Hwangyuan 湟源 | 0 | 0 | 0 | 0 | 89 | 0 | 0 | 0 | 89 | 96 | 0 | 0 | 0 | 0 | 0 | 100 |
| Sining 西寧 | 0 | 0 | 76 | 0 | 76 | 0 | 3 | 3 | 15 | 94 | 0 | 0 | 0 | 0 | 0 | 100 |
| Winter Wheat-millet Area 冬麥小米區 | | | | | | | | | | | | | | | | |
| Number of localities 地區數目 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| Average 平均數 | 13 | 33 | 0 | 59 | 12 | 53 | 83 | 42 | 13 | 19 | 6 | 11 | 0 | 34 | 20 | 99 |
| Honan 河南 | | | | | | | | | | | | | | | | |
| Lingpao 靈寶 | 0 | 14 | 0 | 100 | 9 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 18 | 100 |
| Loyang 洛陽 | 5 | 0 | 0 | 65 | 0 | 0 | 100 | 0 | 0 | 0 | 30 | 0 | 0 | 5 | 5 | 100 |
| Tsiyuan 澠池 | 5 | 95 | 0 | 100 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 100 | 100 |
| Hopeh 河北 | | | | | | | | | | | | | | | | |
| Fowping 阜平 | 14 | 45 | 0 | 100 | 0 | 100 | 100 | 45 | 0 | 45 | 27 | 64 | 0 | 100 | 9 | 100 |
| Kansu 甘肅 | | | | | | | | | | | | | | | | |
| Pingliang 平涼 | 10 | 0 | 0 | 20 | 30 | 90 | 65 | 100 | 0 | 50 | 0 | 0 | 0 | 0 | 10 | 100 |
| Tienshui 天水 | 0 | 0 | 0 | 90 | 25 | 75 | 15 | 50 | 5 | 60 | 0 | 0 | 0 | 70 | 0 | 85 |
| Shansi 山西 | | | | | | | | | | | | | | | | |
| Anyi 安邑 | 0 | 19 | 0 | 100 | 10 | 0 | 100 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| Li 臨縣 | 85 | 5 | 0 | 0 | 5 | 100 | 100 | 0 | 25 | 0 | 0 | 0 | 0 | 45 | 100 | 100 |
| Pingting 平定 | 0 | 15 | 0 | 100 | 0 | 80 | 100 | 35 | 35 | 0 | 0 | 0 | 0 | 15 | 25 | 100 |
| Shouyang 壽陽 | 0 | 9 | 0 | 0 | 5 | 91 | 100 | 100 | 95 | 0 | 0 | 0 | 0 | 14 | 59 | 100 |
| Sin 忻縣 | 0 | 100 | 0 | 5 | 0 | 100 | 100 | 100 | 71 | 0 | 0 | 0 | 0 | 38 | 0 | 100 |
| Taiku 太谷 | 0 | 45 | 0 | 30 | 0 | 100 | 100 | 0 | 0 | 75 | 5 | 85 | 0 | 75 | 0 | 100 |
| Tsincheng 晉城 | 0 | 65 | 0 | 100 | 0 | 100 | 100 | 95 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 100 |
| Tsingyuan 武鄉 | 20 | 100 | 0 | 25 | 0 | 100 | 100 | 65 | 30 | 0 | 0 | 0 | 0 | 55 | 20 | 100 |
| Wusiang 陝西 | 10 | 95 | 0 | 5 | 0 | 100 | 100 | 95 | 0 | 0 | 15 | 0 | 0 | 35 | 55 | 100 |

***Source***: Buck, *Land Utilization in China*, p. 71.

## II.3. Critique and applications of Buck's data

Despite Buck's path-breaking achievements, doubts have been raised by Randall E. Stross who sees a link between *Farm Management* (1913) by George F. Warren (who was Buck's mentor at Cornell) and Buck's notion that each Chinese peasant was a businessman in a closed environment.[49] Should a Chinese peasant be very different from a businessman? Stross provides no answer. But numerous studies seem to agree with Buck.[50]

[49] Stross, *Stubborn Earth*, p. 162.

[50] Numerous works, e.g. Sydney D. Gamble, *North China Villages, Social Political, and Economic Activities before 1933* (Berkeley: University of California Press, 1963); G. W. Skinner, 'Marketing and Social Structure in Rural China', *Journal of Asian Studies* 24/1 (1964): 3-44; 24/2 (1965): 195-228; 24/3 (1965): 363-400; Ramon H. Myers, *The Chinese Peasant Economy: Agricultural Development in Hopei and Shangtung, 1890-1949*, Cambridge [Mass.]: Harvard University Press, 1970); Xu Dixin and Wu Chengming, *Zhongguo Zibenzhuyi Fazhan Shi* (*A History of Capitalist Development in China*) (Beijing: People's Press, 1990-3); Li Wenzhi, 'Lun Mingqing Shidai

Others have questioned the 'representativeness' of Buck's data. The critique from Chinese left-wing academics Xue Muqiao (1904-2005) and Qian Junrui (1908-1985),[51] as well as their Western counterparts Joseph W. Esherick and Victor D. Lippit,[52] suggests that as Buck's student-surveyors were from wealthy families they might be biased to rich households, or a 'upper sampling bias', a point that has been shared by many but not been substantiated so far. To begin with consistent bias across China's 22 provinces with multiple surveyors was technically hard to achieve even if one tried. Moreover, there was no obvious clash in findings of Buck and others. For example, the British economic historian Richard Tawney, Buck's contemporary and a fellow CAF-associate, shared a view with Buck that about 70 percent of all rural households in China were small freeholders (meaning that their wealth was confined).[53] A few recent checks have reached the verdict that Buck's data are not biased towards the rich.[54]

---

Nongmin Jingji Shangpinlü' (Marketing Rates of the Peasant Products in Ming-Qing Times), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 1 (1993): 21-42; Wei Jinyu, 'Qingdai Yazu Xintan' (New Approach to Rent Deposits during the Qing), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 3 (1993): 18-35; Shi Zhihong, *Qingdai Qianqide Xiaonong Jingji* (*Petty Farming in the Early Qing Period*) (Beijing: China's Social Sciences Press, 1994); Bozhong Li, *Agricultural Development in Jiangnan, 1620-1850* (London: Macmillan, 1998); Fang Xing, 'Qingdai Diannongde Zhongnonghua' (Tenants Joining the Middle-Income Group during the Qing Period), *Zhongguo Xueshu* (*Chinese Academics*) 2 (2000): 44-61; Myers, Ramon H. and Yeh-chien Wang, 'Economic Developments, 1644-1800', in W. J. Peterson (ed.), *The Cambridge History of China* (Cambridge: Cambridge University Press, 2002), vol. 9, pp. 604-5; Linda Grove, *A Chinese Economic Revolution, Rural Entrepreneurship in the Twentieth Century* (Lanham [MD]: Rowman & Littlefield, 2006).

[51] Qian Junrui, 'Ping Bukai Jiaoshou Suozhu Zhongguo Nongchang Jingji, 1930' (A Review of John Lossing Buck's *Chinese Farm Economy*, 1930) in Xue Muqiao and Feng Hefa (eds), *Zhongguo Nongcun Lunwenxuan* (*Selected Papers on China's Rural areas*) (Beijing: People's Press, 1983), pp. 894-925.

[52] Joseph W. Esherick, 'Number Games: A Note on Land Distribution in Prerevolutionary China', *Modern China*, 7 (1981): 396; Victor D. Lippit, *Land Reform and Economic Development in China* (NY: International Arts and Sciences, 1974).

[53] Buck, *Land Utilization in China*, pp. 194-7; R. H. Tawney, *Life and Labour in China* (New York: Octagon Books, 1964), p. 34; Kang Chao, *Man and Land in Chinese History: An Economic Analysis* (Stanford: Stanford University, 1986), ch. 8.

[54] Xu Daofu, *Zhongguo Jindai Nongye Shengchan Ji Maoyi Tongji Ziliao* (*Agricultural Production and Trade Statistics in Modern China*) (Shanghai: Shanghai People's Press, 1983); Funing Zhong, Hao Hu, and Qun Su, 'Reliability of John Lossing Buck's Land Utilization Survey Data: A Preliminary Test of Grain Yields', in Hao Hu, Funing Zhong and Calum G. Turvey (eds) *Chinese Agriculture in the 1930s* (London: Palgrave Macmillan, 2019), pp. 113-120; and Hisatoshi Hoken, 'Restoration of Micro Data of John Lossing Buck's Survey and Analysis of the Inverse Relationship between Yield and Farm Size in Rural China in the 1930's', *Working Paper No. 248*. Institute of Developing Economies, Japan External Trade Organization (JETRO), 2010.

After all, Buck's classifications speak for themselves: In his *Land Utilization in China, Atlas*, one comes across data for different landholding groups and their distributions across China as 'owner farmers' (*zi geng nong*), 'semi-owner farmers' (*ban zi geng nong*) and 'tenants' (*diannong*).[55] In addition, Buck was fully aware China's rural-urban income gap: Buck's final calculation shows that China's rural per capita consumption obtained from the market was merely 38 *yuan* (US$20) per year,[56] lower than what an unskilled urban waged worker earned at that time.[57]

The present study holds the view that even if Buck's team had had a deliberate bias towards rich peasants, so long as the survey was consistent across all provinces, Buck's data are still sound for quantitative analyses of the alleged 'wealthy pageantry'. So the survey's statistical value remains.

Finally, there has been a group of Marxian historians in Mainland China who view rural China according to Marx's hypothesis and reject anything that does not fit in with Marxism. They believe that most peasants were perpetually poor before 1949 and blame a lack of a good state for it.[58] Typically, Chen Hansheng asserted that rent-seekers – landlords, merchants, moneylenders, and government officials – squeezed the peasantry till the last drop of rural surplus.[59] But one cannot find enough evidence to support such a Marxian and Eurocentric rhetoric for China. Evidence indicates that during the Republican Period, landlords only counted for

[55] John Lossing Buck, *Land Utilization in China, Atlas* (London: Oxford University Press, 1937), ch. 5.
[56] Trescott, *Jingji Xue*, p. 176.
[57] Sydney D. Gamble, 'Peiping Family Budgets', *The Annals of the American Academy of Political and Social Science*, 152/1 (1930): 81-88; Richard H. Tawney, *Life and Labour in China* (New York: Octagon Books, 1964).
[58] Liu Jinhai, 'Cong Lilun Fangwei Dao Lishi Dingwei—Ershi Shiji Sanshi Niandai Zhongguo Nongcun Diaocha Sanda Lilun Paibie Zhizheng' (From Theoretical Orientation to Historical Orientation - The Three Factions' Dispute on the Investigation of Rural Areas in China in the 1930s), *Exploration and Free Views*, no. 9 (2021): 121-30. Also see Myers, *Chinese Peasant Economy*.
[59] Chen Hansheng, 'Sanshi Nianlaide Zhongguo Nongcun' (Chinese Rural Areas in the Past Three Decades), in *Zhongguo Nongcun* (*China's Countryside*), no. 1 (1941): 8-22; Chen Yixin, 'Meiguo Xuezhe Dui Zhongguo Jindai Nongye Jingji Yanjiu', *Research into Chinese Economic History*, no. 1 (2001): 118-124.

two percent of all rural households across 16 provinces.[60] Also, landlords were not always in control of their villages: Of the 41 cases collected in North China by Sidney D. Gamble, only 22 village leaders had over 50 *mu*; 17 had between 4 and 46 *mu*; two owned no land at all.[61] Then, there is the issue of landlords' exploitation. A recent study reveals that the rent burden declined by half from the late Qing to the Republican Period; and 3 percent rural population controlled only about 10 percent of the total rural gross output as rent (*dizhu*).[62]

II.3. Research gaps

So far, Buck's data have not been comprehensively explored quantitatively. At best, the survey has been used as raw data for rudimentary calculations.

This project identifies two research gaps. First, the Great Divergence Debate so far has lacked a China-wide approach, owing to the obvious fact that the Yangzi Delta is a wealthy pocket of China's economy. On the other hand, most China-wide studies up to the Late Qing Period (until 1911) have been estimates-based. Buck's comprehensive survey with real data fills the gap, given that the rural economy in the early twentieth century remained indigenous/traditional and dominated China's economy with *circa* 80 percent share of the total workforce.[63] Thus, the rural sector in the early twentieth century can either be taken as a close proxy for China's traditional economy or as the best practice along China's long-term growth trajectory, be it a 'high level equilibrium trap'.[64]

Secondly, in terms of rural economic life, before 1949, the production function (*à la* neo-classic economics) and village life in China were self-determined with

[60] John K. Fairbank (ed.), *The Cambridge History of China, Republican China 1912–1949, Part I* (Cambridge: Cambridge University Press, 1983), vol. 12, p. 84.
[61] Fairbank, *Cambridge History of China*, vol. 12, pp. 322, 332; also p. 167.
[62] Gao Wangling, *Zudian Guanxi Xinlun: Dizhu, Nongmin He Dizu* (*New Theory of Tenancy: Landlords, Tenants and Rents*) (Shanghai: Shanghai Book Press, 2005), pp. 9, 12, 20, 29-30, 33-61, 75-6, 177-8. These figures are very similar to those during the Qing, see Li Wenzhi and Jiang Taixin, *Zhongguo Dizhuzhi Jingji Lun* (*The Landlord Economy in China*) (Beijing: China's Social Sciences Press, 2005), pp. 320-8.
[63] John Lossing Buck, 'Agriculture and the Future of China', *The Annals of the American Academy of Political and Social Science* 152/1 (1930): 109.
[64] Mark Elvin, *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973), p. 313.

private landholding:[65] (1) most villagers owned farmland and made their own production decisions, (2) village heads were elected annually and 'village associations' determined communal affairs including law and order, festivals, taxes, and public goods provision.[66] As far as one can tell, this was also the norm under the Qing rule (1644-1911). So, the rural situation in the 1920s and 30s can be justifiably taken as a snapshot of China's indigenous farming economy because drastic changes that made China's traditional growth trajectory discontinued between 1949 and 1958 marked by the notorious 'Drive for People's Communes', when 120 million rural farming households were forcefully rounded up to join 23,400 'people's communes' (*renmin gongshe*). Each commune captured several dozen traditional villages.[67] In the process, rural households no longer possess land and lived on their labour inputs in their collective production brigades (*shengchandui*) called 'wage points' (*gongfen*). Not until 1979, did China's 4.7 million production brigades become obsolete and peasants regain some production autonomy, thanks to under Deng Xiaoping's reforms. Even so, China's national employment pattern was dominated by the agricultural sector by as late as the 1970s.[68]

## III. Quantitative Analysis

### III.1. General socio-economic conditions

To begin with, it is vital to understand some general socio-economic conditions for China's agricultural sector to operate in the 1920s and 30s: (1) Agriculture dominated China's national economy and employed 75 percent of the country's

