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Viewing the Fall of Ming China through the Lens of Climate Change

Timothy Brook: *The Price of Collapse: The Little Ice Age and the Fall of Ming China*.

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Conventional historical explanations for the fall of China's Ming dynasty (1368–1644) have generally centred on factors such as factional disputes, political corruption, imperial incompetence, and the Manchu invasion. However, in his recent book *The Price of Collapse: The Little Ice Age and the Fall of Ming China*, Timothy Brook (University of British Columbia) attributes the dynasty's collapse primarily to the effects of climate change, which led to a dramatic rise in grain prices during its final years.

In his study of the late Ming dynasty, Timothy Brook emphasizes how prolonged climate change contributed to social unrest and economic stress through drastic price increase. Timothy Brook is not the first scholar to argue that climate change profoundly influenced the course of human history. Prior to Timothy Brook's work, in 2013, Geoffrey Parker's monograph, *Global Crisis*, notably discusses that the seventeenth century constituted a period of worldwide upheaval, largely precipitated by the extreme and prolonged cooling of the 'Little Ice Age'. Parker's analysis highlights not only the formidable environmental challenges confronting Ming China but also the concomitant crises that afflicted societies across Europe, the Ottoman Empire, and the Americas during the same epoch. Compared to Parker's work, Timothy Brook utilizes historical price data preserved in the records of Ming officials and local gentry, as well as in literary sources, to provide a detailed account of how people were affected by sharply rising and unaffordable grain prices resulting from climate change. In contrast, Parker's monograph does not include such comprehensive collections of price data. Parker's work may be regarded as part of environmental history on a global scale, examining the consequences of climate change in the seventeenth century. Looking to the origins of the field, the introduction of environmental issues into the field of Chinese studies was pioneered by Mark Elvin and Liu

Ts'ui-jung with their 1998 edited volume *Sediments of Time: Environment and Society in Chinese History*. Following this landmark publication, studies of China's environmental history have attracted considerable attention from both Chinese and Western scholars. Moreover, in 2017, Peter C. Perdue's article, 'The Environmental History of China: Past, Present, and Future', offers a valuable reflection on this field. As records of climate change and the phenomena of famine, floods, and droughts frequently appear in Chinese official documents and literati writings throughout the long span of Chinese history, scholars of China's environmental history can draw on these rich sources, alongside other scientific approaches, to reconstruct events in the periods they study. In particular, the 2011 publication of *Zhongguo lichao qihou bianhua* 中國歷朝氣候變化 (*Climate Change across Successive Chinese Dynasties*) by Kexue Chubanshe 科學出版社 in Beijing, which compiled extensive climate records from a variety of sources spanning multiple Chinese dynasties, represented a significant contribution to the study of ancient China's climate change.

From a broader perspective, Brook's *The Price of Collapse* can also be situated within the study of China's environmental history, offering an unconventional interpretation of the Ming dynasty's collapse through the specific lens of severe inflation caused by prolonged climate change. As a matter of fact, in his earlier book published in 2010, *The Troubled Empire: China in Yuan and Ming Dynasties*, which examines the Yuan and Ming dynasties through the lens of climate, economy, society, and maritime trade, the author also touches upon the long-lasting famines caused by the Little Ice Age in late Ming. The innovative approach adopted by the author in *The Price of Collapse* lies in his skilful use of scattered price data from different periods and regions, which he transforms into coherent and convincing patterns to uncover the underlying forces—namely, the climate changes resulting from the Little Ice Age—that shaped the trajectory of Ming China.

In the opening chapter of this book, Chen Qide 陳其德 (?-?), a local gentry who lived in Tongxiang 桐鄉, approximately one hundred kilometres southwest of present-day Shanghai, during the late Ming period, is introduced. In his writings, Chen recalls in the early years of the Wanli 萬曆 reign (1573–1620), when he was a young boy, the region enjoyed abundant harvests and general prosperity. His writings indicate that during the early Wanli years, the price of one peck (*dou* 斗, approximately 10.7 litres) of grain rarely exceeded three to four cents of silver (with one *liang* 兩/tael of silver 銀 equivalent to 37.3 grams of silver). By 1641, however, the price of grain had risen to thirty cents per peck, roughly ten times higher than in the early Wanli period (1573–1620). This dramatic comparison is employed by the author in the beginning of this book to showcase the crippling inflation that universally impacted all segments of society during

the Ming dynasty's final years. Chen Qide lived in the Jiangnan 江南 region (south of the Yangtze River), where vast quantities of grain had been transported northward via the Grand Canal to supply the Chinese empire's food needs from the Sui and Tang dynasties through the Ming and Qing periods. As a result, local price data from southern China more accurately reflect the importance of grain prices to the broader Chinese economy. If grain prices were high even in the south, one can imagine how harsh the situation must have been in the north. Thus, using southern China's price data is both representative and analytically logical. Reinforcing this, in Chapter Four, the author also provides evidence that grain prices in the north were two to three times higher than in the south during the final years of the Ming dynasty. As a matter of fact, the ultimate collapse of the Ming empire originated in the north. Li Zicheng 李自成 (1606–1645), the peasant rebel leader who overthrew the Ming dynasty and forced the emperor to commit suicide in 1644, exploited the famine in Henan 河南 province to expand his army, thereby altering the course of Ming history.

