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Knowledge for Lineage: Queen, *Keju* and Social Mobility in Tang China

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This paper examines the transition from limited to open-access societies, focusing on early and high-Tang China (618–906). Using a dataset of 1,261 marriages from 618 to 755, we find that Empress Wu's rise to power in 674—the first and only female emperor in Chinese history—positively impacted upward mobility. After 674, men from common and poor clans were more likely to marry into elite clans. This increase in inter-class marriages was primarily driven by Empress Wu's expansion of national civil examinations, which strengthened her legitimacy and created new opportunities for social advancement.

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Abstract

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Keywords: Institutional transformation, Empress Wu, *keju*, social mobility, marital matching, Tang China

JEL: J12, J62, N35, N45

Declarations of interest: none

1. Introduction

Transitioning from limited to open-access orders by breaking the hereditary succession of ruling elites is crucial for economic prosperity in the long run (North et al., 2006, 2009a). Talented individuals can only assume appropriate positions under open access orders, in which societies regulate economic and political competition to establish fair and effective channels, can talented individuals rise to appropriate positions (North et al., 2009b, pp. xxi, 37; Acemoglu and Robinson, 2012). While the existing literature provides narrative accounts of the transition initiated in some advanced Western economies in the seventeenth and eighteenth centuries, knowledge of how this transition occurred in various contexts remains scarce.[1]

A unique setting in early modern China provides an opportunity to microscopically examine the dynamics of the transition from limited to open-access social orders. In seventh-century China, an early example of an open access order began to take shape with the introduction of *keju* (the national civil examination system), one of the pioneering meritocratic institutions (Kung, 2022). *Keju* originated in 605 and later became the key institutional arrangement in Late Imperial China, whereby government officials were selected based on their knowledge rather than their birth.[2] Before the Tang dynasty (618–906), civil officials were primarily selected through aristocratic clan connections and recommendations from incumbent officials (Miyazaki, 2020; Elman, 2000). Starting from Tang, more avenues were opened for non-aristocrats to join the bureaucracy, and civil examinations became among the most crucial pathways (Herbert, 1988; Lee, 1988). Wu

[1] Considering the foregoing, previous research has thoroughly studied England's transition from limited to open access orders, particularly some key events that triggered important institutional changes, including the English Civil War (1642–1651) and the Glorious Revolution of 1688 (Acemoglu and Robinson 2012; North and Weingast 1989; North et al., 2009b).

[2] There were some kinds of civil service exams as early as the Han dynasty (206 BC–220 AD), but the candidates who could attend these exams were mostly relatives of the royal families. It was not until the Sui dynasty (581–618) that the common people could also take the exams.

Zetian (624–705), the first and only female Emperor in Chinese history, played a decisive role in the institutional shift from aristocracy to meritocracy.

Empress Wu Zetian was the second wife of Emperor Gaozong (628–683). In 674, she declared herself the 'Empress of Heaven', symbolizing her equal power and status with Emperor Gaozong. Subsequently, driven by a pressing need to legitimize her rule, she started gradual reforms of the *keju* system to recruit new political elites loyal to her and aligned with her preferences and objectives (Guisso, 1978). This shift allowed previously marginalized literati from common and poor clans to compete with elites from aristocratic clans in the political arena (Herbert, 1992). To consolidate their newly achieved status, these ascending knowledge elites were motivated to squeeze into the esteemed marriage circle previously accessible only to the status elites. This convergence of knowledge and status elites represents one of the most significant social transformations during a pivotal period in Chinese history—the so-called 'Tang-Song Transition' era (Miyakawa, 1955; Miyazaki, 1971, cited by Liu, 2008; Naito, 1992).[3] However, this early shift from a limited to open-access social order in Imperial China has not been thoroughly studied in a rigorous manner before.

Therefore, this paper attempts to empirically examine the upward mobility caused by the establishment and expansion of the *keju* system in Imperial China using an exogenous shock to Tang China—Empress Wu's rise to power. This paper utilizes data on elite marriages during the early and high Tang periods, from 618 to 755. The primary data sample is drawn from version 1.5 of the Prosopographic and Social Network Database of the Tang and Five Dynasties (TBDB),

[3] The 'Tang-Song Transition' concept is first proposed by Naito Konan in the 'Naito hypothesis' (Miyakawa, 1955) and then coined by Miyazaki (1971, cited by Liu, 2008). This is commonly referred to the period from 750 to 1250 (von Glahn, 2016). 'Naito hypothesis' argues that the period spanning the mid Tang and early Song (960–1278) dynasties represented a transitional phase between 'medieval-aristocratic' and 'modern-bureaucratic' China (Miyakawa, 1955; Guisso, 1978).

compiled by Nicolas Tackett (2014, 2020) using the tomb epitaphs of Tang figures. This biographical database represents the most systematic and detailed resources for studying the Tang dynasty.[4] This valuable individual-level dataset allows us to construct a sample comprising 1,261 marriages, with detailed demographic and socio-economic information on husbands and wives. Building on previous studies, we categorize men and women into two groups based on their clans' choronyms and surnames: elite clans, and common or poor clans (Tackett, 2020; Mao, 2002). This paper uses men's marital matching outcomes to measure social mobility, specifically whether the marriage was classified as 'matching-door' or inter-class.

To begin with, following Duflo (2001) and Chen et al. (2020), we employ a cohort difference-in-differences strategy. We compare changes in marriage outcomes between men from common and poor clans and those from elite clans. The treatment year in our analysis is 674, when Empress Wu became the power behind the throne. Our baseline results suggest that inter-class marriages increased after 674. Compared to men from elite clans, the probability of men from common and poor clans marrying women from elite clans was 24.6 percentage points higher. This coefficient on the interaction term between the year 674 and common-clan origin remains significant even when controlling for the office-holding statuses of a man and his father, as well as whether the man was originally from a capital-based or a royal-family related clan.

We then conduct a series of robustness checks. First, we address the issue of sample selection bias and find that the treatment and control groups did not significantly differ in terms of the information recorded in their epitaphs. We add additional controls regarding household wealth and turbulent war periods to the model, consider a more granular marital assortment, and utilize an alternative continuous treatment assignment. The baseline results hold across all these checks. In

[4] TBDB includes in total 5,608 epitaphs and 39,204 individuals in total. The primary source of the database is Zhou and Zhao (1992, 2001), which is the most complete compilation of Tang epitaphs (Lu, 1994).

the post–674 period, men from common and poor clans were more likely to marry into the elite clans compared to the previous period. Additionally, we conduct five placebo tests using alternative years marked by significant historical events to confirm that the observed increase in inter-class marriages in the baseline results is attributed to Empress Wu's ascent to power in 674, rather than other major events that may have influenced marital matching and social mobility. Our analysis reveals that none of these alternative years produced statistically significant results.

Furthermore, we investigate the potential mechanisms through which Empress Wu's rise affected social mobility. First, in classical literature on social mobility, acquiring education and attaining a socially recognized occupation are key channels for achieving higher social status (Sorokin, 1927; Bourdieu and Passeron, 1977). During Empress Wu's reign, the expansion of the *keju* system created more possibilities for men from common clans to enter the officialdom through examinations, thereby facilitating their marriages into old aristocratic clans. To test this hypothesis, we employ a triple-differences (DDD) specification and find that men from common and poor clans in regions with higher *keju* density were more likely to marry into elite clans after 674. Additionally, individuals from modest family backgrounds became more inclined to hold official positions after 674. Second, classical literature has also well documented the "circulation of elites" following a change in rulership, wherein social mobility occurs through elite competition and replacement (see, for example, Pareto, 1968; Acemoglu and Robinson, 2006). Building on this framework, an alternative explanation for our baseline results is the fall of the old elites because of political purges. Given that another strategy Empress Wu adopted was to suppress old aristocratic clans, we hypothesize that the diminishing advantages of the old aristocracy may have contributed to the relative social mobility of common clans. To evaluate this, we examine whether old aristocratic clans performed worse in marriage markets and find no significant evidence to

support this. This suggests that the weakening of the old aristocracy was not a major contributing mechanism to the observed patterns of social mobility.

This paper contributes to several strands of literature. First, it expands the empirical literature on institutional change. Open-access social orders, or inclusive institutions, are widely recognized as instrumental for development and prosperity (North and Weingast, 1989; North et al., 2009b; Acemoglu and Robinson, 2012; Acemoglu and Johnson, 2023). The *keju* reform initiated by Empress Wu provides a distinctive lens for examining an early institutional transition from limited to partly open access orders. Although this transition primarily impacted the upper class, its significance lies in expanding opportunities to a broader segment—particularly the lowest tier within the upper class—allowing them to compete and integrate into economic and political organizations. This shift represents a meaningful and transformative development in institutional history.[5]

Second, our findings add to the ongoing discussion concerning social stratification, mobility, and marital matching in pre-modern times (Horan, 1985; Van Leeuwen and Maas, 2010; Dribe et al., 2012). While social status and wealth are closely connected, as Weber (1978, pp. 932–937) famously observed, status is not always primarily determined by "property"; instead, status groups can be stratified by hereditary prestige, modes of living, and occupation. At the same time, social mobility reflects the broader social nature of human life and shapes the long-term dynamics of inequalities (Clark, 2014; Clark and Cummins, 2015; Piketty, 2014). Prior research has also demonstrated that marital matching based on socio-economic status has profound implications for

[5] As described by North et al. (2009, p.72) in the English case, the 'wider population' achieving more opportunities largely comprised the old landed elites and the new commercial elites with substantial wealth. This situation bears similarities to the French case after the revolutions of the 1790s, where elections were held, but only 'elites via tax, residency, or other restrictions' were covered by suffrage (North et al., 2009, p. 221). Similarly, in Tang China, Empress Wu extended opportunities to men from common and poor clans who were not part of the early Tang state bureaucracy, rather than to the true 'commoners' in society. In essence, this transition towards an open access order was only partly open.

mobility and inequality (Ebrey, 1991; Eika et al., 2019; Fernández and Rogerson, 2001; Greenwood et al., 2014; Clark and Cummins, 2023). Elites have historically practiced endogamy to maintain supremacy (Goñi, 2022; Marcassa et al., 2020; Puga and Trefler, 2014; Tackett, 2020; Wang, 2022a). This paper demonstrates the upward mobility of individuals who lacked hereditary prestige but ultimately gained recognition from the upper class through marital matching in Imperial China. This pattern parallels pre-modern Europe, suggesting a broader generalization of historical social mobility and martial assortment.