[65] E.g. Skinner, 'Marketing and Social Structure in Rural China'.
[66] Gamble, *North China Villages*, pp. 62, 139, 140, 167, 171-4, 179, 181-4, 187-91, 196-208, 216-20, 232-9, 266-84, 324-30, 322, 335-6, 339-41.
[67] Huang Daoxia, Yu Zhan and Wang Xiyü, *Jianguo Yilai Nongye Hezuohua Shiliao Huibian* (*Collected Historical Materials of Agricultural Collectivisation since 1949*) (Beijing: Central Party History Press, 1992), pp. 500-3.
[68] For instance, the proportion of agriculture in China's national income was 71 per cent in 1920 and 65 per cent before 1937. By contrast, the proportion of income from industry, mining, and transportation was approximately 20 per cent in 1936. See Wu Chengming, *Zhongguo Ziben Zhuyi Guonei Shichang* (*Chinese capitalism and domestic market*) (Beijing: China Social Sciences Press, 1985); and Dwight H. Perkins, *China's Modern Economy in Historical Perspective* (Stanford: Stanford University Press, 1975), p. 117.

total workforce (as in 1946).[69] In comparison, the newly emerging industrial and transport hub Shanghai hired a total of 223,000 factory workers in the 1930s.[70] (2) Farming was a privately incentivized economy in which a vast majority of households legally owned their land and made their production decisions on a daily basis (i.e. what to produce, how to produce, when to produce and for whom to produce).[71] (3) There was neither obvious income polarization,[72] nor obvious landholding concentration in the rural sector.[73] (4) China did not depend on food imports from outside although agricultural products were subject to internal trade on a regular basis.[74]

III.2. Overview of Buck's data

Our *prime facie* findings from Buck's survey reveal that China's national average farm size was 1.69 hectares (Table A, Appendix). The national average labour input consisted of two adult men (or their equivalent) plus one draught animal per farm.[75] Regarding the end-result, rural China's average per diem reached an average of 3295 kilocalories per capita, based on data for 136 localities in 21

[69] See D. K. Lieu and Ta-Cheun Liu, *China's Economic Stabilization and Reconstruction* (New Brunswick: Rutgers University Press, 1948), p. 5.
[70] Xu Xuejun, *Shanghai Jindai Shehui Jingji Fazhan Gaikuang, 1882–1931* (*A Survey of Shanghai's Socio-economic Development in Early Modern Times, 1882–1931*) (Shanghai: Shanghai Social Science Press, 1985), p. 275.
[71] At least 70 percent rural population were 'owner-tillers'; see Fairbank, *Cambridge History of China*, vol. 12, p. 84.
[72] Han Hu and Zhongwei Yang, 'Agricultural Poverty and Inequality in 1930s China', in H. Hu, F. Zhong, and C. Turvey (eds) *Chinese Agriculture in the 1930s* (Cham: Palgrave Macmillan, 2019), pp. 153-69.
[73] Thomas G. Rawski and Lillian M. Li (eds), *Chinese History in Economic Perspective* (Berkeley: University of California Press, 1992), pp. 181-3; Li and Jiang, *Landlord Economy in China*, pp. 308, 310, 322. More tellingly, Kang Chao used village-level information from local gazetteers and surveys by Japanese South Manchurian Railway Company and National Land Commission of the Republican Government and discovered that landholding in North China became more equal over 800 years, see his *Man and Land in Chinese History: An Economic Analysis* (United States: Stanford University Press, 1986).
[74] Skinner, 'Marketing and Social Structure in Rural China'; Tang Xianglong, *Zhongguo Jindai Haiguan Shuishou He Fenpei Tongji* (*Data for Customs Revenue and Its Distribution in Modern China*) (Beijing: Zhonghua Books, 1992).
[75] The data cover 21 provinces: Kansu, Ningsia, Shansi, Shensi, Suiyuan, Tsinghai, Honan, Hopeh, Anhwei, Kiangsu, Shantung, Chekiang, Hupeh, Kiangsi, Fukien, Hunan, Szechwan, Kwangsi, Kwangtung, Yunan, and Kweichow. See Buck, *Land Utilization*, pp. 131, 297.

provinces.[76] Thus, China's agriculture really worked; and the average rural person was well fed,[77] a key point made by Pomeranz's utility approach.[78]

Secondly, if one probes further, in terms of the factor input of *land*, China's landholding structure appeared to be olive-shaped with which the 'middle stratum' dominated in all farming zones (Table 1).

Table 1. Farm Sizes and Their Shares in Different Zones

| Scope | Percentage in Total | | | | | | |
|---|---|---|---|---|---|---|---|
| | Small | Medium | Medium-large | Large | Very large | Super-large | Total |
| China-wide | 23 | 38 | 21 | 11 | 7 | 1 | 100 |
| Wheat mega-zone | 24 | 35 | 18 | 12 | 9 | 2 | 100 |
| Rice mega-zone | 22 | 40 | 22 | 10 | 6 | 0 | 100 |
| Spring wheat zone | 23 | 33 | 21 | 11 | 9 | 3 | 100 |
| Winter wheat-millet zone | 24 | 39 | 16 | 12 | 9 | 0 | 100 |
| Winter wheat-kaoliang zone | 25 | 34 | 17 | 13 | 10 | 2 | 100 |
| Yangtze rice-wheat zone | 24 | 41 | 19 | 10 | 6 | 0 | 100 |
| Rice-tea zone | 21 | 38 | 23 | 11 | 6 | 0 | 100 |
| Szechwan rice zone | 21 | 36 | 22 | 13 | 8 | 0 | 100 |
| Double cropping rice zone | 20 | 40 | 25 | 10 | 5 | 0 | 100 |
| Southwestern rice zone | 22 | 45 | 23 | 7 | 4 | 0 | 100 |

***Source***: Buck, *Land Utilization*, *Statistics*, pp. 289-91.

Thirdly, in terms of the factor input of *labour*, the dominant source was families' own members. According to Buck's data, the percentage of hired labour was 20

[76] Buck, *Land Utilization*, p. 73.
[77] Noted, 2100 kilocalories have been prescribed by the Food and Agriculture Organization for 'food security', see Food and Agriculture Organization, 'Food Energy - Methods of Analysis and Conversion Factors', *Food and Nutrition Paper* 77 (Rome, 2002). According to Elisabeth Croll, under Mao's planned economy, the rural food rationing was about 1,300 calories per head per day, which is a 'famine diet'; see Elisabeth Croll, *The Family Rice Bowl, Food and the Domestic Economy in China* (Geneva: UNRISD, 1983), pp. 158, 163.
[78] Pomeranz, *Great Divergence*, ch. 1.

percent in the winter wheat-kaoliang zone in the north. The share was halved to 10 percent in the more productive part of China (as in the double cropping rice zone in the south) (Table 2). Incidentally, during the same period, landlords only counted for two percent of all households across China's 16 provinces.[79] Thus, the rural class structure also appeared to be olive-shaped with which the 'middle stratum' dominated. Buck's survey rebuffs the Marxian notion of 'rural proletarianization' or 'rural class polarization' in Republican China.[80]

Table 2. Hired Labour per Farm in Different Zones

| Agricultural areas | Input, adult male-equivalent | Hired labour, adult male-equivalent | Hired labour in all labour input (Index) |
|---|---|---|---|
| China-wide | 2.0 | 0.3 | 15% (100) |
| Spring wheat zone | 2.0 | 0.3 | 15% (100) |
| Winter wheat millet zone | 1.6 | 0.2 | 13% (87) |
| Winter wheat-kaoliang zone | 2.0 | 0.4 | 20% (133) |
| Yangtze Rice-wheat zone | 2.3 | 0.3 | 13% (87) |
| Rice-tea zone | 1.6 | 0.2 | 13% (87) |
| Szechwan rice zone | 2.0 | 0.3 | 15% (100) |
| Double cropping rice zone | 2.3 | 0.2 | 9% (60) |
| Southwestern rice zone | 2.0 | 0.3 | 15% (100) |

***Source***: Buck, *Land Utilization,* p. 305.

Moreover, as a factor of input, draught animals that substitute human muscles were employed more intensively by small farms (Table 3). But the power of draught animals was not translated into farming output, and hence commanded no obvious advantage (Figure I, Appendix).

[79] Fairbank, *Cambridge History of China*, vol. 12, p. 84.
[80] Mao Zedong, 'Zhongguo Shejui Gejiejide Fenxi' (Analysis of All Social Classes in China), in Mao Zedong, *Mao Zedong Xuanji* (*Selected Works of Mao Zedong*) (Beijing: People's Press, 1986), vol. 1, p. 9.

Table 3. Draught Animals per Hectare

| Scope | Very small farms | Small farms | Medium farms | Medium-large farms | Large farms | Very large farms | All farms |
|---|---|---|---|---|---|---|---|
| China-wide | 1.24 | 1.24 | 0.87 | 0.72 | 0.59 | 0.53 | 0.71 |
| Spring wheat zone | 0.69 | 1.19 | 0.93 | 0.78 | 0.64 | 0.58 | 0.73 |
| Winter wheat-millet zone | 1.07 | 0.83 | 0.76 | 0.71 | 0.53 | 0.53 | 0.61 |
| Winter wheat-kaoliang zone | 0.85 | 0.8 | 0.57 | 0.47 | 0.4 | 0.38 | 0.45 |
| Yangtze rice-wheat zone | 0.92 | 1.01 | 0.58 | 0.48 | 0.39 | 0.4 | 0.48 |
| Rice-tea zone | 1.91 | 1.24 | 0.92 | 0.73 | 0.63 | 0.49 | 0.7 |
| Szechwan rice zone | 0.85 | 2.03 | 0.86 | 0.67 | 0.55 | 0.57 | 0.65 |
| Double cropping rice zone | 1.39 | 1.35 | 1.08 | 1.87 | 0.71 | 0.61 | 0.89 |
| Southwestern rice zone | 2.43 | 3.43 | 2.59 | 2.03 | 2.01 | 1.5 | 2.25 |

***Data***: Buck, *Land Utilization*, p. 199.

Fourthly, output-wise, China operated along the line of 'diseconomies of scale' with which smaller farms produced consistently more from per hectare of land across all regions (Table 4a). From a comparative perspective, the Great Divergence was deeply rooted in the diseconomies of scale on China's side (Table B, Appendix).

Table 4a. Farm Sizes and Annual Grain Yields per Hectare, in Kg, 1929–1933

| Scope | Small | Medium | Medium-large | Large | Very large | All farms |
|---|---|---|---|---|---|---|
| China-wide | 1723.4 | 1726.6 | 1673.6 | 1621.1 | 1455.4 | 1663.9 |
| Wheat mega-zone | 1024.7 | 1062.6 | 1010.7 | 984.0 | 896.1 | 1013.3 |
| Rice mega-zone | 2608.3 | 2572.3 | 2397.1 | 2578.9 | 2383.2 | 2489.6 |
| Spring wheat zone | 363.2 | 480.1 | 410.6 | 372.9 | 439.6 | 456.0 |
| Winter wheat-millet zone | 1230.0 | 1060.9 | 1078.2 | 1013.4 | 1015.5 | 1040.5 |
| Winter wheat-kaoliang zone | 1377.3 | 1368.8 | 1290.2 | 1314.3 | 1100.2 | 1283.6 |
| Yangtze Rice-wheat zone | 2140.0 | 1985.0 | 1756.2 | 2217.7 | 1832.5 | 1913.7 |
| Rice-tea zone | 2656.4 | 2589.7 | 2623.2 | 2532.6 | 2600.8 | 2664.0 |
| Szechwan rice zone | 1944.5 | 2431.9 | 2654.8 | 2416.5 | 3373.1 | 2556.9 |
| Double cropping rice zone | 3021.4 | 2808.1 | 3276.0 | 3180.8 | 2741.3 | 3680.0 |
| Southwestern rice zone | 4650.0 | 4075.6 | 3817.5 | 3211.6 | 1855.4 | 3731.1 |

***Source***: Buck, *Land Utilization*, pp. 291, 297, 302.

Furthermore, Buck's data show that the Yangzi Delta was not the most productive zone in farming. The most productive zones were in China's deep south where output per hectare was greatest (Table 4b).

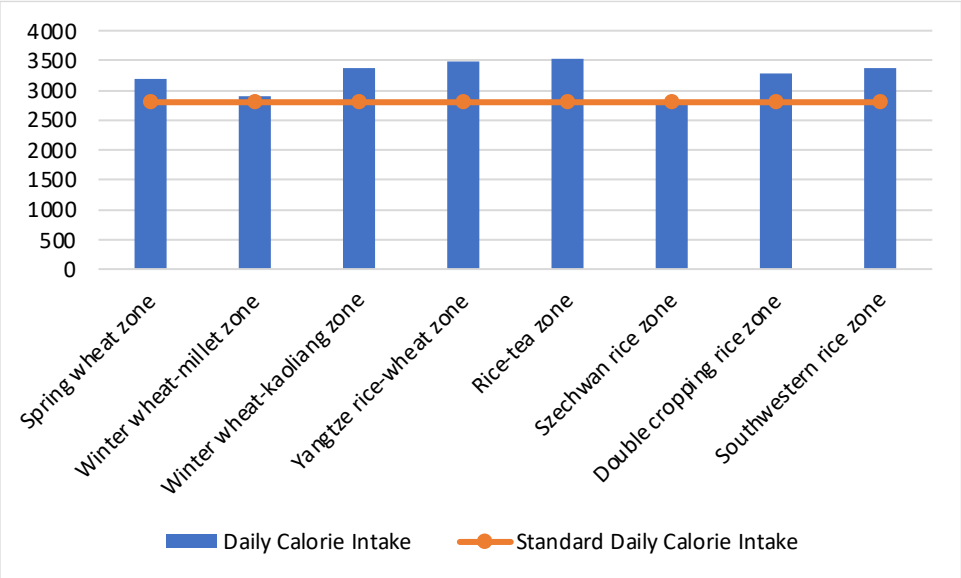
Table 4b. Annual Grain Yields per Hectare, National Average = 100

| Scope | Small | Medium | Medium-large | Large | Very large | All farms |
|---|---|---|---|---|---|---|
| China-wide | 100 | 100 | 100 | 100 | 100 | 100 |
| Wheat mega-zone | 59.5 | 61.5 | 60.4 | 60.7 | 61.6 | 60.9 |
| Rice mega-zone | 151.3 | 149.0 | 143.2 | 159.0 | 163.7 | 149.6 |
| Spring wheat zone | 21.1 | 27.8 | 24.5 | 23.0 | 30.2 | 27.4 |
| Winter wheat-millet zone | 71.4 | 61.4 | 64.4 | 62.5 | 69.8 | 62.5 |
| Winter wheat-kaoliang zone | 79.9 | 79.3 | 77.1 | 81.1 | 75.6 | 77.1 |
| Yangtze Rice-wheat zone | 124.2 | 115.0 | 105.0 | 136.8 | 125.9 | 115.0 |
| Rice-tea zone | 154.1 | 150.0 | 156.7 | 156.2 | 178.7 | 160.1 |
| Szechwan rice zone | 112.8 | 140.8 | 158.6 | 149.1 | 231.8 | 153.7 |
| Double cropping rice zone | 175.3 | 162.6 | 195.7 | 196.2 | 188.3 | 221.1 |
| Southwestern rice zone | 269.8 | 236.0 | 228.1 | 198.1 | 127.5 | 224.2 |

***Source***: the same as Table 4a.

Finally, there is the issue of *living standards* as the end-result of farming. All surveyed 136 localities in 21 provinces achieved an average level of 3295 kilocalories per capita per day, well above the 2800 mark (Figure 5).