In addition to grain prices highlighted through the account of Chen Qide, Timothy Brook further provides careful estimates of the annual cost of living for ordinary people, based on historical expense records. It was revealed that the annual cost of living of a respectable family in the Wanli reign was about 23 *liang*/taels of silver. For a family living close to subsistence, it was just over 14 *liang*/taels. Grain prices are not the only type of data collected in Brook's study. The author also categorizes a wide range of goods and services, including food and beverages, furnishings, paper, textiles and cloth goods, materials, weapons, books, services, and people. Under each category, he lists multiple items with corresponding years and sources in tabular form, presenting a well-structured and lucid picture of the price regime during the late Ming period. In addition, the book also compiles extensive information on the average annual incomes of various occupations. When considered alongside the price data for different goods and services, this provides readers with a vivid picture of purchasing power during that period. Instead of tracing prices during periods of severe climate conditions, the author proposes using famine prices to detect climate change and then to analyse its consequences for economic and social life.

With the comprehensive data on prices, services, and incomes collected in this book, the author seeks to construct a dynamic model capturing the interactions among climate conditions (through which solar energy is converted into food supply), the cost of living, income levels, and the government's disaster relief measures—all of which together sustained the social equilibrium of Ming China. Among these factors, prices played a pivotal role. However, the prolonged climate changes associated with the Little Ice Age in the early 1640s ultimately disrupted this balance, pushing prices to the level that the state's relief

mechanisms could no longer contain and thereby contributing to the collapse of the Ming dynasty. However, a relevant price-related factor not fully highlighted in this book is the heavy military expenditure, which led to increased taxation that further burdened the general population.

Price-related issues, such as inflation and its driving forces, are central topics in modern macroeconomics. However, due to the lack of continuous and comprehensive price data in historical periods, it is far more difficult for economists to analyse price-related phenomena from several centuries ago than it is today. In the absence of sufficient and continuous long-term data, mathematical techniques such as Time-series Analysis, Regression Analysis, Structural Equation Modelling, and Multivariate Analysis cannot be effectively applied to investigate historical economic dynamics. Although the author has assembled a relatively rich collection of price data, it remains insufficient to support rigorous modern economic analysis. Nevertheless, this limitation does not diminish Timothy Brook's ambition. Recognizing that inflation can be driven by economic growth rather than a climate-induced decrease in supply, by presenting historical price data, the author demonstrated that the annual inflation rate during the first two centuries of the Ming dynasty was approximately 0.5% only. As a sinologist specializing in Ming history, Brook makes full use of the available historical data to showcase how fluctuations in temperature affected agricultural production and prices, and how these, in turn, became a driving force that reshaped the course of Ming China's history.

Referring to the Little Ice Age that overlapped with the Ming dynasty, Timothy Brook, in Chapter Four, identifies six multi-year periods in which severe temperature and/or precipitation anomalies coincided with documented reports of environmental crises, famines, and social distress. He designates these periods the six 'sloughs': the Yongle 永樂 Slough (1403–1406), Jingtai 景泰 Slough (1450–1456), Jiajing 嘉靖 Slough (1544–1545), Wanli I Slough (1586–1589), Wanli II Slough (1615–1620), and Chongzhen 崇禎 Slough (1638–1644). Crucially, the Ming dynasty collapsed during the final slough. However, given China's vast territory and diverse climate conditions, these six sloughs do not fully account for all major famines recorded in historical sources. For instance, while Brook dates the Jiajing Slough to 1544–1545, both the *Ming Shilu* 明實錄 (Veritable Records of the Ming) and the *Mingshi* 明史 (Official History of the Ming) document severe droughts across multiple provinces—including Shandong, Henan, Shanxi, Shaanxi, Hunan, and Hubei—during the first decade of the Jiajing reign. These events fall outside the timeframe of Brook's defined Jiajing Slough, thus challenging the proposed chronology.

In summary, while numerous articles and books explore the causes of the Ming dynasty's collapse through conventional perspectives, e.g. the Manchu

invasion, factional disputes, imperial incompetence, peasant rebellions, and state financial unsustainability, the author adopts an unconventional approach attempting to demonstrate the dynasty's fall through the lens of continuous price escalation driven by the dramatic and prolonged climate change associated with the Little Ice Age in the seventeenth century, suggesting a crisis far exceeding the scope of government disaster relief measures. The book's most valuable contribution lies in the author's methodical handling and comparison of diverse data sets, which include domestic and overseas trading prices, as well as global climate conditions from that era, all collected across various sources. These data convincingly demonstrate that conventional explanations for the Ming collapse fail to adequately consider the drastic inflation, as well as its profound social and economic impact, all of which were ultimately caused by climate change.