Third, this paper contributes to the literature on leadership and leaders' strategies for regime survival. On one hand, by exploring the effects of female leadership, this paper closely aligns with Dube and Harish (2020). It also demonstrates that the legitimacy risk faced by female leaders would lead to different policy choices than male leaders, resulting in distinct policy outcomes (for example, Fukuyama 1998; Chattopadhyay and Duflo, 2004; Clots-Figueras, 2012). On the other hand, to address the challenges of state-building and extend her reign, Empress Wu employed a common strategy among authoritarian rulers: sharing power with elite groups in exchange for loyalty (Magaloni, 2008; Svolik, 2009; Boix and Svolik, 2013). This paper, therefore, provides evidence of how leaders' identities and power-sharing strategies shape political and social structures.

Finally, this paper enriches our understanding of the origins of meritocratic bureaucracies. As one of the longest-lasting institutions in the world, *keju* has been extensively examined from various perspectives, including its precursor, the nine-rank system (Miyazaki, 2020), its formalization and procedures (Miyazaki, 1976; Elman, 2000), its short- and long-term effects on the human capital formation (Chang, 1955; Chen et al., 2020; Lin, 1995; Mokyr, 2016), and its contribution to the 'openness' of Chinese society (Ho, 1962; Campbell and Lee, 2003, 2008; Shiue,

2020; Jiang and Kung, 2021; Wen et al. 2024). In particular, Wen et al. (2024) provides a foundation for understanding *keju*-related social mobility in the Tang Dynasty. This paper shifts focus to the early years of *keju*, tracing the rise of meritocracy in an aristocratic society and its role in the Tong–Song Transition, a period of profound economic and political transformations.[6] Recent discussions on this transition emphasize changes in elite social networks (Tackett 2014, 2020; Wang 2022a, 2022b).[7] Similarly, we explore the 'social revolution' under Empress Wu, reflected in evolving marriage networks, which signal the early origin of the Tang–Song transition (Chen, 2001).

The remainder of this paper is structured as follows. Section 2 introduces the historical context of social hierarchy, the marriage system, and the rise of Empress Wu. Section 3 outlines tomb epitaph data. In Section 4, we formalize the empirical strategy used in the analysis, present the results, and address additional concerns regarding the studied relationship. Section 5 discusses the primary mechanism. Finally, Section 6 concludes.

2. Background

[6] Politically, the dominant theme in imperial China shifted from fragmentation to unification (Chen and Ma, 2020; Chen et al., 2023). Economically, the economy shifted from being 'overwhelmingly agricultural' to 'highly commercialized', accompanied by a population increase from around 75 million in 754 to 126 million in 1124 (Dong, 2002; Wu, 2002; Chen and Kung, 2022).

[7] One defining aspect of the Tang–Song transition is the shift from aristocracy to meritocracy, a remarkable historical shift marked by a series of events. Although the *keju* system was initially established in the Sui dynasty, it was Empress Wu who reformed the system for recruiting bureaucrats through the first notable expansion of *keju*. The late Tang dynasty witnessed the demise of the aristocracy due to the Huang Chao Rebellion (874–884), a major rebellion that involved the deliberate large-scale physical eradication of aristocrats under Tang's reign (Tackett, 2014). Among these significant events, this paper focuses on Empress Wu's expansion of *keju*. We believe that her peaceful and medium-scale reform provides us with a relatively significant and pure channel to identify the effects of institutional transition on social mobility.

This section introduces the historical background of the study. Prior to the widespread implementation of civil examinations, individuals' social status and marriage outcomes were primarily determined by their pedigrees. However, after Empress Wu ascended to power and expanded the civil examinations, pedigrees became less influential. Under Empress Wu's rule, the social hierarchy and marriage system were no longer solely dictated by pedigree considerations.

2.1 Before Empress Wu: Pedigree-dominated social and marriage systems

Before the widespread adoption of the civil examinations, social hierarchy in China was structured and organized around clans and their social origins (Ebrey, 1978). At the top of this hierarchy was the imperial clan, followed by sixteen old aristocratic clans distinguished by their long descent lines and prominent office-holding status; below them were the local elite clans, with common and poor clans occupying the lower tiers (Mao, 2002; Tackett, 2014).[8]

To preserve social hierarchy and restrict social mobility, marriages were carefully arranged according to social status (Ditter et al., 2017). Legally, Article 192 of the *Tang Code* prohibited inter-class marriages, stating that 'general bondsmen are not permitted to marry commoners', with penalties imposed on both parties for violations; similarly, 'official bondsmen who marry commoners receive the same punishment' (Johnson 1997, p. 171). In practice, the classification of social status was even more granular, and the hierarchy was enforced with greater rigidity. Among the old aristocratic clans, 'marital exclusiveness' helped them distinguish themselves from both

[8] See Mao (2002, pp. 34–38) for a detailed classification of clans in Tang China, and Tackett (2014) for a comprehensive list of old aristocratic clans. In the Tang dynasty, a combination of choronym (place of origin) and surname was used to identify a clan. The sixteen clans include twelve surnames and fifteen choronyms: the Longxi Lis, Taiyuan Wangs, Xingyang Zhengs, Fanyang Lus, Qinghe Cuis, Boling Cuis, Zhaojun Lis, Langya Wangs, Hongnong Yangs, Jingzhao Weis, Hedong Peis, Nanyang Zhangs, Qinghe Zhangs, Pengcheng Lius, Bohai Gaos, and Tianshui Zhaos. The first seven of these were the most prominent clans.

local elite and common clans: to maintain their privileges and consolidate their dominance, only 'matching-doors' marriages—strictly within their own rank—were deemed acceptable (Ebrey 1978, p. 31; 1991). [9]

2.2 The rise of Empress Wu: A turning point

This rigid social structure began to shift during Empress Wu's reign. Wu Zetian, the only female emperor in Imperial China, entered the palace around 637 as one of Emperor Taizong's concubines; eighteen years later, she became the Empress of Emperor Gaozong, Emperor Taizong's son. Her political ambitions soon became evident. Over the following decades, she gradually accumulated political experience and assisted her husband in governance (Guisso, 1978; Meng, 2021).

In 674, Empress Wu achieved the title 'Empress of Heaven', parallel to Emperor Gaozong's title 'Emperor of Heaven', and together, they were called 'Two Saints', a symbolic equalization of her status and power with his (*New Tang History*).[10] By this point, Empress Wu's status and reputation had reached unprecedented heights, presenting her with the new task of firmly securing her authority over the Tang court (Lei, 2001). In 690, she established the Wu Zhou dynasty and ruled as emperor in her own right until 705.

Empress Wu's ascent to the position of the de facto Emperor naturally provoked outrage among conservative officials (Twitchett and Wechsler, 1979; Guisso, 1975).[11] To them, Empress

[9] In the early Tang period, these close-knit and powerful connections alarmed the emperors. The Tang court thus issued an edict forbidding seven of the most prominent aristocratic clans from intermarrying (Tackett, 2008, 2020). However, these marriage-ban clans disregarded the imperial decree and continued to form marital alliances exclusively within their own bonds. The edict unintentionally acknowledged the dominance of the aristocratic clans and further enhanced their prestige (Johnson, 1977a; Tackett, 2014).

[10] The term 'Heaven' refers to the 'mandate of heaven', which Empress Wu invoked to assert that she had received divine approval to act as the intermediary between heaven and earth.

[11] The official group's fierce opposition towards her was evident, based on the historical record of her reign, as it was 'hostile, biased and curiously fragmentary and incomplete' (Twitchett, 1979, p. 245).

Wu, as both a woman and a non-descendant of the Li family, was an illegitimate contender for the throne. She faced persistent challenges from her opponents in court, particularly officials from the Guanlong Bloc.[12] These ongoing crises prompted Empress Wu to prioritize legitimizing her political dominance. She responded with sustained purges of opposing officials and a systematic reform of the civil service examination system (*keju*), enabling her to form her own loyal clique.

Keju's precursor, the nine-rank arbiter's system, had existed since the Han dynasty (202BC–220AD). Under this system, power was allocated based on bloodlines, with long-standing aristocratic clans controlling the selection of qualified candidates from within their own ranks (Elman, 2000; Miyazaki, 2020). The *keju* examination system, designed to break with traditional practices and select candidates based on merit, was tentatively established in 605 during the Sui dynasty (581–618) but was not widely implemented until the reign of Empress Wu.

Following Empress Wu's rise in 674, the composition of *keju* candidates shifted. She actively encouraged individuals from diverse backgrounds to self-recommend for the exams. To consolidate support in northeastern and eastern China, she issued an edict urging men from these regions to self-recommend and take *keju* examinations. She also issued multiple edicts that emphasized disregard for the candidates' family backgrounds and encouraged all virtuous men to put themselves forward for examinations (Guisso, 1978). As a result, examination opportunities expanded, and *keju*-related academies reached even the southernmost prefectures. Additionally,

[12] The term 'Guanlong Bloc' was first coined by Chen Yingke (2001) to describe a powerful political and military group comprised of the heirs of the political network formed under Yuwen Tai, the de facto ruler of the Xianbei-led Western Wei (535–557) dynasty. The Guanlong Bloc played a significant role in the early Tang dynasty. The old guard of Taizong's statesmen, including Zhangsun Wuji and Chu Suiliang, who led the strong opposition against Empress Wu, were all members of the Guanlong Bloc (Herbert, 1992; Wu, 2019).

besides annually regular examinations, irregular examinations became more frequent, with their occurrence doubling during her reign (Twitchett and Wechsler, 1979; Wu, 2010; Hong, 2013). [13]

2.3 Impacts of keju reforms: Reshaped social hierarchy

The direct outcome of Empress Wu's *keju* reforms is evident in the number of admitted scholars.[14] From 668 to 683, the annual number of *jinshi* admitted increased by over 70 per cent compared to the period from 649 to 667 (Wu, 2010, pp. 151–3). More importantly, not only did the absolute number grow, but the composition also changed. Figure 1 displays the annual number of scholars from poor family backgrounds admitted before and after Wu's reign. Both categories increased significantly during the 'Wu period'. After Empress Wu died in 705, her successor carried her legacy forward by holding frequent decree examinations (Herbert, 1992).[15] As a result, the *keju* system entered a new phase of development, gradually evolving into the form that later generations and dynasties would recognize.