Figure 5. Daily Calorie Intake in Different Zones

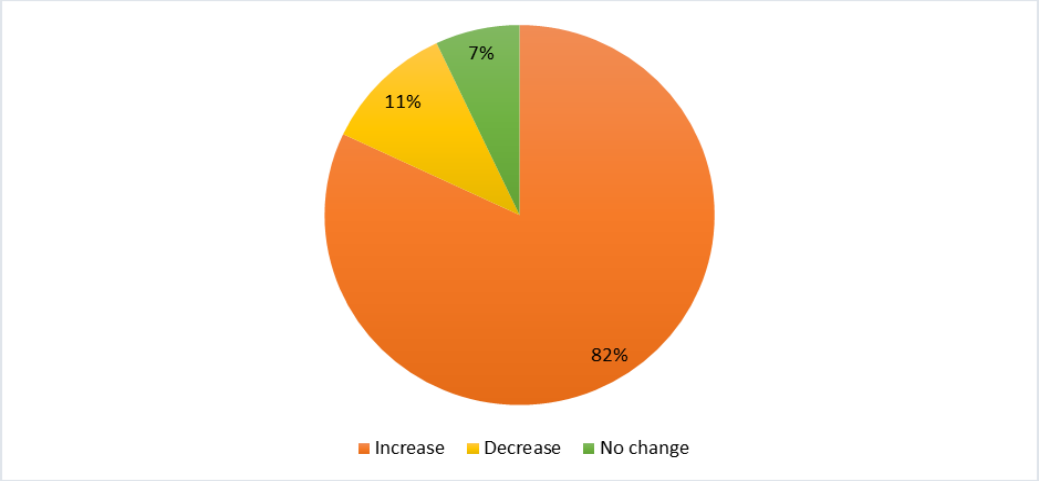



***Note***: 2800 kilocalories per day is used as the floor level of food intake.
***Source***: Buck, *Land Utilization*, p. 73.

In addition, a majority (82 percent) of surveyees reported improvement in their living standards in recent years versus 11 percent of rural households reporting a decline in quality of life (Figure 6).[81]

[81] Buck, *Land Utilization*, p. 400.

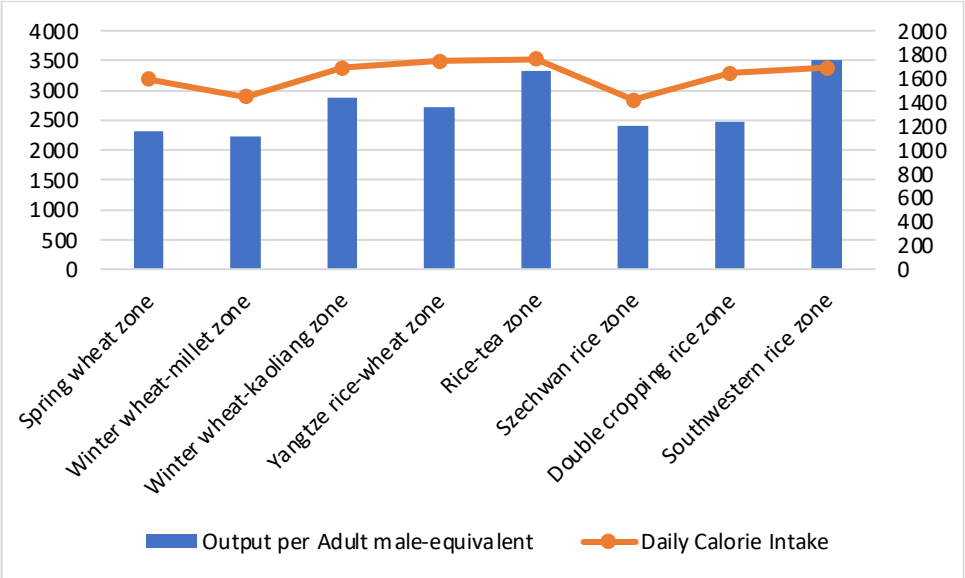
Figure 6. Changes in Living Standards, 1929–1933




***Source***: Buck, *Land* Utilization, pp. 400-2.

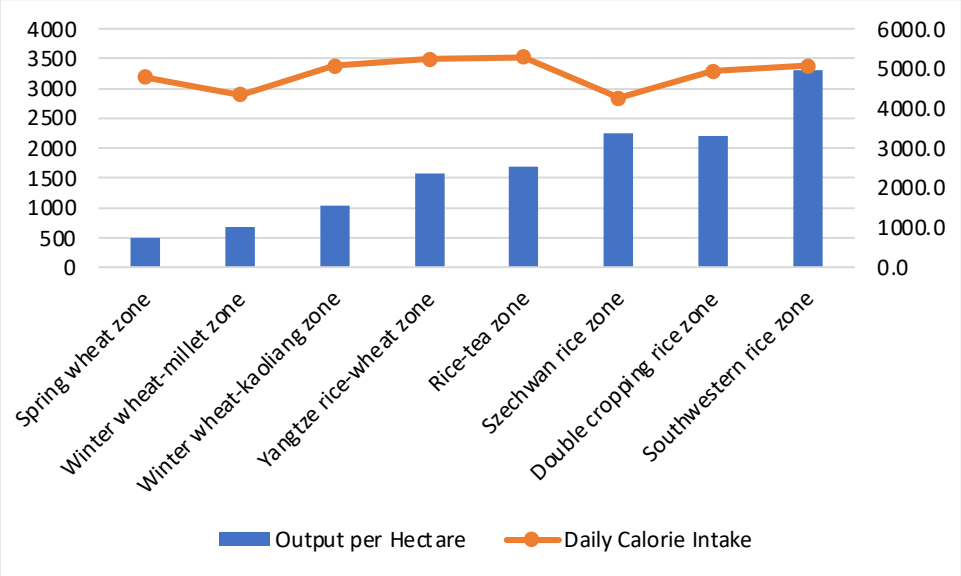
However, factor inputs' impact on living standards varied. Figure 7 shows a rather close correlation between labour input and food consumption. In comparison, such a correlation was unclear between land input and food consumption (Figure 8).

Figure 7. Output per Adult Male-equivalent vs Daily Calorie Intake




***Source***: Buck, *Land Utilization*, pp. 73, 301.

Figure 8. Output per Hectare vs Daily Calorie Intake




***Source***: Buck, *Land Utilization*, pp. 73, 291, 301, 305.

III.3. Variables for empirical modelling

Data used by this study is constructed based on Buck's survey on agriculture production inputs, rural incomes, consumption and living standards in 1930s China.[82] The way information is extracted for Buck's dataset as follows: (1) Buck's *Land Utilization in China: Statistics* is manually digitalized by this project; (2) a dataset with 115 observed localities (out of a total of 136 surveyed) is aggregated to ensure a relatively large sample size with fewer missing variables;[83] (3) localities where missing information exists are excluded.[84] Table 5 presents a summary statistics of our dataset.

[82] Regarding the limitation of Buck' survey, to be specific, it mainly arises from the surveying method. The undergraduates and graduates in the University of Nanking are sent back to survey their own home towns. Each student will be required to investigate 100 families from different income groups in the given location. As students in the University of Nanking normally belongs to richer families at that time, they may inadvertently select a group of households that are relatively richer

[83] 'Locations' were where Buck's team carried out its survey.

[84] The dataset covers Chekiang, Honan, Hopeh, Hunan, Hupeh, Kansu, Kiangsi, Kiangsu, Kwangtung, Kweichow, Ningsia, Shansi, Shantung, Shensi, Szechwan and Yunnan.

Table 5. Statistical Description

| | N | Mean | S. D. |
|---|---|---|---|
| Output or yield per farm (kilograms) | 115 | 2786.891 | 1399.513 |
| Share of localities with increased incomes | 115 | 0.817 | 0.388 |
| Daily consumption of grain per capita (grams) | 115 | 763.722 | 202.363 |
| Daily consumption of fruits per capita (grams) | 115 | 14.762 | 17.378 |
| Daily consumption of vegetables per capita (grams) | 115 | 202.218 | 142.392 |
| Standard deviation of daily consuming quantities across foods | 115 | 307.265 | 79.650 |
| Daily calorie intake per capita | 115 | 3425.930 | 716.629 |
| Acreage per farm (hectares) | 115 | 1.487 | 0.860 |
| Labourers per farm | 115 | 1.812 | 0.510 |
| Draught animals per farm | 115 | 1.128 | 0.742 |
| Local yearly wage level (in silver dollars) | 115 | 82.357 | 23.049 |
| Average Transportation costs per ton-mile (in silver dollars) | 115 | 0.597 | 0.408 |
| Share of tenants among all farmers | 115 | 0.179 | 0.163 |
| Share of land under rice | 115 | 0.205 | 0.247 |
| Government taxes per hectare (in silver dollars) | 115 | 10.995 | 39.450 |
| Number of droughts per decade | 115 | 2.971 | 3.066 |

***Note***: The statistics are calculated by the authors.

In light of works by Richard A. Easterlin and Mark R. Montgomery et al.,[85] three variables are adopted as determinants of agricultural output: output per farm, output per labourer, and output per hectare. They capture effects of factors on total output, labour productivity and land productivity, respectively.

This study employs Buck's data for crop yields, incomes, and daily nutrition intakes as other measures of living standards.[86] Rural communities in China's southeast half produced more, earned more and consumed more (Panels *a*, *c*, *d*, *f* in Figure 9), highly compatible with Huan-Yong Hu's economic demography of the time. [87] Additionally, Buck's survey contains self-reported improvements in

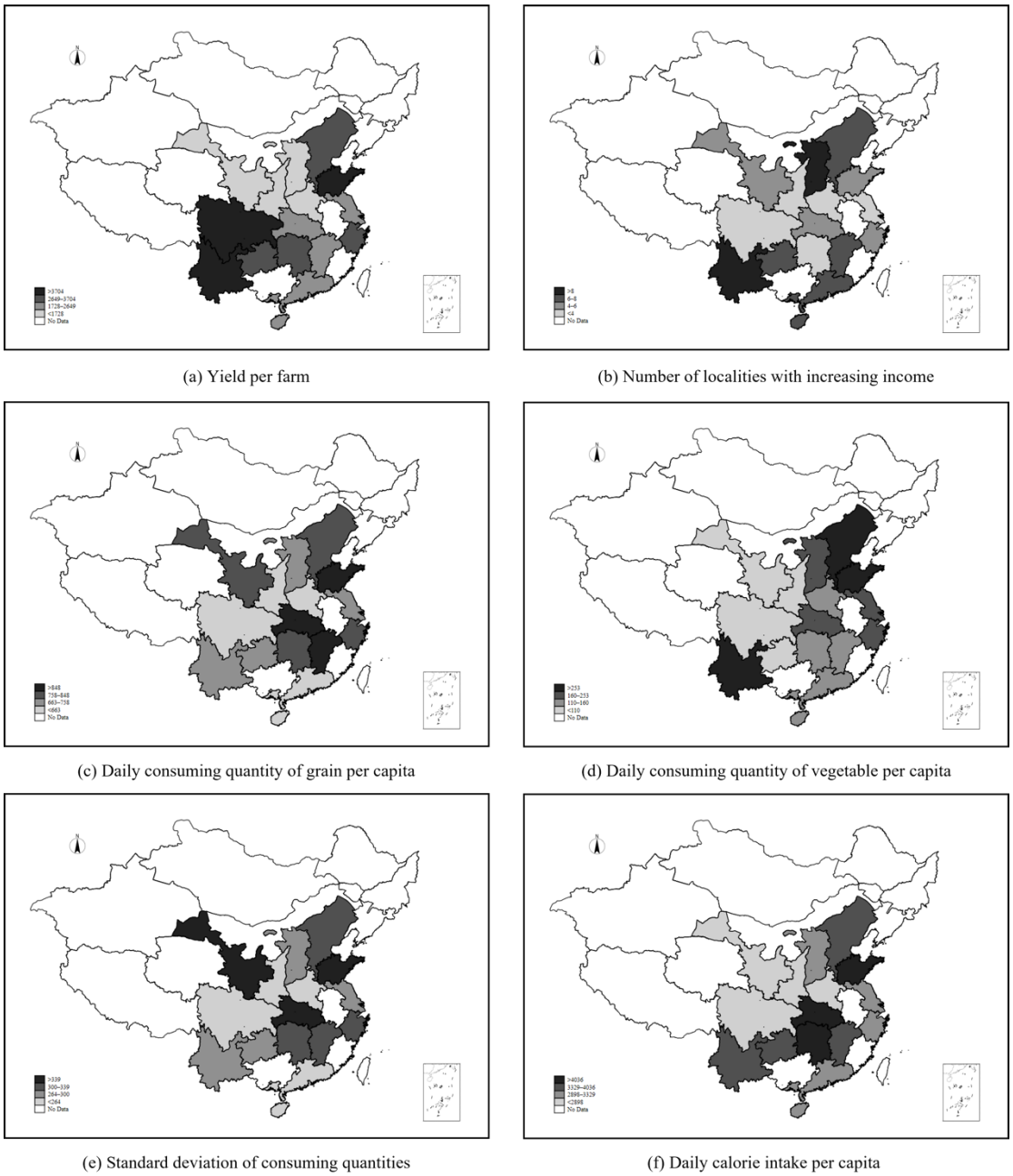
[85] Richard A. Easterlin, 'The Worldwide Standard of Living since 1800', *Journal of Economic Perspectives* 14.1 (2000): 7-26; Mark R. Montgomery, Michele Gragnolati, Kathleen A. Burke, Edmundo Paredes, 'Measuring Living Standards with Proxy Variables', *Demography* 37.2 (2000): 155-174.

[86] In the spirit of Robert C. Allen, Jean-Pascal Bassino, Debin Ma, Christine Moll-Murata, and Jan Luiten van Zanden, 'Wages, Prices, and Living Standards in China, 1738-1925: In Comparison with Europe, Japan, and India', *Economic History Review* 64, Special Issue (2011): 8-38.

[87] Huan-Yong Hu, 'The Distribution of Population in China, with Statistics and Maps', *Acta Geographica Sinica* 2/2 (1935): 33-74.

material life. A high proportion - 85.1 percent of all localities - responded positively (Panel *b*, Figure 9). Figure 10 shows scattered plots.

Figure 9. Area-level Variables



(a) Yield per farm

(b) Number of localities with increasing income

(c) Daily consuming quantity of grain per capita

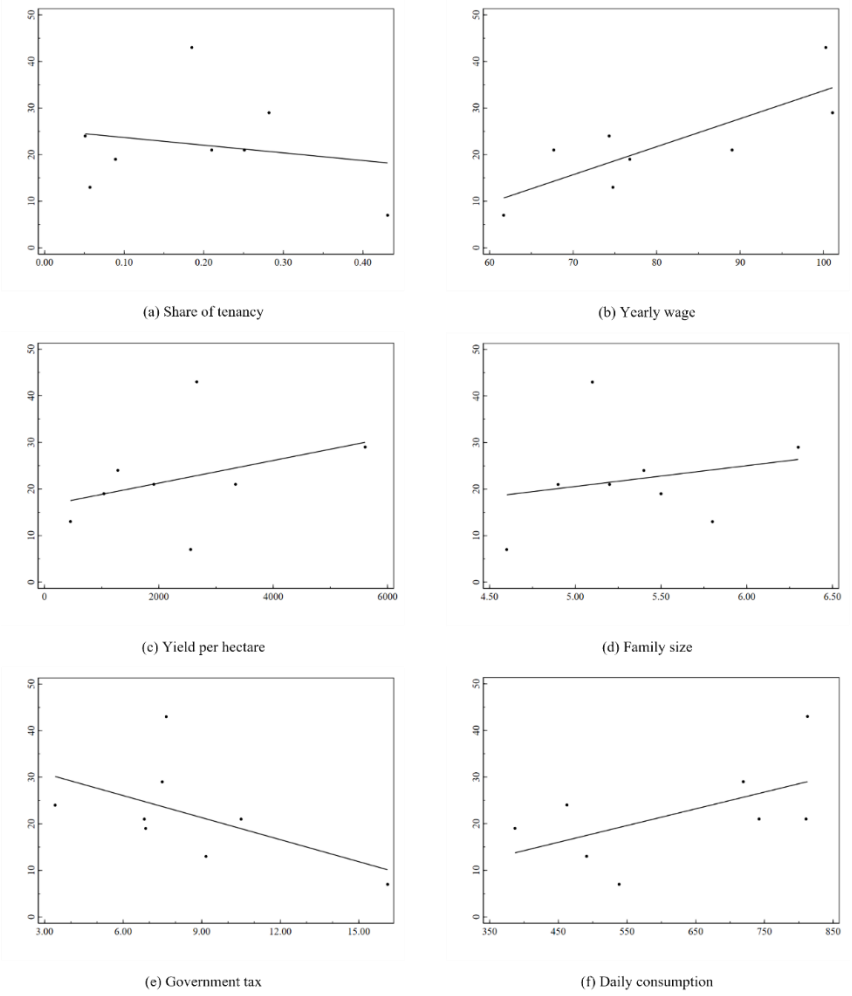
(d) Daily consuming quantity of vegetable per capita

(e) Standard deviation of consuming quantities

(f) Daily calorie intake per capita

***Source***: Buck, *Land Utilization in China*.

Figure 10. Variables and Scattered Plots




Source: Buck, *Land Utilization in China*.

III.4. Empirical modelling

To identify the determinants of living standard in 1930s China, we link agricultural outputs with farming inputs in a regression model:[88]

$$\ln(AgriOutput_{l,p,a}) = \alpha + \beta AgriInputs_{l,p,a} + \mu Socioeco_{l,p,a} + \gamma_a + \varepsilon_{l,p,a} \qquad (1)$$

Where $\ln(AgriOutput_{l,p,a})$ is the logarithm of agricultural output (i.e. output per farm, output per labourer and output per hectare) in locality $l$, province $p$ and

[88] In light of works by John Knight, S. O. N. G. Lina, and Ramani Gunatilaka, 'Subjective Well-Being and Its Determinants in Rural China', *China Economic Review* 4/20 (2009): 635-649; Ada Ferrer-i-Carbonell and Paul Frijters, 'How Important Is Methodology for the Estimates of the Determinants of Happiness?', *Economic Journal* no. 497, vol. 114 (2004): 641-659.

agricultural area $a$. $AgriInputs_{l,p,a}$ is a set of agricultural inputs that are directly related to yields, which includes the logarithm of size per farm, the logarithm of labour per farm, and the logarithm of draught animals per farm. $Socioeco_{l,p,a}$ represents 'socio-eco-economic factors' (taxes, transport costs, tenancy rates, rice cropping, and droughts representing disasters) that may affect agricultural output. It includes the share of land devoted to rice cropping, the logarithm of government taxes, and tenancy rate, and the logarithm of the number of droughts. Therefore, $\beta$ ($\mu$) captures the correlation between farming yield and various agricultural inputs.

However, some unobserved factors may still bias our regression results if they are correlated with both agricultural output and independent variables. To address such concerns, we utilize the classification of each locality into an agricultural area as an advantage and control the area-level fixed effects ($\gamma_a$).[89] It allows us to rule out the bias induced by potential unobservables that are fixed at the area (provincial) level (e.g., climatic factor, natural endowments, culture and diet preference).[90] $\varepsilon_{l,p,a}$ is the error term.

Further, we replace the agricultural outputs with changes in farmer's income to specify a new equation:

$$IncIncr_{l,p,a} = \alpha + \delta \ln (AgriProd_{l,p,a}) + \eta Socioeco_{l,p,a} + \gamma_a + \varepsilon_{l,p,a} \quad (2)$$

Where $IncIncr_{l,p,a}$ is a dummy variable which equals one if the income of farmers increases, otherwise zero. ln ($AgriProd_{l,p,a}$) is the logarithm of output per labourer, indexing the agricultural production. $Socioeco_{l,p,a}$ is a set of socio-eco-economic factors. In addition, we incorporate two more factors: the logarithm of local wage level and the logarithm of Transportation costs. Other terms follow Equation (1).

[89] The agricultural area includes double cropping rice area, rice tea area, southwestern rice area, Yangtze rice-wheat area, spring wheat area, winter wheat-kaoliang area and winter wheat-millet area.

[90] Note: in the following Table 7, we further control the province-level fixed effect.

Finally, we employ food consumption as a proxy for living standards. The regression model is given in equation (3):

$$\ln(Consum_{l,p,a}) = \alpha + \pi \ln(AgriProd_{l,p,a}) + \xi Socioeco_{l,p,a} + \gamma_a + \varepsilon_{l,p,a} \quad (3)$$

$\ln(Consum_{l,p,a})$ is the logarithm of food consumption (i.e. daily per capita intake of grain, fruits and vegetables; the standard deviation of consuming quantity across different types of foods; and the daily per capita calorie intake). As in Equation (2), $\ln(AgriProd_{l,p,a})$ is the logarithm of output per capita; $Socioeco_{l,p,a}$ is a set of socio-eco-economic factors; $\gamma_a$ is the area-level fixed effects; and $\varepsilon_{l,p,a}$ is the error term.

III.5. Analysis in detail

We firstly deploy Equation (1) and use farms' yields to measure economic returns. Column by column, we add both production inputs and socio-eco-economic factors. Table 6 reports our findings.

Table 6. Factors and Their Impact on Farming Outputs

| Dep. var. | ln (*Output per farm*) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| ln (*Land per farm*) | 0.873*** | 0.658*** | 0.692*** | 0.693*** | 0.698*** | 0.719*** | 0.722*** |
| | (0.103) | (0.099) | (0.110) | (0.111) | (0.120) | (0.147) | (0.148) |
| ln (*Labourers per farm*) | | 1.005*** | 1.042*** | 1.040*** | 1.031*** | 1.016*** | 0.968*** |
| | | (0.202) | (0.221) | (0.221) | (0.221) | (0.227) | (0.250) |
| ln (*Draught animals per farm*) | | | -0.104 | -0.101 | -0.104 | -0.113 | -0.099 |
| | | | (0.171) | (0.168) | (0.171) | (0.177) | (0.180) |
| *Share of land under rice* | | | | -0.028 | -0.031 | -0.019 | 0.004 |
| | | | | (0.226) | (0.229) | (0.236) | (0.231) |
| ln (*Government taxes*) | | | | | 0.014 | 0.018 | 0.017 |
| | | | | | (0.052) | (0.056) | (0.058) |
| *Tenancy rate* | | | | | | -0.085 | -0.168 |
| | | | | | | (0.247) | (0.256) |
| ln (*Number of droughts*) | | | | | | | -0.042 |
| | | | | | | | (0.052) |
| Area FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 7.798 | 7.798 | 7.798 | 7.798 | 7.798 | 7.798 | 7.798 |
| Observations | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.665 | 0.715 | 0.713 | 0.710 | 0.707 | 0.705 | 0.705 |
| $R^2$ | | | | | | | 0.739 |
| $F$ test | | | | | | | 17.725 |
| Prob > $F$ | | | | | | | 0.000 |

***Note***: (1) Robust standard errors are in parentheses and are clustered at the locality level; (2) *** p<0.01.

As shown in Table 7, the socio-eco-economic factors are insignificant. So, their importance has so far been overplayed by many.[91] In comparison, farmland (capital) and labourers (labour) both play crucial roles in determining farming output. The correlations captured in Columns 2-7 also show that the impact of labour is consistently greater than that of farmland, which challenges the 'man-

[91] E.g. Zhang Youyi, *Zhongguo Jindai Nongyeshi Ziliao* (*Materials for Agricultural History on Early Modern China*) (Beijing: Sanlian Books, 1957), vol. 3; Yeh-chien Wang, *Late Taxation in Imperial China, 1750-1911* (Cambridge [Mass.]: Harvard University Press, 1973); Madeleine Zelin, *The Magistrate's Tael: Rationalizing Fiscal Reform in Eighteenth-Century Ch'ing China* (Berkeley: University of California Press, 1984); Zhou Yuanlian and Xie Zhaohua, *Qingdai Zudianzhi Yanjiu* (*Study of Tenancy in the Qing Period*) (Shenyang: Liaoning People's Press, 1986); Rawski, *Economic Growth in Prewar China*, pp. 209-17; Song Zhenghai, Gao Jianguo, Sun Guanlong, and Zhang Binglun, *Zhogguo Gudai Ziran Zaiyi Dongtai Fenxi* (*Dynamic Analysis of Natural Disasters in Premodern China*) (Hefei: Anhui Education Press, 2002); Li and Jiang, *Landlord Economy in China*.

to-land ratio' hypothesis for China.[92] More specifically, one-percentage-point increase in farmland is correlated to 0.66-0.72 percent increase in the farming output which is lower than labour's 0.97-1.04 percentage increase. Other factors such as draught animals, tenancy, rice cropping, taxes and droughts are insignificant and even negatively correlated to the agricultural output. This result supports the notion that China's was a labour-intensive economy in comparison with a capital-intensive and technology-intensive model emerged in post-Renaissance Europe.[93] With the adjusted $R^2$ at 0.7, this model explains 70 percent of the variation of the farm output.

Moreover, we substitute farm's output with output per labourer (i.e. agricultural labour productivity) and output per hectare (i.e. land productivity),[94] respectively. Regression results in Column (2) of Table 7 show negative correlation between labour input and labour productivity (-0.67); and in Column (3), negative correlation between land input and land productivity (-1.09). This implies that China's factor allocation reached a production probability frontier. Additional factor inputs resulted in inefficiency. This is compatible with the afore-mentioned 'high-level equilibrium trap' in late Imperial China.[95] Why and how China's production probability frontier remained frozen is a quite another matter.

Draught animals still are insignificant to agricultural productivities; and so are the socio-eco-economic factors. The values of adjusted $R^2$ listed in Columns 1 and 3 suggest that our results explain 70% of farm output variation and 80% of land productivity variation, respectively.

[92] Chao, *Man and Land in Chinese History*.
[93] Patrick K. O'Brien, Leandro Prados, and De La Escosura, 'Agricultural Productivity and European Industrialization, 1890-1980', *Economic History Review* 3/45 (1992): 514-53; Huang, Philip C., 'Development or Involution In Eighteenth-Century Britain and China? A Review of Kenneth Pomeranz's the Great Divergence: China, Europe, and the Making of the Modern World Economy', *Journal of Asian Studies* 2/61 (2002): 501-38.
[94] Note: 'farms' here are defined as 'production units' which are not identical with 'hectares'.
[95] Mark Elvin, *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973), p. 313.

Table 7. Factors and Their Impact on Land and Labour Productivities

| Dep. var. | (1) ln (*Output per farm*) | (2) ln (*Output per labourer*) | (3) ln (*Output per hectare*) |
|---|---|---|---|
| ln (*Land per farm*) | 0.722*** | 0.692*** | -1.091*** |
| | (0.148) | (0.147) | (0.156) |
| ln (*Labourers per farm*) | 0.968*** | -0.672*** | 0.923*** |
| | (0.250) | (0.247) | (0.258) |
| ln (*Draught animals per farm*) | -0.099 | -0.085 | -0.070 |
| | (0.180) | (0.176) | (0.196) |
| *Share of land under rice* | 0.004 | 0.020 | 0.074 |
| | (0.231) | (0.229) | (0.245) |
| ln (*Government taxes*) | 0.017 | 0.022 | 0.025 |
| | (0.058) | (0.057) | (0.058) |
| *Tenancy rate* | -0.168 | -0.111 | -0.149 |
| | (0.256) | (0.256) | (0.274) |
| ln (*Number of droughts*) | -0.042 | -0.046 | -0.051 |
| | (0.052) | (0.052) | (0.055) |
| Area FE | Yes | Yes | Yes |
| Mean of dep. var. | 7.798 | 7.246 | 7.580 |
| Observations | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.705 | 0.490 | 0.826 |

***Note***: (1) Robust standard errors are in parentheses and are clustered at the locality level; (2) *** p<0.01.

Furthermore, we use an income increase as a dummy variable and add factors column by column for regressions according to Equation (2). Table 8 reports the results.

Table 8. Factors and Their Impact on Income

| Dep. var. | *Increase in income* | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| ln (*Local wage levels*) | 0.613*** | 0.621*** | 0.578*** | 0.527*** | 0.473*** | 0.591*** | 0.581*** |
| | (0.100) | (0.104) | (0.099) | (0.109) | (0.105) | (0.120) | (0.114) |
| ln (*Transportation costs*) | | -0.310** | -0.352** | -0.515*** | -0.565*** | -0.553*** | -0.547*** |
| | | (0.148) | (0.153) | (0.170) | (0.169) | (0.158) | (0.181) |
| *Tenancy rate* | | | -0.517** | -0.667** | -0.864*** | -0.702*** | -0.881*** |
| | | | (0.251) | (0.257) | (0.279) | (0.253) | (0.272) |
| ln (*Farming output per labourer*) | | | | 0.234** | 0.253** | 0.213** | 0.202** |
| | | | | (0.108) | (0.106) | (0.096) | (0.098) |
| *Share of land under rice* | | | | | 0.912*** | 0.902*** | 0.959*** |
| | | | | | (0.259) | (0.227) | (0.216) |
| ln (*Government taxes*) | | | | | | -0.186*** | -0.188** |
| | | | | | | (0.070) | (0.071) |
| ln (*Number of droughts*) | | | | | | | -0.096* |
| | | | | | | | (0.050) |
| Area FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 0.817 | 0.817 | 0.817 | 0.817 | 0.817 | 0.817 | 0.817 |
| Observations | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.237 | 0.252 | 0.277 | 0.301 | 0.402 | 0.478 | 0.500 |
| $R^2$ | | | | | | | 0.558 |
| $F$ test | | | | | | | 9.482 |
| Prob > $F$ | | | | | | | 0.000 |

***Note***: (1) Robust standard errors are in parentheses and are clustered at the locality level; (2) *** p<0.01, ** p<0.05, * p<0.1.