Historians widely recognize that Empress Wu's reforms reshaped the social hierarchy and enhanced social mobility (Tackett, 2020; Chen, 2001). Following her reforms, an increasing number of newly ascended knowledge elites without pedigrees emerged. For these individuals, the most effective way to secure their newly acquired status was to marry into old aristocratic clans and thereby obtain a pedigree (Sun, 2021). Correspondingly, the old aristocratic clans adapted their criteria for selecting sons-in-law, increasingly favoring holders of exam degrees over those with

[13] From 650 to 673, decree examinations were held only in 8 out of 24 years; however, between 674 and 684, the exams were held in 8 out of 11 years (Hong, 2013). From 688 until her death in 705, decree exams were omitted in only 4 out of 17 years (Wu, 2010; Hong, 2013).
[14] There were two types of scholars admitted in Tang keju system, *jinshi* (presented scholars) and *mingjing* (classicists).
[15] Emperor Xuanzong inherited most of Empress Wu's policies, especially the expanded and systematic use of the *keju* (Wu, 2010). Under his reign, the Tang dynasty entered the Kaiyuan period (713–741), a period also recognized as the 'flourishing and prosperous age' of the Tang dynasty. This era laid a solid foundation for the later development of the *keju* system in China.

pedigrees alone. By the mid-Tang period, 'between half and two-thirds of each year's graduates used their academic success to confirm conditional betrothals to the daughters of eminent families' (Lewis, 2009, p. 106).[16] Ultimately, the two types of elites—knowledge-based and status-based—converged.

3. Data

The main data used in this paper are derived from version 1.5 of the TBDB constructed by Tackett (2014, 2020). The primary sources for the TBDB are tomb epitaphs of Tang figures, many of whom were socio-economic elites and family members from imperial and aristocracy clans throughout the Tang dynasty. Figure A1 in Online Appendix A shows a typical example of a Tang tomb epitaph. One advantage of the TBDB is its abundance of detailed individual-level information, including vital statistics, family status and social origins, office holdings, and kinship ties. After linking individual-level information between grooms and brides, the dataset allows us to identify changes in marital assortment over time. Each observation, that is, each marriage, contains two parts of information: the groom's and the in-law's (either the bride or father-in-law).

In this paper, we construct a pooled cross-sectional data sample comprising 1,261 marriages between 618 and 755, spanning the beginning of the Tang dynasty through the mid-Tang period, 50 years after the fall of Wu's regime. Most epitaphs provide birth and death dates for the deceased; however, marriage dates are rare, except for royal marriages. Hence, we follow the method applied

[16] Several tales from *Taiping guangji* (Extensive records of the Taiping reign), a collection of unofficial histories, local accounts, and stories compiled in the Song dynasty, clearly illustrate people's obsession with distinguished pedigree and their efforts to marry daughters from great aristocratic clans in the Tang period. See, for example, tales of 'Old man Lv', 'Bibliography of Li Wa', 'The record of Master Shenxiu's Prediction', and 'Tang Xuan' for more details (Sun, 2021; Ditter et al., 2017).

by Tackett (2020) and add 30 years to a groom's birth year to proxy for the couple's marriage year.[17] The earliest date of birth observed in the sample is 588, and the latest death year is 808. Figure 2 shows the frequency distribution of marriage data by ten-year periods, and Figure 3 shows the spatial distribution.

Although tomb epitaph data are invaluable for historical analyses, they are prone to potential selection bias. Specifically, these epitaphs were available only to individuals and families who could afford elaborate burials and sophisticated tombs. Therefore, this sample may not represent the entire societal spectrum. However, wide variations can still be observed in this sample. While the majority of these individuals achieved elite statuses during their lifetimes, it is crucial to note that they were not necessarily born into elite families. As Tackett (2014, pp. 23–24) stated, 'It is fair to say that any individual with a tomb inscription was by definition a member of the wealthier strata of society. That is not to say that these individuals came from a homogeneous socioeconomic class.' In the subsequent section demonstrating the robustness of our baseline results, we further address the sample selection bias stemming from the data generation process.

3.1 Outcome variable: Inter-class Marriage

Our primary dependent variable is *Inter-class Marriage*, a dummy variable for marital matching that measures social mobility in this paper. It equals one for an inter-class marriage, which means the groom had 'married up' or 'married down', and zero if the marriage was 'matching doors'. We construct this measure as follows: First, following the classification of clan types applied in Mao

[17] In some cases, the groom's birth year was missing, with only the death year recorded. In such cases, if the bride's birth year was recorded, we add 20 years to the bride's birth year to proxy for the marriage year. If both birth years for the couple were both missing, we subtract 32 years from the groom's age at death, given that the average lifespan for grooms in our sample was 61.9 years old.

(2002) and Tackett (2014), we divide all individuals in the sample into four ordered groups based on the clans they belonged to—the imperial clan, marriage-ban clans, top office-holding clans, and other clans. As previously mentioned, there were, in total, 16 top office-holding clans, and 7 of them were the most prominent marriage-ban clans. In this paper, the first three types of clans are considered elite clans, and the last type is considered common. Second, we compare the couples' family backgrounds. If both the groom and the bride were from elite clans, or if both were from common and poor clans, the marriage was 'matching doors', and the dependent variable equals zero. If one was from an elite clan and the other was not, the dependent variable equals one. Therefore, our dependent variable measures negative assortative mating; an increase in negative assortative mating indicates an increase in upward mobility. Generally speaking, in the early Tang dynasty, when class endogamy was the norm, both elites and commoners followed similar marriage patterns—most engaged in 'matching doors' marriages.

3.2 Treatment

We use a binary measure based on the groom's family background for the baseline analysis. Grooms from common and poor clans are considered in the treated group, and those from the elite clans, the royal clan and the 16 old aristocratic clans, are considered in the control group. In our sample, 936 grooms from 808 lineages are assigned to the treated group, and the remaining 339 grooms from 383 lineages are assigned to the control group.[18]

[18] A clan, identified in this paper as the combination of a choronym and a surname, may encompass several distinct lineages. For instance, in Tackett (2020), the Longxi Li clan is assigned three separate IDs, reflecting the presence of different lineages within the same clan.

We categorize grooms in our sample based on family background, as their marriage outcomes were differently affected by the rise of Empress Wu and the subsequent expansion of the *keju* system. Men from elite clans already held elite status, reducing their incentive to take the exams for social advancement to marry daughters from elite clans. Conversely, men from common clans were driven by heightened desperation to succeed in exams for social status enhancement, thereby facilitating their marriages into elite clans. Figure 4 displays the spatial distributions of the treated and control groups.

3.3 Control variables

We include a series of control variables that would also affect marriage outcomes.

Father's prestige. In traditional China, fathers primarily made their sons' marriage decisions. As a father's social outcomes would significantly affect his son's marriage outcomes, we control for the father's office-holding status. It equals one if the father was an official, either civil or military, and zero if the father held no office.

Number of brothers. We use the number of brothers a man had—the number of sons his father had—as an additional measure of household wealth. In a traditional Malthusian society, wealth and reproduction were always positively correlated and thus could be a valid measure of household wealth (see, for example, Clark and Hamilton, 2006; Campbell and Lee, 2008).

Royal families. We use this dummy variable to control for the potential effects of royal families on inter-class marriages. Thus, we control for whether the men were from the four consort clans that were ranked first in the national list of clans after 659, that is, the Wu, DuGu, ZhangSun, and Dou clans (Guisso, 1978).

Clan region. We condition on the 'home base' of a clan, which Tackett (2020) defined as the usual place where a clan buried its dead. This categorical variable indicates whether the groom's clan is capital-based or not.[19]

We include this clan region variable for two reasons: First, the home basis of a clan in the Tang dynasty was closely related to its political and economic prominence (Johnson, 1977b; Tackett, 2014). Second, the equal field (*juntian*) system is claimed to have significantly contributed to the demise of aristocracy (Dai and Bie, 2015).[20] As it was most strictly enforced in the capital region (Ji, 1981), conditioning on the base region of a clan would also control for its effect on the economic conditions of wealthy families.

Emperors' reign years. We control for different Tang emperors' reign periods, spanning the period 618–755. This categorical variable comprises five groups: married during Emperor Taizong's reign, Emperor Gaozong's reign, the Wu Zhou dynasty, Emperor Xuanzong's reign, and the reference group (684–711), which is a tumultuous period as the throne shifted among various emperors. This variable allows us to control for the temporal effects on matching in marriage, as the eras associated with these rulers may have affected marital alliance dynamics.

Table A1 in the Online Appendix gives the descriptive statistics of the sample.

4. Empirical strategy and results

[19] 'Capital-based' regions include the Western Capital of Chang'an, the Eastern Capital of Luoyang, and the corridor area between the two capitals.

[20] The equal field system is the land-tenure institution in Tang China that in theory equally distributed agricultural lands to all adult peasants.

In this section, we examine how the rise of Empress Wu Zetian affected inter-class marriages. Section 4.1 describes our DID strategy and validates the identification assumptions. Section 4.2 presents our baseline estimates of the binary treatment effects. We demonstrate the robustness of our baseline results and placebo tests in Sections 4.3 and 4.4, respectively.