Here, an increase in income is positively correlated to wage levels, labourers' output and rice cropping, but negatively correlated to transport costs, tenancy rates, taxes and droughts. And all correlations are significant. In other words, rural communities were better off with rice farming, under property rights protection, in an economic autarky, with a low-tax government, and without the *force majeure* of natural disasters such as droughts. A tall order. It again suggests that the rural economy now operated itself highly rationally. With the adjusted $R^2$ at 0.50, our model explains around 50 percent of the variation in the outcome variable. Given the sample size (115 observations), such a coefficient carries a weight.

Furthermore, food consumption is taken as a proxy for living standards and regress Equation (3). We set three food variables: (1) daily intake of food grain, fruits, and vegetables per capita, (2) the standard deviation of daily intake quantity across different foods, (3) and daily calorie intake per capita. Table 9 shows the results.

Table 9. Factors and Their Impact on Food Consumption

| Dep. var. | ln (*Daily intake per capita*) | | | ln (*SD of consumption*) | ln (*Daily calories per capita*) |
|---|---|---|---|---|---|
| | (1) Grain | (2) Fruits | (3) Vegetables | (4) | (5) |
| ln (*Local wage level*) | 0.068 | -0.029 | 0.518** | 0.075 | -0.004 |
| | (0.118) | (0.353) | (0.245) | (0.118) | (0.066) |
| ln (*Transportation costs*) | -0.179 | -0.995* | 0.215 | -0.156 | 0.035 |
| | (0.172) | (0.544) | (0.374) | (0.176) | (0.106) |
| *Tenancy rate* | 0.184 | 0.383 | -0.124 | 0.155 | 0.005 |
| | (0.238) | (0.793) | (0.559) | (0.243) | (0.164) |
| ln (*Farming output per labourer*) | 0.362*** | 1.246*** | 0.713*** | 0.367*** | 0.401*** |
| | (0.073) | (0.370) | (0.201) | (0.075) | (0.056) |
| *Share of land under rice* | -0.180 | -0.640 | -0.525 | -0.214* | -0.077 |
| | (0.125) | (0.595) | (0.352) | (0.126) | (0.133) |
| ln (*Government taxes*) | -0.011 | 0.131 | -0.238** | -0.032 | 0.023 |
| | (0.057) | (0.141) | (0.104) | (0.050) | (0.028) |
| ln (*Number of droughts*) | 0.087 | -0.106 | 0.111 | 0.088 | 0.012 |
| | (0.060) | (0.117) | (0.110) | (0.059) | (0.029) |
| Area FE | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 6.600 | 2.204 | 5.087 | 5.693 | 8.117 |
| Observations | 115 | 115 | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.348 | 0.482 | 0.408 | 0.376 | 0.516 |
| $R^2$ | 0.423 | 0.541 | 0.477 | 0.448 | 0.572 |
| $F$ test | 5.791 | 3.442 | 6.158 | 6.438 | 13.275 |
| Prob > $F$ | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |

***Note***: (1) Robust standard errors are in parentheses and are clustered at the locality level; (2) *** p<0.01, ** p<0.05, * p<0.1.

As shown in Table 9, labour productivity is the key to an increase in consumption: One percentage-point increase in output per labourer is positively correlated to 0.36 percentage-point increase in grain consumption, 1.25 percentage-point increase in fruit consumption, 0.71 percentage-point increase in vegetable consumption, 0.37 percentage-point increase in food diversification, and 0.40 percentage-point increase in calorie intake.

Meanwhile, the wage level would only help vegetable consumption. But government taxes, presumably imposed upon marketed vegetables, had the opposite effect. Rice cropping went against an increase in food intakes (although

insignificantly) in a zero-sum, which makes a good sense given the afore-mentioned fact that China-wide farmers devoted merely 20.5 percent of their land to rice cultivation of the time. This 20.5 percent seems to have reached the optimum without external and ultra-economic interferences of the time. Any increase in rice farming would upside an equilibrium. Other factors (including transportation costs, land ownership, crop choice, government taxes and water shortage) play an insignificant role across specifications.

Given that China had many regions and that the Great Divergence Debate is about the Yangzi Delta in South China,[96] we have the motivation to see comparatively how the south where Yangzi Delta is located outperformed the north. Therefore, we adopt a north-south divide based on cropping differences and rerun our main regressions.[97] Table 10 contains the results.

[96] E.g. Terry Cannon and Alan Jenkin, *The Geography of Contemporary China* (London: Routledge, 1990). To understand how a farming divide has even become 'Chinese psyche', see Thomas Talhelm, Xuemin Zhang, Shigehiro Oishi, Shimin Chen, Dngyuan Duan, Xuezhao Lan, and Shinobu Kitayaman, 'Large-Scale Psychological Differences within China Explained by Rice versus Wheat Agriculture', S*cience* 344 (6184) (2014): 603-608.

[97] In the northern part of China, we include spring wheat area, winter wheat-kaoliang area and winter wheat-millet area. And in the southern part of China, we include double cropping rice area, rice tea area, southwestern rice area, and Yangtze rice-wheat area.

Table 10. Regionalized Factors and Their Impact on Dependent Variables

| Dep. var. | ln (*Output per farm*) | | ln (*Output per labourer*) | | *Increase in income* | | ln (*Calories per capita*) | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | North | South | North | South | North | South | North | South |
| ln (*Land per farm*) | 1.164*** | 0.426** | 1.126*** | 0.425** | | | | |
| | (0.196) | (0.189) | (0.194) | (0.190) | | | | |
| ln (*Labourers per farm*) | 0.330 | 1.414*** | -1.391*** | -0.139 | | | | |
| | (0.272) | (0.278) | (0.251) | (0.274) | | | | |
| ln (*Draught animals per farm*) | -0.111 | -0.351 | -0.082 | -0.339 | | | | |
| | (0.238) | (0.288) | (0.230) | (0.289) | | | | |
| ln (*Local wage levels*) | | | | | 0.417** | 0.681*** | -0.114 | 0.062 |
| | | | | | (0.182) | (0.106) | (0.072) | (0.097) |
| ln (*Transportation costs*) | | | | | -0.233 | -0.302 | 0.173 | 0.075 |
| | | | | | (0.271) | (0.253) | (0.144) | (0.151) |
| ln (*Farming output per labourer*) | | | | | 0.247** | 0.084 | 0.548*** | 0.190*** |
| | | | | | (0.104) | (0.125) | (0.067) | (0.067) |
| *Share of land under rice* | 4.431*** | -0.008 | 3.945*** | 0.017 | -2.820 | 0.983*** | 1.103* | -0.107 |
| | (1.344) | (0.234) | (1.184) | (0.233) | (2.456) | (0.194) | (0.583) | (0.131) |
| ln (*Government taxes*) | -0.009 | -0.122 | 0.001 | -0.114 | -0.089 | -0.306*** | 0.003 | -0.025 |
| | (0.071) | (0.129) | (0.064) | (0.130) | (0.056) | (0.077) | (0.030) | (0.058) |
| *Tenancy rate* | -0.515 | -0.046 | -0.421 | -0.006 | -1.171*** | -0.361 | -0.184 | 0.058 |
| | (0.440) | (0.338) | (0.400) | (0.335) | (0.381) | (0.275) | (0.167) | (0.212) |
| ln (*Number of droughts*) | 0.063 | -0.048 | 0.066 | -0.056 | 0.016 | -0.194*** | 0.052 | -0.012 |
| | (0.118) | (0.056) | (0.118) | (0.056) | (0.129) | (0.047) | (0.048) | (0.034) |
| Area FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 7.554 | 7.992 | 7.103 | 7.359 | 0.804 | 0.828 | 8.060 | 8.163 |
| Observations | 51 | 64 | 51 | 64 | 51 | 64 | 51 | 64 |
| Adjusted $R^2$ | 0.816 | 0.488 | 0.677 | 0.265 | 0.521 | 0.654 | 0.797 | 0.183 |

***Note***: (1) Robust standard errors are in parentheses and are clustered at the locality level; (2) *** p<0.01, ** p<0.05, * p<0.1

Columns 1 to 4 of Table 10 reveal China's regional heterogeneity in several counts. Firstly, 'socio-eco-economic factors' are all insignificant. Secondly, in both regions input of farmland is positively and significantly corrected to both land productivity and labour productivity. But the north is more sensitive (coefficient 1.16) than the south (coefficient 0.43). This makes sense as multi-cropping in South China intensifies production from the same plot for more output, whereas North China's mono-cropping depends on more land to produce more output. In other words, farming in South China was relatively labour intensive, and farming in North China, land intensive. This was a 'little divergence' inside China.

Thirdly, on the one hand, labour contributes significantly (and also positively) to land productivity in the south (coefficient 1.41) but insignificantly in the north. Such a difference suggests that southerners were better farmers, so farming skills mattered more. On the other hand, labour contributes negatively and significantly to labour productivity in the north (coefficient -1.39). The labour impact on labour productivity in the south was insignificant. This means that China's marginal product of labour in agriculture dropped below zero so that a marginal increase in labour input might cause output deduction.[98] So, non-farming production such as household-based weaving and trading offered an outlet for surplus labour.[99]

Similarly, draught animals are negatively correlated to labour productivity in both regions (coefficients -0.08 and -0.34, respectively). This is understandable as draught animals - cattle, water buffalo, horses, donkeys and mules - substitute human labour in production. So, the impact of draught animals on the dependent variables was comparable to that of human labourers. But draught animals are also negatively correlated to land productivity in both regions (-0.11 and -0.35, respectively). A sensible explanation is that these animals lived on land and competed with the same resources for food production. This is more obvious in the

[98] Elvin, *Pattern of the Chinese Past*, ch. 17.
[99] Skinner, 'Marketing and Social Structure in Rural China'; Li Bozhong, *Jiangnande Zaoqi Gongyehua, 1550-1850* (*Proto-industrialisation in the Yangtze Delta, 1550-1850*) (Beijing: Social Science Literature Press, 2000); Grove, *Chinese Economic Revolution*.

South where land was scarcer. However, draught animals' impact is insignificant, meaning that humans provided the main labour input in farming.

Thirdly, rice cropping is positively and significantly corrected to land and labour productivities in the North (coefficients 4.43 and 3.95, respectively) where dry farming prevailed, meaning that gains were to be made by rice-farming there. The situation in the South is the opposite: the impact of both rice-farming on land and labour productivities is insignificant. Also, rice is modestly negatively correlated to land productivity (coefficient -0.008) and barely positively correlated to labour productivity (coefficient 0.017). This means that rice farming operated along a production probability frontier in the south; and extra rice farming led to diminishing returns.

Overall, the values of adjusted $R^2$ explain the influence of independent variables is greater in the north than in the south: 82% vs 49% for land productivity, and 68% vs 27% for labour productivity. This means that inputs had less impact on dependent variables because the southern economy moved away from farming. This can be supported by the field work by Sidney D. Gamble which shows employment opportunities in services and handicrafts within a traditional Chinese village even in the north and supported 75 to 207 full-time jobs in a community of 270-280 families.[100] This was not trivial. South China was likely to have even more people working outside farming. This supports a 'little divergence' inside China.

In Columns 5 to 8 of Table 10, wage levels and farm total output are both positively and significantly correlated to incomes (coefficients 0.42 vs 0.68) and calorie-intake levels (coefficients 0.55 vs 0.19) with a north-south divide. So, wages were not the sole determinant of living standards as being hypothesized.[101] Rice farming is positively and significantly correlated to income in the south (coefficient

[100] Gamble, *North China Villages*, pp. 161, 162, 177, 327, 332. The number of families is based on Gamble's data of 1,402 and 1,373 villagers.
[101] Allen, *et al.*, 'Wages, Prices, and Living Standards'.

0.98), but it is insignificantly in the north. It means that rice was not the main income source in the north. But rice farming is positively and significantly correlated to calorie intake in the north (coefficient 1.10), and it is insignificantly correlated to calorie intake in the south. A sensible explanation lies in the calorific differences in cereals. Per unit of rice allows for more calories (Table 11).

Table 11. Calories from Different Cereals, per 100 grams

| Type | Kilocalories | Farming | Index |
|---|---|---|---|
| Barley | 332 | Dry | 100 |
| Millet | 340 | Dry | 102 |
| Wheat | 340 | Dry | 102 |
| Rice | 357 | Paddy | 108 |

***Source***: Food and Agriculture Organization, 'Food Composition Tables', online *vide* https://www.fao.org/3/X9892E/X9892e05.htm, available on 12th September 2023.

Other discrepancies include: (1) government taxes are negatively and significantly correlated to income in the south (coefficient -0.31), but they are insignificantly correlated to income in the north. This is compatible with research into rural taxation in the 1920s and 30s in China, showing that tax burden increased disproportionately in the rural south during the Republic Era.[102] Noted here, tenants did not pay land taxed, but landowners did. That was applicable to absentee landlords.[103] (2) Tenancy rate are negatively and significantly correlated to income in the north (coefficient -1.17), but it is insignificantly correlated to income in the south. A sensible answer comes from China's moral economy: It was common for tenants to pay rent (and tax) from the main crop of the year. The second crop was rent-free.[104] Thus, in the south, tenants' rent burden was reduced by multi-cropping, typically the winter wheat crop bringing the annual rent burden down. So much so, recent studies indicate that during the Qing Period

[102] Weng Youwei, 'Minguo Shiqide Nongcun Yu Nongmin (1927-1937)' (Countryside and Peasants in the Republican Era, 1927-1937), *China's Social Sciences*, 7 (2018): 184-203.
[103] See Li and Jiang, *Landlord Economy in China*, pp. 456-7; Huang Daoxuan, '1902-1940 Niandai Zhongguo Dongnan Diqude Tudi Zhanyou, Jiantan Dizhu, Nongmin Yu Tudi Geming' (Landownership Types in Southeast China during the 1920s to 1940s with a Reference to Landlords, Peasants and the Land Revolution), *Lishi Yanjiu* (*Study of History*) 1 (2005): 34-53.
[104] Gao, *New Theory of Tenancy*, pp. 208-12. For the Sicuan case in the south, see Madeleine Zelin, 'The Rights of Tenants in Mid-Qing Sichuan: A Study of Land-Related Lawsuits in the Baxian Archives', *Journal of Asian Studies* 45/3 (1986): 499-526.

(1644-1911) there was a strong tendency for tenants to become 'middle-income peasants' (*zhong nong*).[105] This alleviation was unavailable in the north where annual mono-cropping was the norm. (3) Droughts are negatively and significantly correlated to income in the south (coefficient -0.19). But it has little impact on the north. This is simply because rice paddies in the south need water.

Finally, Columns 5 to 8 show that the values of adjusted $R^2$ explain the degree of influence of independent variables on income is 52% for the north and 65% for the south; and the degree of influence on calorie intake is 80% for the north and 18% for the south. It suggests that farmers' incomes in the south are better explained by our model, while farmers' calorie intakes in the north are better explained by our model.

III.5. Robustness tests

A primary concern of regression analysis is the validity of model specification in terms of whether the regression results are different from zero. To alleviate such concerns, we add *F* tests in the bottom two rows of Tables 6, 8 and 9 with the null hypothesis (all the regression coefficients = zero). All our regressions pass the *F* tests, with Prob > *F* values less than 0.001. Another concern of regression analysis is the potential over-specification. That is, whether there are too many irrelevant variables in the regressions. To address the magnitude of such a concern, we now report the $R^2$ with no adjustment in Tables 6, 8 and 9. Results show that our models are well specified with the difference between adjusted $R^2$ and $R^2$ less than 0.1.

In addition, to address a possible unobservable bias, we add the province fixed effects to rule any potential confounders at the province level. More specifically, we rerun our main regressions and cluster them at the provincial boundary and farming zone levels. In other words, the residuals can be observed at provincial boundary level and at farming zone level. Tables 12 and 13 report our results

[105] Wei, 'New Approach to Rent Deposits during the Qing'; Fang, 'Tenants Joining the Middle-Income Group during the Qing Period'.

where Columns 1, 4, 7, and 10 are clustered at the locality level; Columns 2, 5, 8, 11 are clustered at the provincial boundary level; and Columns 3, 6, 9, and 12 are clustered at the farming zone level. Our results show that the province fixed effects do not change the sign or significance of earlier regression results in Tables 7, 8 and 9.

Table 12. Spatial Correlations, Test I

| Dep. var. | ln (*Output per farm*) | | | ln (*Output per labourer*) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln (*Land per farm*) | 0.722*** | 0.722*** | 0.722*** | 0.692*** | 0.692*** | 0.692*** |
| | (0.148) | (0.230) | (0.165) | (0.147) | (0.232) | (0.160) |
| ln (*Labourers per farm*) | 0.968*** | 0.968** | 0.968** | -0.672*** | -0.672* | -0.672 |
| | (0.250) | (0.373) | (0.384) | (0.247) | (0.362) | (0.358) |
| ln (*Draught animals per farm*) | -0.099 | -0.099 | -0.099 | -0.085 | -0.085 | -0.085 |
| | (0.180) | (0.226) | (0.192) | (0.176) | (0.224) | (0.183) |
| ln (*Local wage level*) | | | | | | |
| ln (*Transportation costs*) | | | | | | |
| ln (*Farming output per labourer*) | | | | | | |
| *Share of land under rice* | 0.004 | 0.004 | 0.004 | 0.020 | 0.020 | 0.020 |
| | (0.231) | (0.470) | (0.435) | (0.229) | (0.472) | (0.438) |
| ln (*Government taxes*) | 0.017 | 0.017 | 0.017 | 0.022 | 0.022 | 0.022 |
| | (0.058) | (0.080) | (0.043) | (0.057) | (0.077) | (0.041) |
| *Tenancy rate* | -0.168 | -0.168 | -0.168 | -0.111 | -0.111 | -0.111 |
| | (0.256) | (0.410) | (0.432) | (0.256) | (0.403) | (0.443) |
| ln (*Number of droughts*) | -0.042 | -0.042 | -0.042 | -0.046 | -0.046 | -0.046 |
| | (0.052) | (0.074) | (0.094) | (0.052) | (0.074) | (0.095) |
| Area FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 7.798 | 7.798 | 7.798 | 7.246 | 7.246 | 7.246 |
| Observations | 115 | 115 | 115 | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.705 | 0.705 | 0.705 | 0.490 | 0.490 | 0.490 |

***Note***: (1) Robust standard errors are in parentheses; (2) *** p<0.01.

Table 13. Spatial Correlations, Test II

| Dep. var. | *Income increase* | | | ln (*Calorie intake per capita*) | | |
|---|---|---|---|---|---|---|
| | (7) | (8) | (9) | (10) | (11) | (12) |
| ln (*Land per farm*) | | | | | | |
| ln (*Labourers per farm*) | | | | | | |
| ln (*Draught animals per farm*) | | | | | | |
| ln (*Local wage level*) | 0.581*** | 0.581*** | 0.581*** | -0.004 | -0.004 | -0.004 |
| | (0.114) | (0.127) | (0.133) | (0.066) | (0.065) | (0.065) |
| ln (*Transportation costs*) | -0.547*** | -0.547** | -0.547** | 0.035 | 0.035 | 0.035 |
| | (0.181) | (0.214) | (0.202) | (0.106) | (0.121) | (0.159) |
| ln (*Farming output per labourer*) | 0.202** | 0.202* | 0.202* | 0.401*** | 0.401*** | 0.401*** |
| | (0.098) | (0.112) | (0.104) | (0.056) | (0.091) | (0.108) |
| *Share of land under rice* | 0.959*** | 0.959*** | 0.959** | -0.077 | -0.077 | -0.077 |
| | (0.216) | (0.315) | (0.314) | (0.133) | (0.154) | (0.113) |
| ln (*Government taxes*) | -0.188** | -0.188** | -0.188* | 0.023 | 0.023 | 0.023 |
| | (0.071) | (0.077) | (0.083) | (0.028) | (0.032) | (0.043) |
| *Tenancy rate* | -0.881*** | -0.881** | -0.881 | 0.005 | 0.005 | 0.005 |
| | (0.272) | (0.409) | (0.490) | (0.164) | (0.196) | (0.174) |
| ln (*Number of droughts*) | -0.096* | -0.096 | -0.096 | 0.012 | 0.012 | 0.012 |
| | (0.050) | (0.069) | (0.076) | (0.029) | (0.046) | (0.045) |
| Area FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 0.817 | 0.817 | 0.817 | 8.117 | 8.117 | 8.117 |
| Observations | 115 | 115 | 115 | 115 | 115 | 115 |
| Adjusted $R^2$ | 0.500 | 0.500 | 0.500 | 0.516 | 0.516 | 0.516 |

***Note***: (1) Robust standard errors are in parentheses; (2) *** p<0.01, ** p<0.05, * p<0.1.

## IV. Final Conclusions

This study aims to identify *what* put China on a different growth trajectory, and *why* and *how* it worked. To do so, for the first time in economic history of China, John Buck's path-breaking survey is systematically scrutinised by the present study to establish correlations between factor inputs, food outputs and living standards. The justification here is that, although *passé*, China's rural economy could have continued indefinitely without the external shock from Maoism.

Regarding to *what* determined China's unique growth trajectory, the answer can be found in China's unique socio-economic structure seen from landholding family farms in an olive-shaped distribution. This was uncommon in Western Europe. Bear in mind though, China's physiocratic choice was state-led, historically.[106] Thus, the seeds for the Great Divergence were both archaic and Empire-specific, stemming from China's distinctive political and moral economy in the remote past. The ending of China's traditional rural economy was equally political through Mao's ultra-economic coercion to be precise;[107] and disasters such as the 'Great Leap Famine' were waiting to happen.[108]

On *why* China's package of 'inputs, outputs and living standards' worked, the answer lies in China's 'diseconomies of scale' in farming which validated an ocean of small but highly productive family farms, commonly known as 'high-yield farming'. It in turn supported descent living standards of China's country folks.

---

[106] Gang Deng, *The Premodern Chinese Economy - Structural Equilibrium and Capitalist Sterility* (London and New York: Routledge, 1999).

[107] Peng Xizhe, 'Demographic Consequences of the Great Leap Forward in China's Provinces', *Population and Development Review* 13/4 (1987): 639-70; Guan Yongqiang, 'Nongcun Tudi Chanquan Zhidu De Lishi Jiejian, Jindai Zhongguo Diquan Fenpei Yanjiu Shuping' (The Land System from Historical Perspectives: A Survey on the Distribution of Land Rights in Modern China), *Nankai Economic Studies*, no.3 (2015): 131-139; Long Denggao and He Guoqing, 'Tugai Qianxi Diquan Fenpei De Jianyan Yu Jieshi' (Examination and Explanation of Land Rights Distribution on the Eve of the Land Reform in China), *Southeast Academic Research*, no.4 (2018): 150-161.

[108] Jasper Becker, *Hungry Ghost, China's Secret Famine* (London: John Murray, 1996), ch. 18; Jin Hui, 'Sannian Ziyanzaihai Beiwanglu' (Memorandum on the Alleged Three Years of Natural Disasters, 1959-62), *Shehui* (*Society*) 4-5 (1993): 13-22; Cao Shuji, *Da Jihuang, 1959-1961 Niande Zhongguo Renkou* (*Great Famine and China's Population in 1959-1961*) (Hong Kong: Times International Publishing Co., 2005); Yang Jisheng's *Mubei - Zhongguo Liushi Niandai Dajihuang Jishi* (*Gravestone for the Great Leap Famine Victims, Evidence from History*) (Hong Kong: Tiandi Books, 2008).

So, one should not be surprised that China's rural population did eat quite well even during the politically troubled time, which in turn supports Pomeranz's utility comparison between the Yangzi Delta and Western Europe. This challenges opinions which have been based on untrustworthy anecdotes rather than reliable statistics. *Pace tua.*

Moreover, in the 1920s at the latest, China's high-yield farming seems to have perfected itself to the point of reaching a production probability frontier (or a 'high-level equilibrium trap'). So much so, an extra input in land or labour could reduce the total output. Draught animals helped but little (which should initiatively be the opposite). But reaching a production probability frontier in a premodern economy suggests long continuity. This was also uncommon in Western Europe.

On *how* the economy functioned, China's labour productivity was correlated to rural food consumption which in turn unveils incentives: a reward came in the form of food consumption, uniquely Chinese, commonly known as 'food is people's heaven' (*min yi shi wei tian*).[109]

In addition, China's peasants were rational operators to maximise their returns, as rural incomes were positively correlated to wages, farming outputs and rice cropping, but negatively correlated to transport costs, tenancy rates, taxes and droughts. Call these peasants *homo economicus* if you will. So, China's rural economy was highly rational and ran on its own course. This was however common in Western Europe.

Finally, this study has identified 'two Chinas' in a 'little divergence' between the north and the south with two distinctive patterns (Figure B, Appendix): (1) Relatively speaking, farming was 'land-intensive' in North China and 'labour-intensive' in South China (applicable to the Yangzi Delta); (2) in the south, rice-

[109] This was first declared by a political consultant named Li Sheng in *circa* 199 BC as 'people's support is a ruler's heaven, while food is people's heaven' (*wangzhu yi minren wei tian, er minren yi shi wei tian*), see Sima Qian, *Shi Ji* (*The Book of History*) in *Ershiwu Shi* (*The Twenty-five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 1, p. 301.

farming reached an optimum with which the marginal product of labour became negative (applicable also to the Yangzi Delta). In comparison, North China had some growth potential if rice farming was available. In a nutshell, rice determined China's little divergence. If so, Yangzi Delta was the best scenario for China's national economy.

## Appendix

Table A. Farm Sizes and Their Shares, 1929–1933

| Scope | Average farm sizes (hectares) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Small | Medium | Medium-large | Large | Very large | Super-large | Average |
| China-wide | 0.58 | 1.15 | 1.99 | 2.9 | 5.27 | 8.89 | 1.69 |
| Wheat mega-zone | 0.73 | 1.45 | 2.46 | 3.81 | 7.05 | 10.08 | 2.28 |
| Rice mega-zone | 0.47 | 0.93 | 1.65 | 2.18 | 3.7 | 4.13 | 1.25 |
| Spring wheat zone | 1.12 | 2.16 | 3.44 | 5.72 | 7.7 | 10.49 | 3.25 |
| Winter wheat-millet zone | 0.6 | 1.18 | 1.97 | 2.87 | 4.57 | 5.72 | 1.71 |
| Winter wheat-kaoliang zone | 0.67 | 1.35 | 2.36 | 3.69 | 8.12 | 10.31 | 2.25 |
| Yangtze rice-wheat zone | 0.56 | 1.14 | 2.18 | 2.61 | 4.88 | - | 1.56 |
| Rice-tea zone | 0.39 | 0.76 | 1.29 | 1.78 | 2.51 | 4.28 | 1 |
| Szechwan rice zone | 0.49 | 0.94 | 1.62 | 2.54 | 3.62 | - | 1.43 |
| Double cropping rice zone | 0.42 | 0.74 | 1.15 | 1.65 | 2.99 | - | 0.96 |
| Southwestern rice zone | 0.38 | 0.82 | 1.37 | 2.07 | 4.08 | - | 1.03 |
| | % Shares of farms in each category | | | | | | |
| | Small | Medium | Medium-large | Large | Very large | Super-large | Total |
| China-wide | 23 | 38 | 21 | 11 | 7 | 1 | 100 |
| Wheat mega-zone | 24 | 35 | 18 | 12 | 9 | 2 | 100 |
| Rice mega-zone | 22 | 40 | 22 | 10 | 6 | 0 | 100 |
| Spring wheat zone | 23 | 33 | 21 | 11 | 9 | 3 | 100 |
| Winter wheat-millet zone | 24 | 39 | 16 | 12 | 9 | 0 | 100 |
| Winter wheat-kaoliang zone | 25 | 34 | 17 | 13 | 10 | 2 | 100 |
| Yangtze rice-wheat zone | 24 | 41 | 19 | 10 | 6 | 0 | 100 |
| Rice-tea zone | 21 | 38 | 23 | 11 | 6 | 0 | 100 |
| Szechwan rice zone | 21 | 36 | 22 | 13 | 8 | 0 | 100 |
| Double cropping rice zone | 20 | 40 | 25 | 10 | 5 | 0 | 100 |
| Southwestern rice zone | 22 | 45 | 23 | 7 | 4 | 0 | 100 |

***Source***: Buck, *Land Utilization in China*, *Statistics*, pp. 289-91.

Table B. International Comparison of Average Farm Sizes

| Date | Region | Average farm size (hectares) |
|---|---|---|
| | North America | |
| 1930 | US | 63.5 |
| | Western Europe | |
| 1924 | England and Wales | 25.6 |
| 1919 | Denmark | 16.0 |
| 1933 | Germany | 8.8 |
| 1930 | Netherlands | 5.8 |
| | East Asia | |
| 1933 | China | 1.7 |
| 1927 | Japan | 1.1 |

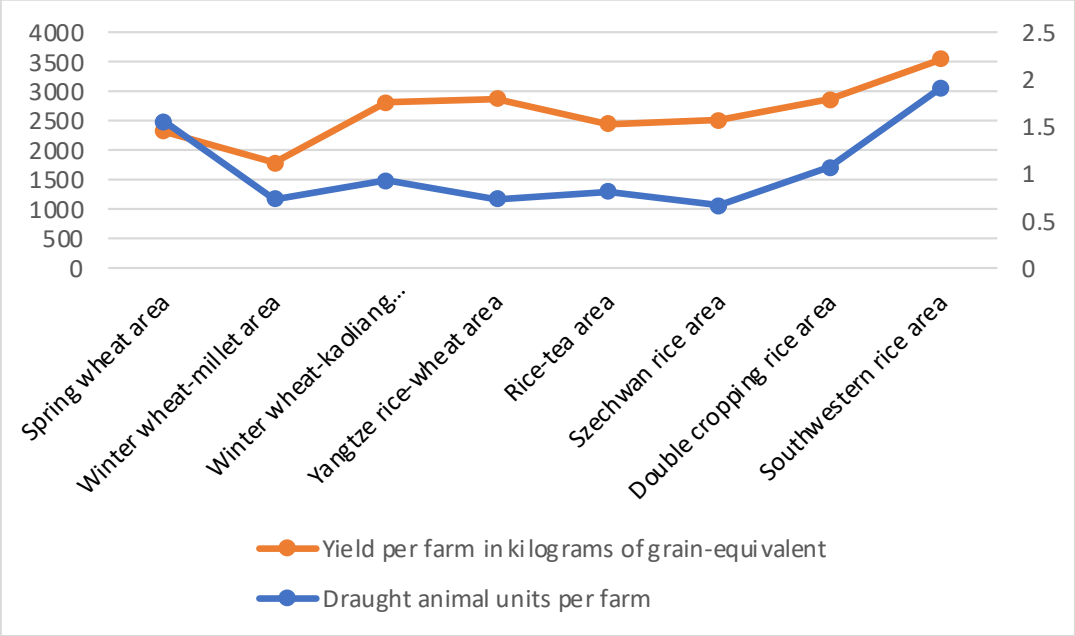
***Source***: Buck, *Land Utilization*, p. 268.