4.1 Empirical strategy

Our empirical strategy follows the standard DID approach. We compare the relative changes in inter-class marriages with grooms from common clans and those with grooms from elite clans. The model specification takes the following form using logistic regression:

$$(1) \qquad Interclass\ Marriage_{ik} = c_1 + \beta Common\ Clan_i \times Post_k + \gamma_i + \delta_k + \varepsilon_{ik}\ ,$$

where dummy variable *Interclass Marriage*$_{ik}$ is the marital matching outcome of the male individual *i* in year *k*, indicating whether he married a woman from a clan type other than his own. *Common Clan*$_i$ is a dummy variable that equals one if the male *i* came from the common and poor clan, which did not belong to either the seven marriage-ban clans or the nine office-holding clans, and the control group (equals zero) comprises men from either the seven marriage-ban clans or the nine office-holding clans. We also employ the dummy variable *Post*$_k$ to denote marriage year *k* for male *i*, which equals one if the marriage year was after Empress Wu became the de facto Emperor. The equation also contains controls for individual and intergenerational fixed effects (γ_i) and marriage period fixed effect (δ_k), which correspond to the emperor's reigning periods. c_1 represents the constant term. The coefficient of interest in Equation (1) is β, representing the

estimated impact of *keju* expansion on the probability of negative assortative mating. We expect the coefficient to be positive, suggesting a higher probability of negative assortative mating for men from the common and poor clans. The identification assumes that we have controlled for all variables or events that coincide with *keju* expansion and affect social mobility. This assumption should not be taken for granted because a set of individual- and family-level variables would also contribute to marital outcomes. Therefore, we address the issue in the next section.

We define the pre- and post-reform periods based on the establishment of Empress Wu's political dominance in 674 for two reasons. First, the adoption of the 'Empress of Heaven' tied Empress Wu's rule to divine rights, suggesting that her political influence had begun to strengthen and accumulate, laying the groundwork for her more profound *keju* expansion reforms. Second, although Empress Wu was bestowed the title of 'Empress of Heaven", she still had a weaker legitimacy as a true emperor. Therefore, she had a strong incentive to justify her future legitimate governance by implementing reforms (e.g., *keju* expansion). Some previous studies suggest that during the co-ruling period, Empress Wu had already shown a strong interest in *keju* (Li, 2012; Zhao, 2006). For instance, she broadened the geographic range for enrolment into *keju*, implemented the South selection (*nanxuan*) in 676 (Zhao, 2006), and added miscellaneous essay (*zawen*) writing in the *jinshi* examination in 680 to select talents based on her own taste. Therefore, we argue that 674 is a reasonable treatment date for identification purposes.

Our assumption for estimating equation (1) is that grooms with different family backgrounds were on a similar trend before Empress Wu's rise to power. To confirm that this assumption is reasonable, we use an event study strategy to estimate the impacts decade by decade:

$$(2) \qquad Matching_{ik} = c_2 + \sum_{\Gamma=643-}^{755} \beta_\Gamma \, Commonclan_i \times Decade_k^\Gamma + \gamma_i + \varepsilon_{ik} \, ,$$

where all the variables are defined as in Equation (1). The only difference in Equation (2) is that, rather than interacting $Commonclan_i$ with a post-reform indicator variable, we interact the treatment variable with each of the decade fixed effects (relative to 674), considering the period about 50 years before 674 as the reference group. The estimated β_Γ vectors reveal the differences between the treated and control groups during each decade. If Empress Wu's *keju* expansion increased inter-class marriages for men from common and poor clans, then the estimated β_Γ is expected to remain constant over time for the years before Empress Wu and Emperor Gaozong's co-ruling. We would also expect the coefficients to increase after the co-ruling period.

Figure 3 plots the estimates of Equation (2). A clear pattern emerges from the figure, and each dot on the solid line is the interaction coefficient between variables representing men from common and poor clans and men's year of marriage. The difference between the treated and control groups is constant over time and small in magnitude before 674. During the ruling period of Empress Wu, we first observe a big increase in negative assortative mating in the first ten years (674–683), and a slight increase in the next ten years (684–693). The period 693–703 in the Wu Zhou dynasty saw a noticeable, yet insignificant, decline in the difference between the marriage patterns of the elite and common clans. Later, during the Kaiyuan era (713–742), the difference between men from the common and poor clans and those from elite clans considerably widened and became more significant, with *keju* procedures being increasingly refined and becoming the major way for candidates from common and poor clans to achieve political achievements. Thus, they became as competitive as, or even more competitive than, men from elite clans in the marriage

market.[21] Therefore, the general class exogamy trend displays an upward tendency after the beginning of co-ruling, which confirms our choice of 674 as the treatment year. The point estimates shown in Figure 5 also suggest that no differential trends existed between the two groups before the rise of Empress Wu, which is the key assumption of the parallel trend for our identification. [22]

4.2 Baseline model results

We present our baseline estimates derived from Equation (1) in Table 1, where the dependent variable is *Inter-class Marriage* and equals one for a man married to a woman from a class other than his own.[23] The five columns reflect the varying combinations of controls.

The first specification, reported in column 1, includes only the year of marriage and clan type, without additional controls. For column 2, we include the prestige of the man's father—the father's office-holding status. The specification in column 3 aims to rule out the differential effects on marriage matching when one comes from the imperial clan and clans that were closely related to the imperial clan. In column 4, we control for the home base of a clan to account for the differential impacts of capital and local regions on marriage matching. Furthermore, since different reign periods had varying numbers of marriages, and periods with a larger number of marriages would be more likely to exhibit higher social mobility, we condition on *Reign* in column 5 to control for the effects of different emperors' reign years on marriage matching.

[21] 'Selection of Officials' of *Tongdian* ('Encyclopedia of Tang') states that, 'After the Kaiyuan period, the world was peaceful, and scholars were judged solely based on their talent and virtue. It was considered shameful not to achieve recognition through literary accomplishments. The number of candidates who applied and were selected for positions ranged from two thousand or more to no less than one thousand'.

[22] Consistent with this, we also conduct a balance test on the pre-Wu period characteristics of men from common and poor clans and men from elite clans. The results are reported in Table A2 in Online Appendix A.

[23] We also run the regression under the OLS regression (Online Appendix Table A3); the results are comparable to the logistic estimates.

The coefficients on the interaction term between *Common Clan* and *Post* obtained across all specifications are positive and significant, suggesting an increase in the probability of negative assortative mating after Empress Wu's rise to power in 674. For example, the marginal effect reported in column 1 is 0.246. This indicates that men from common and poor clans who married after 674 would experience an increase of around 24.6 percentage points in their probability of marrying women from elite clans. The marginal effects reported in columns 2–5 exhibit magnitudes and significance levels similar to the one reported in column 1.

More broadly, we suggest that the deep roots that triggered the Tang-Song Transition can be traced back to the rise of Empress Wu. China underwent profound changes during the transition period, characterized by significant transformations in both its economic and political landscapes. Since then, the dominant theme in imperial China has been unification rather than fragmentation (Chen and Ma, 2020; Chen et al., 2023). The economy shifted from being 'overwhelmingly agricultural' to becoming 'highly commercialized' in the Song dynasty, and the population increased from around 75 million in 754 to 126 million in 1124 (Dong, 2002; Wu, 2002; Chen and Kung, 2022). Recent discussions on the timing and reasons for the transition highlight the changes that occurred in the social networks of elites. Tackett (2014, 2020) and Wang (2022a, 2022b) study the evolution of elite composition and marriage networks during the Tang and Song dynasties to provide insights into elites' political stances and their roles in state building.[24] In a similar vein, we also focus on the changing marriage network, but emphasize the earlier period more, seeking

[24] The transition from aristocracy to meritocracy in imperial China represents a remarkable historical shift, marked by a series of events. Although the *keju* system was initially established in the Sui dynasty, it was Empress Wu who reformed the system for recruiting bureaucrats through the first notable expansion of *keju*. The late Tang dynasty witnessed the demise of the aristocracy due to the Huang Chao Rebellion (874–884), a major rebellion that involved the deliberate large-scale physical eradication of aristocrats under Tang's reign (Tackett, 2014). Among these significant events, this paper focuses on Empress Wu's expansion of *keju*. We believe that her peaceful and medium-scale reform provides us with a relatively significant and pure channel to identify the effects of institutional transition on social mobility.

to understand the origins of societal transformation and its implications for long-term social development.

4.3 Robustness checks

In the previous section, we provide empirical evidence that the rise of Empress Wu in 674 increased the probability of men from the common and poor clans marrying daughters from elite clans. In this section, we demonstrate the robustness of our baseline results to (1) selection bias originating from the data generation process, (2) the use of alternative marriage cohorts for the marriage period fixed effect, (3) the inclusion of additional control variables, (4) alternative outcome measures, and (5) an alternative modeling approach regarding different treatment assignments.

First, as outlined in the Data section, one might concern that having a preserved tomb epitaph was a privilege limited to a select segment of society. We acknowledge the possibility of a survivor bias. If a considerable number of men from common clans who followed similar marriage patterns did not possess preserved tomb epitaphs, our coefficients might be selection-driven, potentially overestimating the true effect. This bias could occur because we only have data on the 'survivors' from common and poor clans—those who were relatively wealthier or more successful in marrying daughters from the old aristocracy, but not on the 'failures' from common and poor clans—those who did not share these advantages.

Such survivor bias does not seem to apply for several reasons. On the one hand, this paper focuses on the wealthier strata of society (Tackett, 2014). Although common and poor clans were

less privileged than the elite clans or the old aristocracy, they were far from being impoverished in absolute terms. Many of these clans were still regarded as local elites and possessed sufficient resources to finance burials and tomb inscriptions. On the other hand, a man's ability to marry a daughter from the old aristocracy was not a prerequisite for receiving a tomb epitaph. Members of the royal family, aristocrats, office-holding elites, commoners, and even monks were eligible to be buried in tombs with inscriptions (Chen, 1991, Preface).[25]

Nevertheless, one might still be concerned that although epitaphs for men from common and poor clans were also preserved, their records could be less complete compared to those of men from elite clans, potentially leading to the spurious coefficients in Table 1. Men from common and poor clans who failed to marry daughters from elite clans might have had a lower likelihood of having their marital information recorded. Even if such an issue exists, our DID estimation accounts for it, as the degree of the lack of marital information would not differ significantly between the pre-674 and post-674 cohorts. However, given that more men from common and poor clans moved upwards after 674, it is possible that the issue of lack turned statistically significant. Hence, Table A4 in the Online Appendix shows the difference in the completeness of the recorded information between men from common and poor clans and those from the nine office-holding clans. We find that the completeness of records for the two groups is statistically similar. This suggests that the information preserved in epitaphs is not selected based on the clan types of either the men or their wives. This outcome indicates that our dataset has no significant sample selection bias.