Table C. Farm Sizes and Input of Draught Animals per Hectare

| Scope | Very small farms | Small farms | Medium farms | Medium-large farms | Large farms | Very large farms | All farms |
|---|---|---|---|---|---|---|---|
| China-wide | 1.24 | 1.24 | 0.87 | 0.72 | 0.59 | 0.53 | 0.71 |
| Spring wheat zone | 0.69 | 1.19 | 0.93 | 0.78 | 0.64 | 0.58 | 0.73 |
| Winter wheat-millet zone | 1.07 | 0.83 | 0.76 | 0.71 | 0.53 | 0.53 | 0.61 |
| Winter wheat-kaoliang zone | 0.85 | 0.8 | 0.57 | 0.47 | 0.4 | 0.38 | 0.45 |
| Yangtze rice-wheat zone | 0.92 | 1.01 | 0.58 | 0.48 | 0.39 | 0.4 | 0.48 |
| Rice-tea zone | 1.91 | 1.24 | 0.92 | 0.73 | 0.63 | 0.49 | 0.7 |
| Szechwan rice zone | 0.85 | 2.03 | 0.86 | 0.67 | 0.55 | 0.57 | 0.65 |
| Double cropping rice zone | 1.39 | 1.35 | 1.08 | 1.87 | 0.71 | 0.61 | 0.89 |
| Southwestern rice zone | 2.43 | 3.43 | 2.59 | 2.03 | 2.01 | 1.5 | 2.25 |

***Data***: Buck, *Land Utilization*, p. 199.

Figure A. Draught Animals and Farming Output

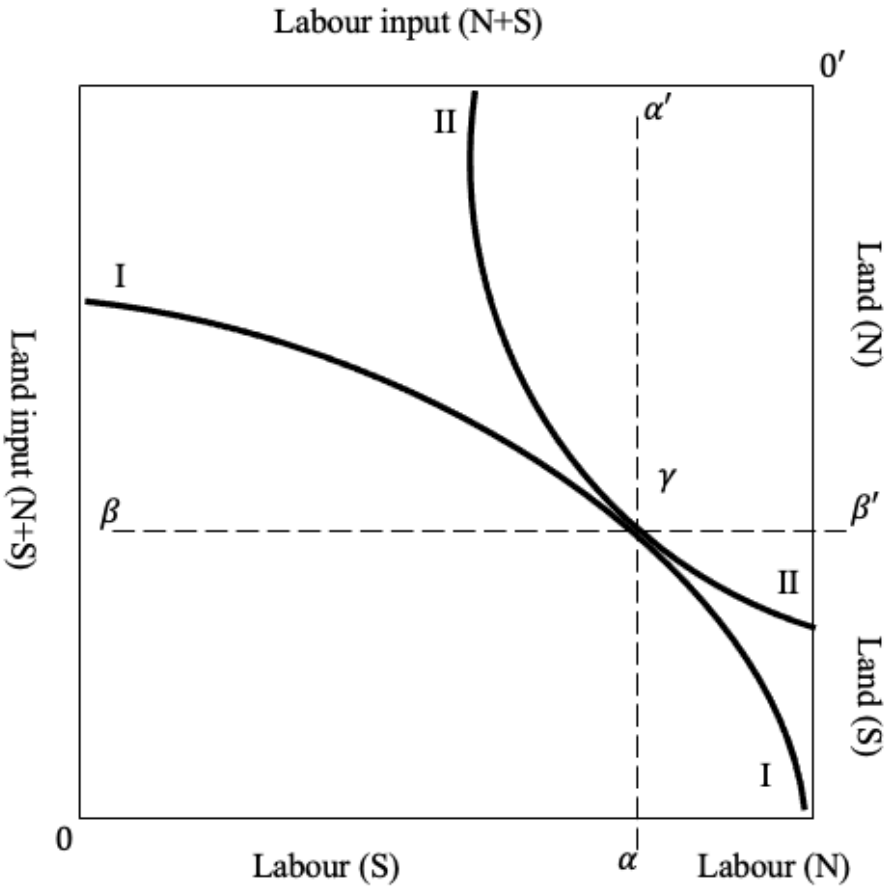



***Note***: Left axis – kg grain output; right axis – heads of draught animals.
***Source***: Buck, *Land Utilization*, pp. 131, 301, 302, 305.

Little Divergence in China

China's little divergence is illustrated in Figure B: China had two input curves I-I and II-II for the south and the north, respectively. Along both curves, each point represents factor substitution between land and labour (although in reality either factor can reach zero). The southern curve is labour-intensive thus leans toward labour; and its norther counterpart is land-intensive thus leans toward land. In terms of aggregate factor inputs, the south economy is larger, hence Area $0\beta\gamma\alpha >$ Area $0'\beta'\gamma\alpha'$. The tangent point $\gamma$ is the equilibrium with which the national economy has full employment of labour and full use of land.

Figure B. Little Divergence in China




***Note***: N = North China; S = South China. I-I = Total input curve for the South; II-II = Total input curve for the North. Point $\gamma$ = factor allocation equilibrium for China; Line $\alpha\alpha'$ = labour distribution between the north and the south; Line $\beta\beta'$= land distribution between the north and the south. This is a national autarky, and no food is imported.

## Bibliography


Allen, Robert C., 'Agricultural Productivity and Rural Incomes in England and the Yangtze Delta, c.1620-c.1820', *Economic History Review*, 63/3 (2009): 525-50.

Allen, Robert C., Jean-Pascal Bassino, Debin Ma, Christine Moll-Murata, and Jan Luiten van Zanden, 'Wages, Prices, and Living Standards in China, 1738-1925: In Comparison with Europe, Japan, and India', *Economic History Review* 64, Special Issue (2011): 8-38.

American Young Men's Christian Association (YMCA), *Institute of Pacific Relations, Honolulu Session, June 30-July 14, 1925: History, Organisation, Proceedings, Discussions and Addresses* (United States: Institute, 1925).

Arrigo, Linda Gail, 'Chinese Agriculture in the 1930s: Investigations into John Lossing Buck's Rediscovered "Land Utilization in China" Microdata', *The China Journal*, (84) 2020: 185-188.

Becker, Jasper, *Hungry Ghost, China's Secret Famine* (London: John Murray, 1996).

Broadberry, Stephen, Hanhui Guan, and David Daokui Li, 'China, Europe and the Great Divergence: A Study in Historical National Accounting, 980-1850', *Journal of Economic History*, 78/4 (2018): 955-1000.

Broomhall, Marshall, *Martyred Missionaries of China Inland Mission* (London: Morgan & Scott and CIM, 1901).

Buck, John Lossing, 'Agriculture and the Future of China', *The Annals of the American Academy of Political and Social Science* 152/1 (1930): 109-115.

Buck, John Lossing, *Land Utilization in China* (London: Oxford University Press, 1937).

Cannon, Terry and Alan Jenkin, *The Geography of Contemporary China* (London: Routledge, 1990).

Cao Shuji, *Da Jihuang, 1959-1961 Niande Zhongguo Renkou* (*Great Famine and China's Population in 1959-1961*) (Hong Kong: Times International Publishing Co., 2005).

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

Chen Hansheng, 'Sanshi Nianlaide Zhongguo Nongcun' (Chinese Rural Areas in the Past Three Decades), in *Zhongguo Nongcun* (*China's Countryside*), no. 1 (1941): 8-22.

Chen Yixin, 'Meiguo Xuezhe Dui Zhongguo Jindai Nongye Jingji Yanjiu', *Research into Chinese Economic History*, no. 1 (2001): 118-124.

Chi, Chao-Ting, *Key Economic Areas in Chinese History* (London: Allen and Unwin, 1936).

Croll, Elisabeth, *The Family Rice Bowl, Food and the Domestic Economy in China* (Geneva: UNRISD, 1983).

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

Deng, Kent, *China's Political Economy in Modern Times: Changes and Economic Consequences, 1800-2000* (London: Routledge, 2012).

Deng, Kent and Patrick O'Brien, 'Establishing Statistical Foundations of a Chronology for the Great Divergence: A Survey and Critique of the Primary

Sources for the Construction of Relative Wage Levels for Ming-Qing China', *Economic History Review* 69/4 (2016): 1057-1082.
Deng, Kent and Patrick O'Brien, 'The Kuznetsian Paradigm for the Study of Modern Economic History and the Great Divergence with Appendices of Literature Review and Statistical Data', *Working Papers of Department of Economic History, LSE*, No. 321, January 2021
Deng, Kent and Patrick O'Brien, 'Why Maddison Was Wrong', *World Economics Journal*, 18/2 (2017): 21-41.
Easterlin, Richard A., 'The Worldwide Standard of Living since 1800', *Journal of Economic Perspectives* 14.1 (2000): 7-26.
Elvin, Mark, *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973).
Esherick, Joseph W., 'Number Games: A Note on Land Distribution in Prerevolutionary China', *Modern China*, 7 (1981): 387-411.
Fairbank, John K., *The Cambridge History of China, Republican China 1912–1949, Part I* (Cambridge: Cambridge University Press, 1983), vol. 12.
Fairbank, John K. and Kwang-Ching Liu, *The Cambridge History of China*, vol. 11 (Cambridge: Cambridge University Press, 1980), vol. 11.
Fang Xing, 'Qingdai Diannongde Zhongnonghua' (Tenants Joining the Middle-Income Group during the Qing Period), *Zhongguo Xueshu* (*Chinese Academics*) 2 (2000): 44-61.
Ferrer-i-Carbonell, Ada and Paul Frijters, 'How Important Is Methodology for the Estimates of the Determinants of Happiness?', *Economic Journal* no. 497, vol. 114 (2004): 641-659.
Food and Agriculture Organization, 'Food Composition Tables', online *vide* https://www.fao.org/3/X9892E/X9892e05.htm, available on 12th September, 2023.
Food and Agriculture Organization, 'Food Energy - Methods of Analysis and Conversion Factors', *Food and Nutrition Paper* 77 (Rome, 2002).
Forsyth, R. C., *The China Martyrs of 1900* (London: Publisher unknown, 1904).
Gamble, Sydney D., *North China Villages, Social Political, and Economic Activities before 1933* (Berkeley: University of California Press, 1963).
Gamble, Sydney D., 'Peiping Family Budgets', *The Annals of the American Academy of Political and Social Science*, 152/1 (1930): 81-88.
Gao Wangling, *Zudian Guanxi Xinlun: Dizhu, Nongmin He Dizu* (*New Theory of Tenancy: Landlords, Tenants and Rents*) (Shanghai: Shanghai Book Press, 2005).
Ge, Q.-S., J.-H. Dai, F.-N. He, J.-Y. Zheng, Z.-M. Man, and Y. Zhao, 'Guoqu 300nian Zhongguo Bufen Shengqu Gengdi Ziyuan Shuliang Bianhua Ji Qudong Yinsu Fenxi' (Quantitative Changes and Their Dynamic Causes regarding Farmland Resources in China Proper in the Past 300 Years), *Ziran Kexue Jinzhan* (*Progress in Natural Sciences*), 13/8 (2003): 825-34.
Goldstone, Jack, 'Data and Dating in the Great Divergence', in T. Roy and G. Riello (eds), *Global Economic History* (London: Bloomsbury, 2019), pp. 38-53.
Goldstone, Jack A., 'Efflorescences and Economic Growth in World History: Rethinking the "Rise of the West" and the Industrial Revolution', *Journal of World History* 13/2 (2002): 323-89.

Greenfeld, Liah, *The Spirit of Capitalism: Nationalism and Economic Growth* (Cambridge, MA: Harvard University Press, 2001).
Grove, Linda, *A Chinese Economic Revolution, Rural Entrepreneurship in the Twentieth Century* (Lanham [MD]: Rowman & Littlefield, 2006).
Guan Yongqiang, 'Nongcun Tudi Chanquan Zhidu De Lishi Jiejian, Jindai Zhongguo Diquan Fenpei Yanjiu Shuping' (The Land System from Historical Perspectives: A Survey on the Distribution of Land Rights in Modern China), *Nankai Economic Studies*, no.3 (2015): 131-139.
Hobson, John M., *The Eastern Origins of Western Civilisation* (Cambridge: Cambridge University Press, 2004).
Hoken, Hisatoshi, 'Restoration of Micro Data of John Lossing Buck's Survey and Analysis of the Inverse Relationship between Yield and Farm Size in Rural China in the 1930's', *Working Paper No. 248*. Institute of Developing Economies, Japan External Trade Organization (JETRO), 2010.
Hooper, Paul F., 'The Institute of Pacific Relations and the Origins of Asian and Pacific Studies', *Pacific Affairs* 61, no. 1 (1988): 98-121.
Hu Yingze, 'Lishi Shiqi Diquan Fenpei De Lilun, Gongju Yu Fangfa' (Theories, Tools and Methods of Land Rights Distribution Research in Chinese History), *Open Times*, no. 4 (2018): 168-184.
Hu, Han and Zhongwei Yang, 'Agricultural Poverty and Inequality in 1930s China', in H. Hu, F. Zhong, and C. Turvey (eds) *Chinese Agriculture in the 1930s* (Cham: Palgrave Macmillan, 2019), pp. 153-69
Hu, Huan-Yong, 'The Distribution of Population in China, with Statistics and Maps', *Acta Geographica Sinica* 2/2 (1935): 33-74
Huang Daoxia, Yu Zhan and Wang Xiyü, *Jianguo Yilai Nongye Hezuohua Shiliao Huibian* (*Collected Historical Materials of Agricultural Collectivisation since 1949*) (Beijing: Central Party History Press, 1992).
Huang Daoxuan, '1902-1940 Niandai Zhongguo Dongnan Diqude Tudi Zhanyou, Jiantan Dizhu, Nongmin Yu Tudi Geming' (Landownership Types in Southeast China during the 1920s to 1940s with a Reference to Landlords, Peasants and the Land Revolution), *Lishi Yanjiu* (*Study of History*) 1 (2005): 34-53.
Huang, Philip C., 'Revisiting "the Great Divergence": Clarifying the Two Major Modes of Agriculture in China and the West', *Modern China* 49/5 (2023), online 9770042311647-531.
Huang, Philip C., *The Peasant Family and Rural Development in the Yangzi Delta, 1350-1988* (Stanford: Stanford University Press, 1990).
Jin Hui, 'Sannian Ziyanzaihai Beiwanglu' (Memorandum on the Alleged Three Years of Natural Disasters, 1959-62), *Shehui* (*Society*) 4-5 (1993): 13-22.
Jing Zhang, *Zhongguo Taipingyang Xuehui Yanjiu (1925-1945)* (*The Institute of Pacific Relations in China, 1925-1945*) (Beijing: Social Sciences Literature Press, 2012),
Jones, Eric, *The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia* (Cambridge: Cambridge University Press, 2003).
Knight, John, S. O. N. G. Lina, and Ramani Gunatilaka, 'Subjective Well-Being and Its Determinants in Rural China', *China Economic Review* 4/20 (2009): 635-649.