[25] According to Geng (2007), within the 5,200 tomb epitaphs collected by Mao Hanguang and his research team, the majority of the individuals featured falls within the middle and lower strata of the elite class. Only about five percent of them can be attributed to the upper echelons, as documented in the *New Book* and *Old Book of Tang*.

Second, we use an alternative variable to account for the marriage period fixed effect. In the baseline analysis, we use the reign periods of emperors from 618 to 755. Here, we adopt a more granular classification, dividing the marriage years into fifteen cohorts: the first cohort covers 618 –619, the final cohort spans 750–755, and the intermediate thirteen cohorts each represent a 10-year interval. Column 1 of Table 2 reports the result; the coefficient of the interaction term remains significant and positive.

Third, we include two additional controls to the model: the number of brothers a man had and whether the marriage year was during a war. We control for these two variables to ensure that the change in marriage patterns after 674 was not driven by the man's family background and household wealth or the turbulent social environment. Regarding the war years, we consider only large-scale conflicts that occurred, where the Tang army mobilized over 100,000 troops, including the Goguryeo War, Turkic War, and Yingzhou Rebellion. As shown in the first column of Table 2, the number of brothers had a positive effect on inter-class marriages, and the DID estimator coefficient remains positive and strong, suggesting that the baseline results are robust.

Additionally, in column 3, we separate the imperial clan, marriage-ban clans, and top office-holding clans, instead of grouping them together. As hierarchies remained within each of these categories, combining them into one 'elite clans' group might disguise the differences between them. For instance, compared to the other office-holding clans, marriage-ban clans could be more defensive in preserving their prestige through marriage. This emphasis was driven not only by their desire to maintain social status but also by a commitment to preserve the 'purity' of their lineage (Guisso, 1978). Therefore, we assign the dependent variable equals one if a man married a woman from a clan other than his own type, such as a marriage between a marriage-ban clan

man and a top office-holding clan woman or a marriage between a top office-holding clan man and an imperial clan woman.

Consistent with the pattern of inter-class marriages, column 3 reveals a substantial increase in inter-clan marriages after 674. A closer examination of the four types of clans reveals distinct patterns of inter-clan marriages. Figure 6 shows the marginal effect of a man's probability of marrying a daughter from a different clan type based on the results in column 4. As expected, the marriage-ban clans felt the most pressure from men from common and poor clans, and they had the most matching-door marriages, whereas the common and poor clans had the most marrying-up marriages. The imperial clan's legitimacy was not contingent on marital connections with old aristocratic clans, making them impartial in their choice of brides, choosing from either the elite or common and poor clans. Likewise, the nine top office-holding clans, situated as the lowest tier within the elite clans in this sample and attainable by knowledge elites from common and poor clans, did not exhibit the same degree of urgency as marriage-ban clans in safeguarding the perceived 'purity' of their lineage. After all, good marriages were perceived as crucial for preserving the aristocracy (Tackett, 2014).

Finally, we use alternative treatment assignments to demonstrate that the baseline estimates are not driven by our definition of treatment status. When the effect of a treatment is heterogeneous between groups, the DID estimator could be biased (Chaisemartin and D'haultfœuille, 2021; Callaway et al., 2021). To address this concern, we redefine the treatment as a continuous variable to account for potential heterogeneity in treatment effects. Instead of the binary distinction between elite and common clans, we construct a new variable, *Minister Intensity*, which represents the number of chief ministers produced by a male individual's clan during the early Tang period (618–674), before the rise of Empress Wu. This variable serves as a proxy for the degree of "eliteness"

of a male individual's clan. During this period, 30 lineages from 20 clans produced 59 chief ministers.

Based on this redefined treatment, we modify our outcome variable, *Chief minister's clan marriage*, to indicate whether a male individual married a daughter from a clan that had produced chief ministers between 618 and 674. The results of this new specification are presented in column 4. The coefficients on the interaction term, *Minister Intensity × Post 674*, are negative despite being less statistically significant, suggesting that males from clans with fewer chief ministers were more likely to marry daughters from clans that had produced chief ministers before 674. This finding further supports the robustness of our baseline results.

4.4 Placebo tests

Another related concern is that the results might reflect the effects of other major events that occurred during the early Tang dynasty rather than the effects of Empress Wu's rise to power in 674. Although we condition on the cohort-specific impact in the baseline analysis, the lasting effects of these events may disguise the real effect of Empress Wu's rise. Therefore, we attempt to address this issue by implementing a placebo design.

To assess the sensitivity of our baseline results to the definition of treatment, we test alternative treatment years: 638, 660, 664, 686, and 690. Historians have identified significant events in each of these years that could potentially affect marriage patterns between elite and common clans. In 638, Emperor Taizong, with the intention of diminishing the power of the old aristocratic clans from previous dynasties, revised the national list of clans (*shizu zhi*) by demoting aristocratic clans and elevating the royal Li family to the top of the list. By 660, Empress Wu had

successfully eradicated the opposition from the Guanlong bloc in the northwestern region. The elimination of her strong opponents granted her more freedom to interfere with state affairs during Emperor Gaozong's reign. Consequently, previous historical research has also designated this year as the point at which Empress Wu assumed the role of the "ruler of the empire in fact" (Twitchett and Wechsler 1979, p. 255). As mentioned earlier, the year 664 is regarded in some historical records and by some historians as the time when the title 'Two Saints' began to be used, marking the 'true' rise to power of Empress Wu (see, for example, Lei, 2011). In 686, Empress Wu ordered the production of four types of bronze caskets (*tonggui*) and placed them in front of the imperial palace of Luoyang to receive petitions from officials and commoners across the realm at any time.[26] This act is considered to mark the beginning of Empress Wu's era of tyrannical rule, a period that substantially heightened her political dominance (Guisso, 1978; Lei, 2011). Furthermore, scholars suggest that many commoners advanced socially during this period by submitting petitions and serving as "secret police officials" (Sun, 2021). In 690, after years of de facto rule, Empress Wu finally proclaimed herself Emperor Wu and established the Wu Zhou dynasty in her own name. Her legitimacy peaked at this point.

The results of the five placebo tests are reported in Table 3. After conditioning on the interaction term between *Common clan* and *Post 674*, the other five interaction terms with different treatment years in all five columns are not statistically significant, whereas the original DID estimator remains statistically and economically significant. Before Empress Wu became the 'Empress of Heaven' and the true power behind the throne in 674, she was not as motivated to form her own loyal clique. The previous strategies implemented by Emperor Taizong, Emperor

[26] The four types of caskets include the Yan'en Casket, for those presenting tributes, praises, and seeking official positions; the Zhaojian Casket for those criticizing the gains and losses of court policies; the Shenyuan Casket, for those lodging complaints of injustice; and the Tongxuan Casket, for those discussing celestial phenomena, disasters, and confidential military strategies.

Gaozong, and Empress Wu herself in 638, 660, and 664 did not result in significant changes in the marriage patterns and social structure of Tang China. In 686 and 690, after she had already gained substantial legitimacy, mainly by expanding *keju*, her policies and assumption of the imperial title did not affect social mobility further. The results clearly suggest that our baseline results are robust and solid, and that the positive effects on inter-class marriages were exerted by the elevation of Empress Wu in 674.

5. Discussion of mechanisms

In this section, we examine the mechanisms through which the rise of Empress Wu affected inter-class marriages and, consequently, social mobility in Tang China. Classical literature on social mobility has extensively documented two key pathways: first, for the lower class, increased access to education and expanded occupational opportunities could break hereditary privileges and enable upward mobility (Sorokin, 1927; Boudon, 1974; Bourdieu and Passeron, 1977); second, political changes could reshape the upper-class by displacing and replacing old elites (Pareto, 1968; Acemoglu and Robinson, 2006).

Turning to the traditional Chinese context, in 1947, Kracke (1947) famously asked whether *keju* 'introduced new blood into the Chinese civil service?' Since then, historians have engaged in lasting debates regarding whether Empress Wu contributed to a more 'egalitarian' bureaucracy and the blurring of distinctions between lineage elites and knowledge elites (for example, Twitchett, 1973, 1979; Lee, 1988; Chen, 2001). This debate centres on whether Empress Wu contributed to upward social mobility through the promotion of men from common and poor clans by the expansion of *keju*, or simply by suppressing and eliminating the old Northwestern

aristocratic clans. Hence, drawing from previous literature, we explore two mechanisms that operate in opposing directions: one involves the uplifting of men from common and poor clans through the opening of more opportunities, exemplified by the expansion of *keju*, and the other involves the suppression of the old aristocracy in the northwestern region, which accelerated their regression to the mean.

5.1 Opening up opportunities for a wider population: Expansion of keju

We first present the quantitative trend in the evolution of the number of *keju* degree holders from common and poor clans in Figure 7. In this figure, we employ the previous classification to categorize all recorded *keju* degree holders throughout the Tang dynasty based on their clan backgrounds.[27] During the period from 649 to 673, under Emperor Gaozong and before Empress Wu's rise, only 43 candidates from common and poor clans were admitted, accounting for 65.2 per cent of all admitted candidates. In contrast, during Empress Wu's reign from 674 to 704, the number of admissions rose to 135, representing 83.7 per cent of the total candidates admitted during that period. As expected, Emperor Xuanzong continued Empress Wu's legacy by expanding the number of admitted scholars over the subsequent half-century. Between 705 and 755, a total of 318 candidates were admitted through the *keju* system. The data show a significant increase in the total number of *keju* degree holders after 674, accompanied by a corresponding rise in the percentage of degree holders from common and poor clans. This trend, along with the rise in inter-class marriages shown in Figure 5, suggests that men from common clans primarily achieved upward marriages through passing the *keju* and entering the bureaucracy.

[27] The data on Tang dynasty *keju* degree holders is sourced from Gong (2021) and Hong (2013), comprising a total of 1,583 degree holders from 618 to 906.