Krader, Lawrence, *The Asiatic Mode of Production: Sources, Development and Critique in the Writings of Karl Marx* (Assen: Van Gorcum, 1975).
Li, Bozhong, *Agricultural Development in Jiangnan, 1620-1850* (London: Macmillan, 1998).
Li Bozhong, 'Cong Fufu Bingzuo Dao Nangeng Nüzhi' (From 'Husband and Wife Tilling Together' to 'Husband Tilling And Wife Weaving'), *Lishi Yanju* (*Research into History*), 3 (1996): 99-107.
Li Bozhong, *Jiangnande Zaoqi Gongyehua, 1550-1850* (*Proto-industrialisation in the Yangtze Delta, 1550-1850*) (Beijing: Social Science Literature Press, 2000).
Li, Bozhong and Jan Luiten van Zanden, 'Before the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the Beginning of the Nineteenth Century', *Journal of Economic History* 72/4 (2012): 956-89.
Li Jie, *Wenwu Beiyang* (*Achievements of the 'Northern Modern' Elite*) (Nanning: Guangxi Normal University Press, 2004).
Li Wenzhi, 'Lun Mingqing Shidai Nongmin Jingji Shangpinlü' (Marketing Rates of the Peasant Products in Ming-Qing Times), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 1 (1993): 21-42.
Li Wenzhi and Jiang Taixin, *Zhongguo Dizhuzhi Jingji Lun* (*The Landlord Economy in China*) (Beijing: China's Social Sciences Press, 2005).
Liang Jingming, 'Yulin Tuce Yanjiu Zongshu' (A Survey of Studies of the Fish-Scale Cadastral Registration), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 1 (2004): 135-41.
Lieu, D. K. and Ta-Cheun Liu, *China's Economic Stabilization and Reconstruction* (New Brunswick: Rutgers University Press, 1948).
Lippit, Victor D., *Land Reform and Economic Development in China* (NY: International Arts and Sciences, 1974).
Liu Foding, Wang Yuru and Zhao Jin, *Zhongguo Jindai Jingjishi* (*A History of Economic Development in Early Modern China*) (Beijing: Tertiary Education Press, 1999).
Liu Jinhai, 'Cong Lilun Fangwei Dao Lishi Dingwei—Ershi Shiji Sanshi Niandai Zhongguo Nongcun Diaocha Sanda Lilun Paibie Zhizheng' (From Theoretical Orientation to Historical Orientation - The Three Factions' Dispute on the Investigation of Rural Areas in China in the 1930s), *Exploration and Free Views*, no. 9 (2021): 121-30.
Long Denggao and He Guoqing, 'Tugai Qianxi Diquan Fenpei De Jianyan Yu Jieshi' (Examination and Explanation of Land Rights Distribution on the Eve of the Land Reform in China), *Southeast Academic Research*, no.4 (2018): 150-161.
Ma, Ye., Herman de Jong, and T. Chu, 'Living Standards in China between 1840 and 1912', Groningen Growth and Development Center, *GGDC Research Memorandum*, vol. GD-147 (2014).
Maddison, Angus, *Chinese Economic Performance in the Long Run* (Paris: OECD, 1998).
Maddison, Angus, *Chinese Economic Performance in the Long Run, 960-2030 AD, 2nd Edition, Revised and Updated* (Paris: OECD Publishing, 2007).
Mao Zedong, *Mao Zedong Xuanji* (*Selected Works of Mao Zedong*) (Beijing: People's Press, 1986).
Mokyr, Joel, *A Culture of Growth* (Princeton: Princeton University Press, 2016).

Montgomery, Mark R., Michele Gragnolati, Kathleen A. Burke, Edmundo Paredes, 'Measuring Living Standards with Proxy Variables', *Demography* 37.2 (2000): 155-174.

Myers, Ramon H., *The Chinese Peasant Economy: Agricultural Development in Hopei and Shantung, 1890-1949* (Cambridge, Mass.: Harvard University Press, 1970).

Myers, Ramon H. and Yeh-chien Wang, 'Economic Developments, 1644-1800', in W. J. Peterson (ed.), *The Cambridge History of China* (Cambridge: Cambridge University Press, 2002), vol. 9.

North, Douglass C. and Robert P. Thomas, *The Rise of the Western World: a New Economic History* (Cambridge: Cambridge University Press, 1973).

O'Brien, Patrick, *The Economies of Imperial China and Western Europe. Debating the Great Divergence* (Cham: Palgrave Macmillan, 2020).

Peng Kaixiang, 'Lishi GDP Gusuanzhongde Jijia Wenti Chuyi' (Critique of Prices Used in Historical GDP Estimates), *Zhongguo Jingjishi Yanjiu* (*Research into Chinese Economic History*), 4 (2011): 53-60.

Peng Xizhe, 'Demographic Consequences of the Great Leap Forward in China's Provinces', *Population and Development Review* 13/4 (1987): 639-70.

Perkins, Dwight H., *Agricultural Development in China, 1368-1968* (Edinburgh: Edinburgh University Press, 1969).

Perkins, Dwight H., *China's Modern Economy in Historical Perspective* (Stanford: Stanford University Press, 1975).

Pomeranz, Kenneth, *The Great Divergence: Europe, China and the Making of the Modern World Economy* (Princeton, 2000).

Preston, Diana, *The Boxer Rebellion; The Dramatic Story of China's War on Foreigners That Shook the World in the Summer of 1900* (New York: Walker & Company, 2000).

Qian Junrui, 'Ping Bukai Jiaoshou Suozhu Zhongguo Nongchang Jingji, 1930' (A Review of John Lossing Buck's *Chinese Farm Economy*, 1930) in Xue Muqiao and Feng Hefa (eds), *Zhongguo Nongcun Lunwenxuan* (*Selected Papers on China's Rural areas*) (Beijing: People's Press, 1983), pp. 894-925.

Qiao Qiming, *Jiangsu Kunshan Nantong Anhui Suxian Nongdian Zhidu Zhi Bijiao* (*A Comparison of Tenancy System in Nantong and Kunshan in Jiangsu Province, and Su County in Anhui Province*) (Nanjing: Jinling Daxue Nonglinke, 1926).

Rawski, Thomas G., *Economic Growth in Prewar China* (Berkeley: University of California Press, 1989).

Rawski, Thomas G. and Lillian M. Li (eds), *Chinese History in Economic Perspective* (Berkeley: University of California Press, 1992).

Shi Tao and Ma Guoying, 'Qingdai Qianzhongqi Liangshi Muchan Yanjiu Pingshu' (Survey of Yield per *Mu* in the First Half of the Qing Period), *Lishi Yanjiu* (*Study of History*), 2 (2010): 143-55.

Shi Zhihong, *Qingdai Qianqide Xiaonong Jingji* (*Petty Farming in the Early Qing Period*) (Beijing: China's Social Sciences Press, 1994)

Shi Zhihong, 'Shijiu Shiji Shangbanqide Zhongguo Liangshi Muchanliang Jiqi Zongchanliang Zai Guji' (Re-Estimation of Yields per *Mu* and the Aggregate Food Output in Early Nineteenth Century China), *Zhongguo Jingjishi Yanjiu* (*Research into Chinese Economic History*), 3 (2012): 52-66.

Shlomo, Avineri, *Karl Marx on Colonialism and Modernisation: His Despatches [sic] and Other Writings on China, India, Mexico, the Middle East and North Africa* (N.Y.: Anchor Books, 1969).
Sima Qian, *Shi Ji* (*The Book of History*) in *Ershiwu Shi* (*The Twenty-five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 1.
Skinner, G. W., 'Marketing and Social Structure in Rural China', *Journal of Asian Studies* 24/1 (1964): 3-44; 24/2 (1965): 195-228; 24/3 (1965): 363-400.
Solar, Peter M., 'China, Europe, and the Great Divergence: Further Concerns about the Historical GDP Estimates for China' *Working Papers* 0217, European Historical Economics Society (EHES), 2021.
Solar, Peter M., 'China's GDP: Some Corrections and the Way Forward', *Journal of Economic History* 81/3 (2021): 943-57.
Song Zhenghai, Gao Jianguo, Sun Guanlong, and Zhang Binglun, *Zhogguo Gudai Ziran Zaiyi Dongtai Fenxi* (*Dynamic Analysis of Natural Disasters in Premodern China*) (Hefei: Anhui Education Press, 2002).
Stross, Randall E., *The Stubborn Earth: American Agriculturalists on Chinese Soil, 1898-1937* (Berkeley: University of California Press, 1986).
Talhelm, Thomas, Xuemin Zhang, Shigehiro Oishi, Shimin Chen, Dngyuan Duan, Xuezhao Lan, and Shinobu Kitayaman, 'Large-Scale Psychological Differences within China Explained by Rice versus Wheat Agriculture', S*cience* 344 (6184) (2014): 603-608.
Tan, Chester C., *The Boxer Catastrophe* (New York: Columbia University Press, 1955).
Tang Degang, *Wanqing Qishinian, Yihetuan Yu Baguo Lianjun* (*The Last Seventy Years of the Qing, the Boxer Riot and the Eight-Nation Alliance*) (Taipei: Yuanliu Press, 1998).
Tang Xianglong, *Zhongguo Jindai Haiguan Shuishou He Fenpei Tongji* (*Data for Customs Revenue and Its Distribution in Modern China*) (Beijing: Zhonghua Books, 1992).
Tawney, Richard H., *Life and Labour in China* (New York: Octagon Books, 1964).
Trescott, Paul B., *Jingji Xue, the History of the Introduction of Western Economic Ideas into China, 1850-1950* (Hong Kong: Chinese University of Hong Kong Press, 2007).
Tuotuo, *Song Shi* (*History of the Song Dynasty*), *Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vo. 7.
Von Glahn, Richard , *The Economic History of China: From Antiquity to the Nineteenth Century* (United Kingdom: Cambridge University Press, 2016).
Vries, P. H. H., 'Governing Growth: A Comparative Analysis of the Role of the State in the Rise of the West', *Journal of World History* 13, no. 1 (2002): 67-138.
Vries, P. H. H., *State, Economy and the Great Divergence, Great Britain and China, 1680-1850* (London: Bloomsbury 2015).
Wang, Yeh-chien, *Late Taxation in Imperial China, 1750-1911* (Cambridge [Mass.]: Harvard University Press, 1973).
Weber, Max, *The Protestant Ethic and the Spirit of Capitalism* (London: Routledge, 2001).

Wei Jinyu, 'Qingdai Yazu Xintan' (New Approach to Rent Deposits during the Qing), *Zhongguo Jingjishi Yanjiu* (*Study of Chinese Economic History*) 3 (1993): 18-35.

Weng Youwei, 'Minguo Shiqide Nongcun Yu Nongmin (1927-1937)' (Countryside and Peasants in the Republican Era, 1927-1937), *China's Social Sciences*, 7 (2018): 184-203.

Wu Chengming, *Zhongguo Ziben Zhuyi Guonei Shichang* (*Chinese capitalism and domestic market*) (Beijing: China Social Sciences Press, 1985).

Wu Hui, *Zhongguo Lidai Liangshi Muchan Yanjiu* (*Grain Yields in Chinese Long-term History*) (Beijing: Agriculture Press, 1985).

Xu Daofu, *Zhongguo Jindai Nongye Shengchan Ji Maoyi Tongji Ziliao* (*Agricultural Production and Trade Statistics in Modern China*) (Shanghai: Shanghai People's Press, 1983).

Xu Dixin and Wu Chengming, *Zhongguo Zibenzhuyi Fazhan Shi* (*A History of Capitalist Development in China*) (Beijing: People's Press, 1990-3).

Xu Xuejun, *Shanghai Jindai Shehui Jingji Fazhan Gaikuang, 1882–1931* (*A Survey of Shanghai's Socio-economic Development in Early Modern Times, 1882–1931*) (Shanghai: Shanghai Social Science Press, 1985).

Yang Jisheng, *Mubei - Zhongguo Liushi Niandai Dajihuang Jishi* (*Gravestone for the Great Leap Famine Victims, Evidence from History*) (Hong Kong: Tiandi Books, 2008).

Yu Kailiang, 'Qingdai Liangjia Shuju Zhiliang Jiqi Zhiduxing Yinsu Tantao' (Data Quality of the Qing Food Market Prices and Its Institutional Explanations), *Shanghai Jingji Yanjiu* (*Shanghai Economic Review*), 9 (2018): 90-99.

Yu Yaohua, *Zhongguo Wujia Shi* (*A History of Prices in China*) (Beijing: China's Price Press, 2000).

Zelin, Madeleine, *The Magistrate's Tael: Rationalizing Fiscal Reform in Eighteenth-Century Ch'ing China* (Berkeley: University of California Press, 1984).

Zelin, Madeleine, 'The Rights of Tenants in Mid-Qing Sichuan: A Study of Land-Related Lawsuits in the Baxian Archives', *Journal of Asian Studies* 45/3 (1986): 499-526.

Zhang Huixin, Yinliangde Pingse Ji Mingcheng' (Qualities and Names of Silver), *Gugong Wenwu Yuekan* (*Palace Museum Cultural Relics Monthly*) (Taipei), 52 (1987): 128–31.

Zhang Jingyu, *Shehui Diaocha-Shejiahang Shikuang* (*A Social Survey on Shengjiahang*) (Shanghai: Commercial Press, 1924).

Zhang Tingyu, 'Ming Shi (History of the Ming Dynasty)', *Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 10.

Zhang Youyi, 'Benshiji Ersanshi Niandai Woguo Diquan Fenpei De Zaiguji' (Re-estimation of Land Rights Distribution in China in the 1920s and 1930s), *Research into Chinese Economic History*, no.2 (1988): 3-10.

Zhang Youyi, *Zhongguo Jindai Nongyeshi Ziliao* (*Materials for Agricultural History on Early Modern China*) (Beijing: Sanlian Books, 1957).

Zhao Erxun, *Qingshi Gao (Draft of the History of the Qing Dynasty), Er-shi-wu Shi* (*Twenty-Five Official Histories*) (Shanghai: Shanghai Classics Press, 1986), vol. 11.

Zhong, Funing, Hao Hu, and Qun Su, 'Reliability of John Lossing Buck's Land Utilization Survey Data: A Preliminary Test of Grain Yields', in Hao Hu, Funing Zhong and Calum G. Turvey (eds) *Chinese Agriculture in the 1930s* (London: Palgrave Macmillan, 2019), pp. 113-120.

Zhong Weimin, 'Shuju Gusuan Yu Lishi Zhenshi' (Quantitative Estimates and Historical Reality), *Shixue Yuekan* (*Historical Study Monthly*), 2 (2014): 105-14.

Zhou Yuanlian and Xie Zhaohua, *Qingdai Zudianzhi Yanjiu* (*Study of Tenancy in the Qing Period*) (Shenyang: Liaoning People's Press, 1986).