To empirically demonstrate the impact of Empress Wu's rise and *keju* expansion on inter-class marriages, we set up the following difference-in-difference-in-differences (DDD) model:

$$(3) \qquad Interclass\ Marriage_i = c_1 + \beta Commonclan_i \times Post_k \times Keju_i + \gamma_i + \delta_k + \varepsilon_{ik} ,$$

where $Keju_i$ denotes the '*keju* density' pertaining to the man's home base and is used as a proxy for assessing the likelihood of a man to achieve an academic degree in the *keju* examination. We employ two measures. The first is *Jinshi*, the log-transformed number of *jinshi*-degree holders admitted during the entire Tang dynasty period within a man's region of origin. The second is *Printing centre*, a dummy variable denoting whether a man's province of origin had one or more printing centres in the Tang dynasty. The presence of a printing centre held significant importance for men, as it facilitated their access to the requisite classical texts necessary for their preparation for *keju* exams. All other notations maintain their definitions as presented in Equation (1).

Table 4 reports the DDD model results. In columns 1 and 2, we use the log-transformed number of *jinshi* to quantify *keju*, while in columns 3 and 4, we use the presence of a printing center. The results in all columns indicate that whether additional controls are included or not, the interaction terms consistently exhibit significant and positive coefficients. These positive coefficients suggest that men from common and poor clans situated in regions with a higher number of admitted *jinshi* and with the presence of printing centres were more inclined to marry daughters from elite clans. Combining with the fact that the coefficients on *Jinshi* and *Printing centre* are not statistically significant (columns 2 and 4), the results clearly demonstrate that *keju* expansion was the main mechanism through which Empress Wu's rise affected inter-class marriages between elite and common clans.

To further examine this main mechanism, we also change our baseline dependent variable to the office-holding status to show that whether it was more likely for an individual from common and poor clans to become an officeholder. Using a subsample of men with career records, we run a regression in the form of Equation (4):

$$(4) \qquad Officeholding_i = c_1 + \beta Commonclan_i \times Post_k + \gamma_i + \delta_k + \varepsilon_{ik} \ ,$$

where *Officeholding* is a dummy variable that indicates whether the man held an office in the bureaucracy. The other notations are as in Equation (1). Table 5 report the results.

Consistent with the findings in Table 4, our analysis reveals a positive correlation between the ascent of Empress Wu and the officeholding status of individuals from common and poor clans. This relationship largely holds across all five specifications, each incorporating different sets of control variables, as the positive DID estimators show. In columns 4 and 5, the coefficients on the interaction term attain statistical significance, which suggests that men from common and poor clans exhibited increased propensity to attain official positions after 674. As expected, the likelihood of obtaining office roles was notably elevated if fathers held official positions. These findings confirm that Empress Wu's rise facilitated men from common and poor clans to participate in *keju* exams and achieve academic and political success, thereby enhancing their chances of marrying daughters from elite clans, as presented in the baseline results.

Combining the results in Tables 4 and 5 with the baseline results shows that attending *keju* exams and holding official positions played pivotal roles for knowledge elites in gaining recognition from established aristocratic clans. In a poem written by the Tang poet Wei Zhuang, he vividly described the scene where daughters from elite clans would stand on the terraces along

the streets, awaiting the sight of newly rewarded exam degree holders in a celebratory parade and selecting their future husbands (Lewis, 2009). In the Tang era, political achievements, such as acquiring *keju* degrees and attaining political power, did not directly translate into social advancement (Moore, 2004, p.253). By marrying into elite clans, one could achieve his real social success.

5.2. Regression to the mean

We then examine the other competing mechanism. The previous section demonstrates that the increase in inter-class marriages observed in the baseline results can be attributed to the rising likelihood of commoners obtaining *keju* degrees. However, another possible explanation is the decline of the old aristocracy. Upon ascending to power, Empress Wu initiated a campaign specifically targeting the Guanlong Bloc, the dominant faction of the old aristocracy and a principal opponent of her rule (Chen, 2001; Wu, 2019). With the Guanlong Bloc politically suppressed and removed from key bureaucratic positions, its members may have become less likely to form marital connections with unaffected elite clans and more accessible to common clans. Consequently, the positive coefficients in Table 1 could reflect not only the social advancement of common clans, as discussed in Section 5.1, but also the diminished exclusivity of the old aristocracy.

Therefore, we first investigate whether, after 674, men from the Guanlong Bloc were more inclined to marry women from either the Guanlong Bloc or the non-Guanlong Bloc. Following the design in Equation 1, we modify the dependent variable to whether the man's spouse originated from the Guanlong Bloc and refine our treatment group to exclusively include men from the

Guanlong Bloc.[28] The results are presented in Table 6. The negative and significant coefficients on the interaction term across all specifications suggest that, compared to the period before 674, Guanlong men were indeed less likely to marry Guanlong women after 674.

Next, we examine whether Guanlong men, compared to non-Guanlong men, exhibited a lower likelihood of marrying women from elite clans (the royal clan, the seven marriage-ban clans, and the nine office-holding clans) after 674. In this analysis, the treatment group remains Guanlong men, with the dependent variable adjusted with women from elite clans. Columns 1 and 2 of Table 7 present these results. The insignificant coefficients indicate a lack of strong evidence to suggest that Guanlong men were disadvantaged relative to non-Guanlong men in marrying elite women after 674. Columns 3 and 4 present findings from our analysis on whether men from poor and common clans were more likely to marry women from the Guanlong Bloc after 674. Similar to the previous results, we do not find significant evidence suggesting that common men had an advantage in marrying Guanlong women.

Qualitative evidence further supports the quantitative findings. A major event occurred in 659 when Empress Wu executed four former chief ministers from Emperor Taizong's reign—Zhangsun Wuji, Chu Suiliang, Han Yuan, and Liu Shi—who were her long-standing adversaries and associated with the Guanlong Bloc. According to the *Old Book of Tang*, "their immediate families were enslaved, those of sons and grandsons exiled to the far South" (Guisso, 1978, p. 397). Despite this, many descendants from these affected Guanlong clans managed to secure marriages with elite clans. For instance, Zhangsun Yuanyi (655–723), the great-grandson of Zhangsun Wuji, married a daughter from the Boling Cuis, one of the seven marriage-ban clans. Similarly, one of Liu Shi's daughters married Li Dan, who later became Emperor Ruizong (r. 684–690). The

[28] Following Chen's (2001) definition of the Guanlong Bloc, the Guanlong clans referenced in this paper include the well-known clans of the "Eight Pillar Statesmen of the Guanlong Region" as well as clans of Xianbei ethnic origin.

Yingchuan Hans, Han Yuan's clan, recovered quickly after Empress Wu's suppression and later produced Han Hong (765–822), a chief minister during Emperor Xianzong's reign (r. 805–820). Pei Yan (?–684), another chief minister executed by Empress Wu in 684, had a sister who married Wei Boxin from the Jingzhao Weis, one of the nine top office-holding clans.

In summary, the empirical findings across the three sets of analyses in Tables 6 and 7, alongside the qualitative evidence regarding the relatives of executed court officials, suggest that men from the old aristocracy, particularly those from the Guanlong Bloc, did not experience significant disadvantages in their marital outcomes compared to others after Empress Wu's rise. Likewise, commoners did not gain an advantage in marrying Guanlong women post-674 as a result of "regression to the mean" among Guanlong men. While Guanlong men were less likely to marry within their own bloc after 674, this appears to reflect a preference shift in marital behavior rather than active suppression.

6. Conclusion

In conclusion, this paper explores a unique case of institutional transformation from limited to open access orders—specifically, the early transition from aristocracy to meritocracy. When Empress Wu became the de facto emperor in 674, she formed her own ruling coalition to strengthen her legitimacy. We investigate her rise to power and provide the first empirical evidence demonstrating its positive effects on upward mobility in China. By examining a valuable sample of Tang epitaphs and utilising a cohort DID method, we find that men from common and poor clans who entered marriage after 674 were more likely to marry into elite clans. The baseline results are robust to a series of checks. Furthermore, after considering other significant events

during the early and high Tang periods, Empress Wu's rise in 674 remains a significant effect on the increase in inter-class marriages. Supported by quantitative and qualitative evidence, we argue that Empress Wu's rise contributed to upward mobility primarily through her expansion of national civil examinations. Her strategy of establishing her own loyal allies encouraged more men from common and poor clans to participate in civil examinations and enter the state bureaucracy. The insecurity experienced by these knowledge elites motivated them to marry daughters from old aristocratic clans, leading to the convergence of knowledge and lineage elites and marking the beginning of the rise of meritocracy.

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Figures

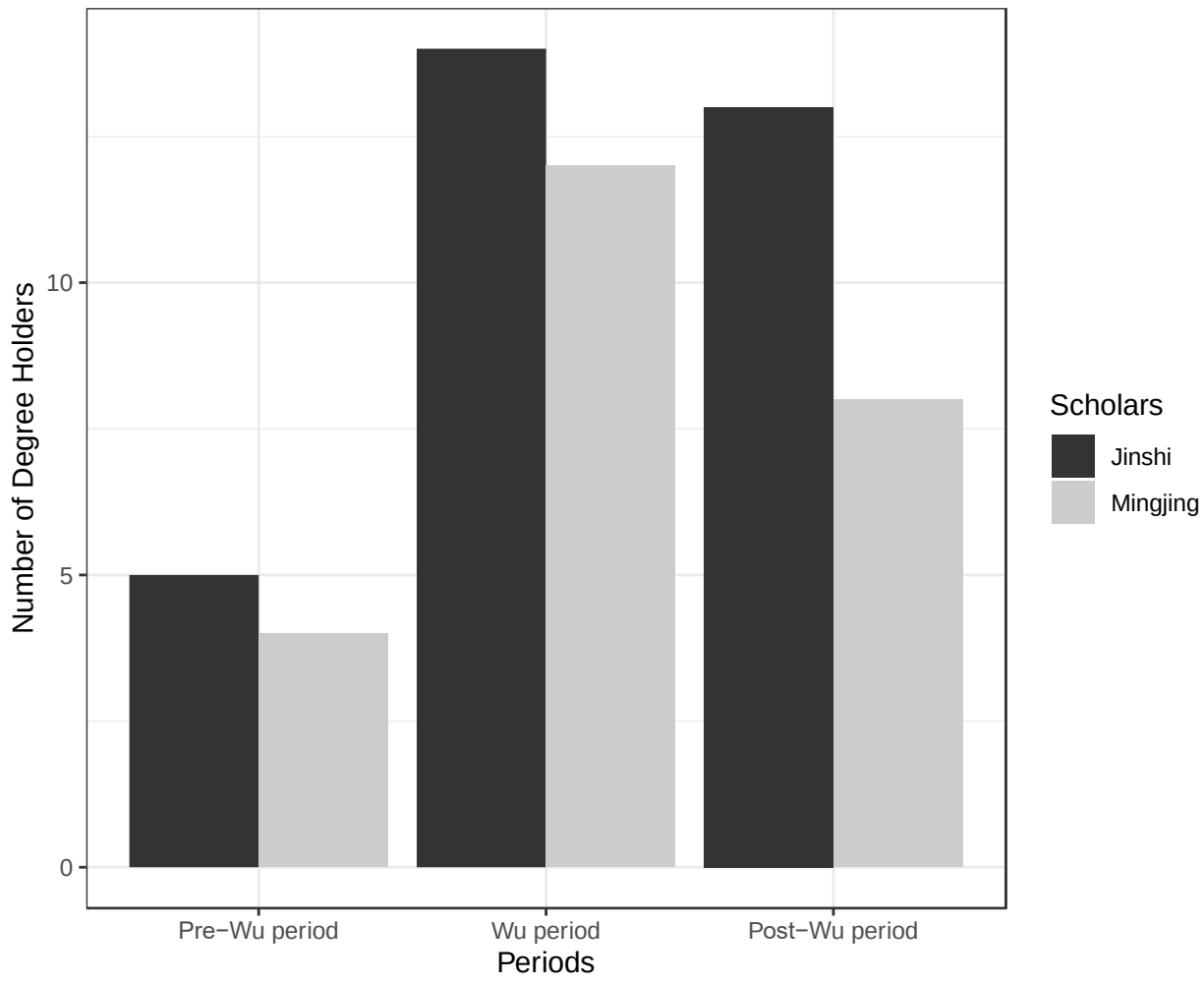

Figure 1 Number of degree holders from poor family backgrounds by period

Notes: 1. *Jinshi* refers to the 'presented scholar' and *mingjing* refers to the 'classicist'. These are the two main categories of degree holders from Tang *keju* exams. 2. The "pre-Wu period" refers to the period from 618 to 655, the "Wu period" refers to 655–705, and the "post-Wu period" refers to 705–755.

Source: Dong 2007, pp. 21–22.

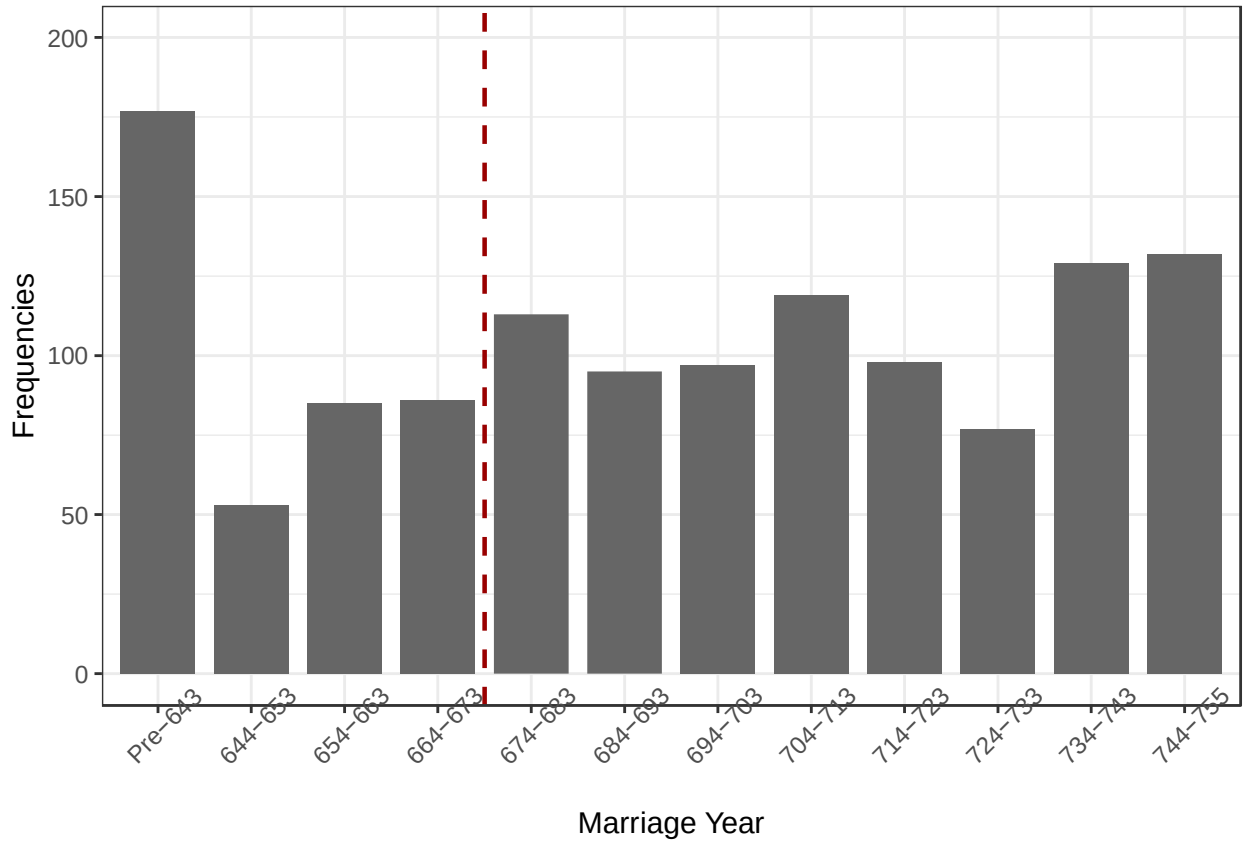

Figure 2 Frequency distribution of marriage year, pre-643 to 755.

Note: The red dashed line in the figure denotes the year of Empress Wu's rise to power.

Source: Tackett (2020).

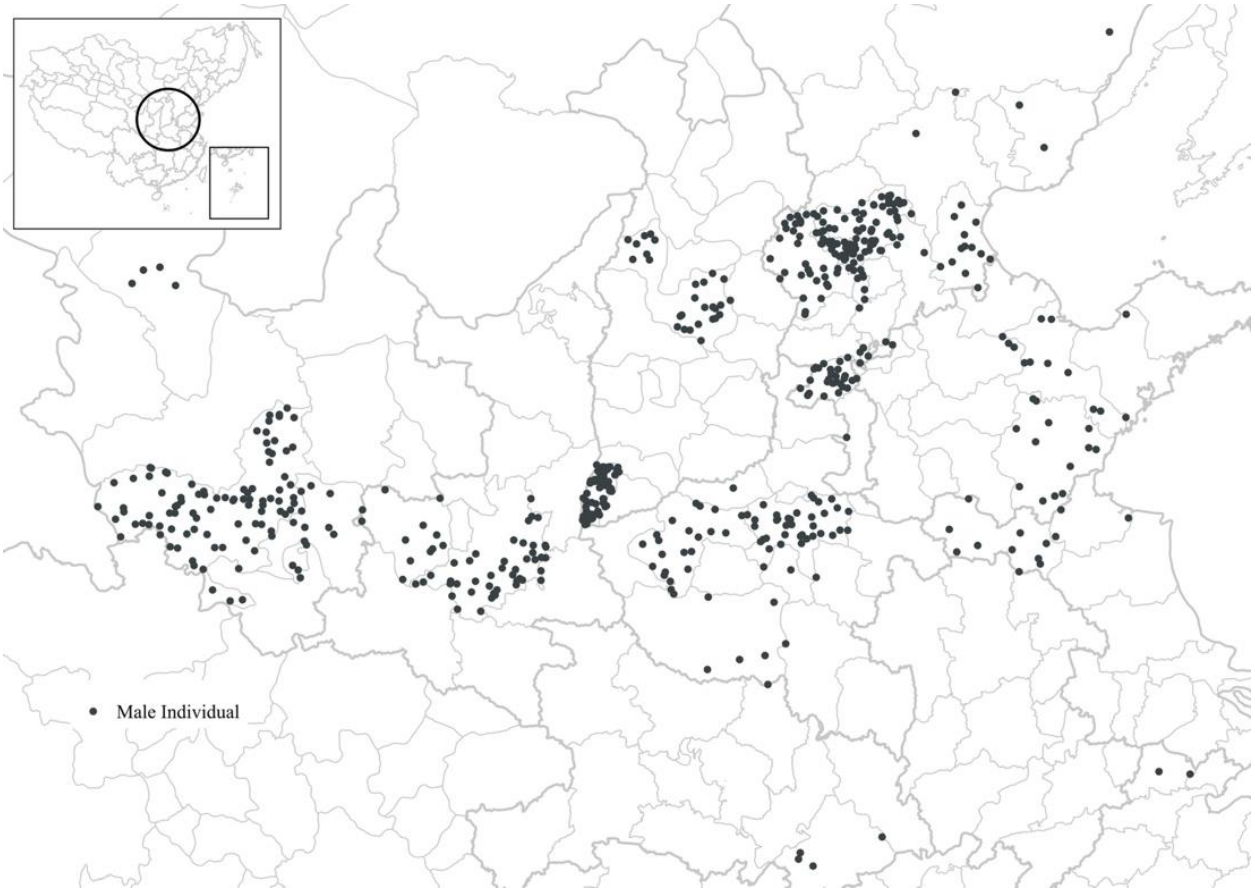

Figure 3 Place of origins of male individuals, 618–755.

Source: CHGIS (2016); Tackett (2020).

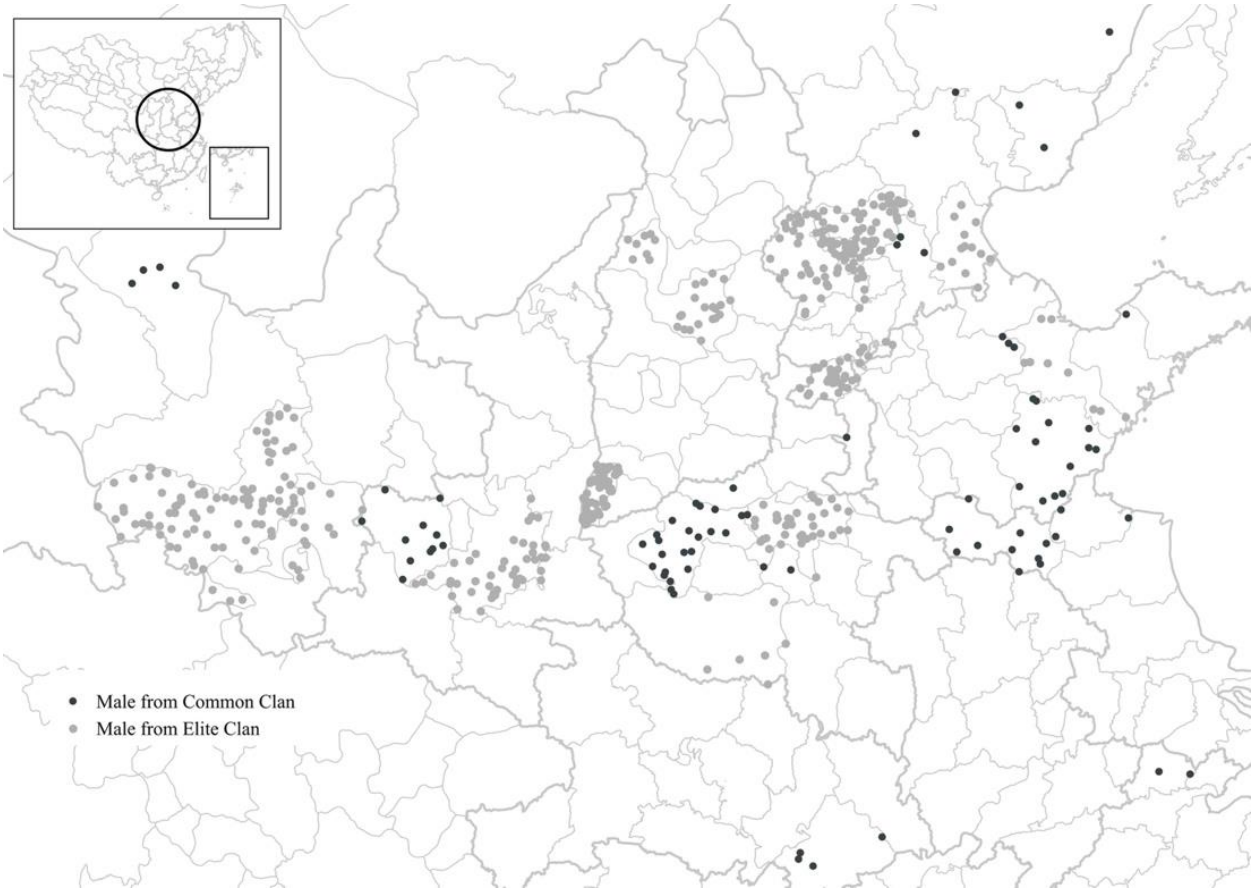

Figure 4 Place of origins of male individuals from common and elite clans, 618–755.

Source: CHGIS (2016); Tackett (2020).

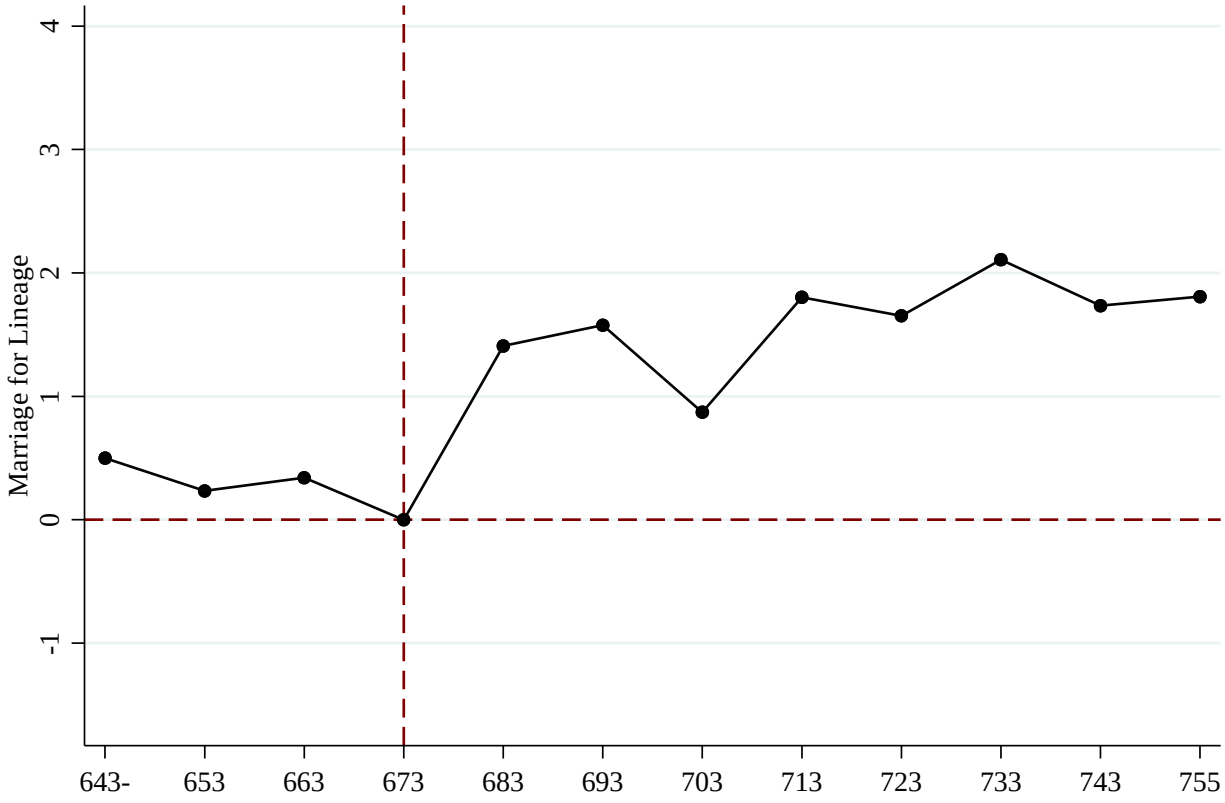

Figure 5 The rise of Empress Wu and class exogamy: Event study

Note: The solid lines represent the point estimates. The shaded area represents the 95% confidence intervals based on robust standard errors.

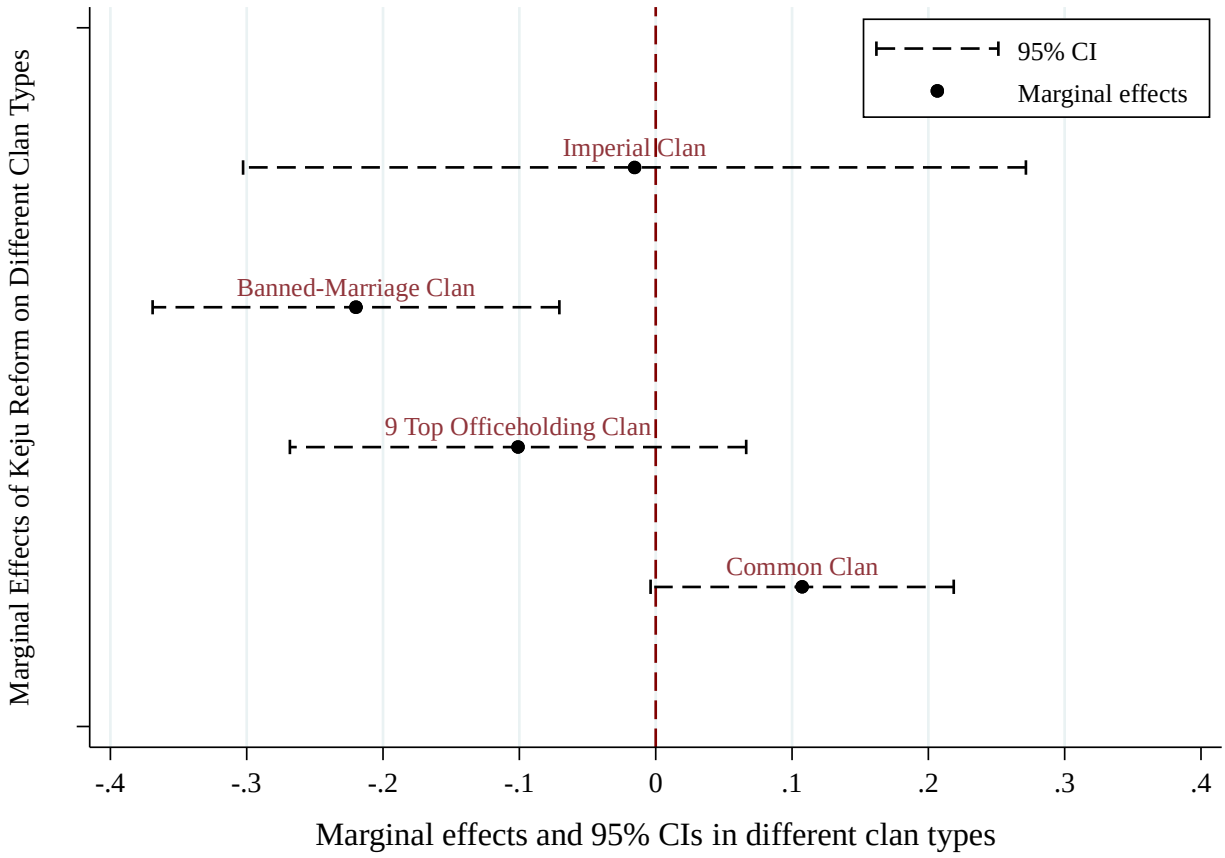

Figure 6 Marginal effects of the rise of Empress Wu on different clan types.

Note: The dashed lines represent the 95% confidence intervals based on robust standard errors.

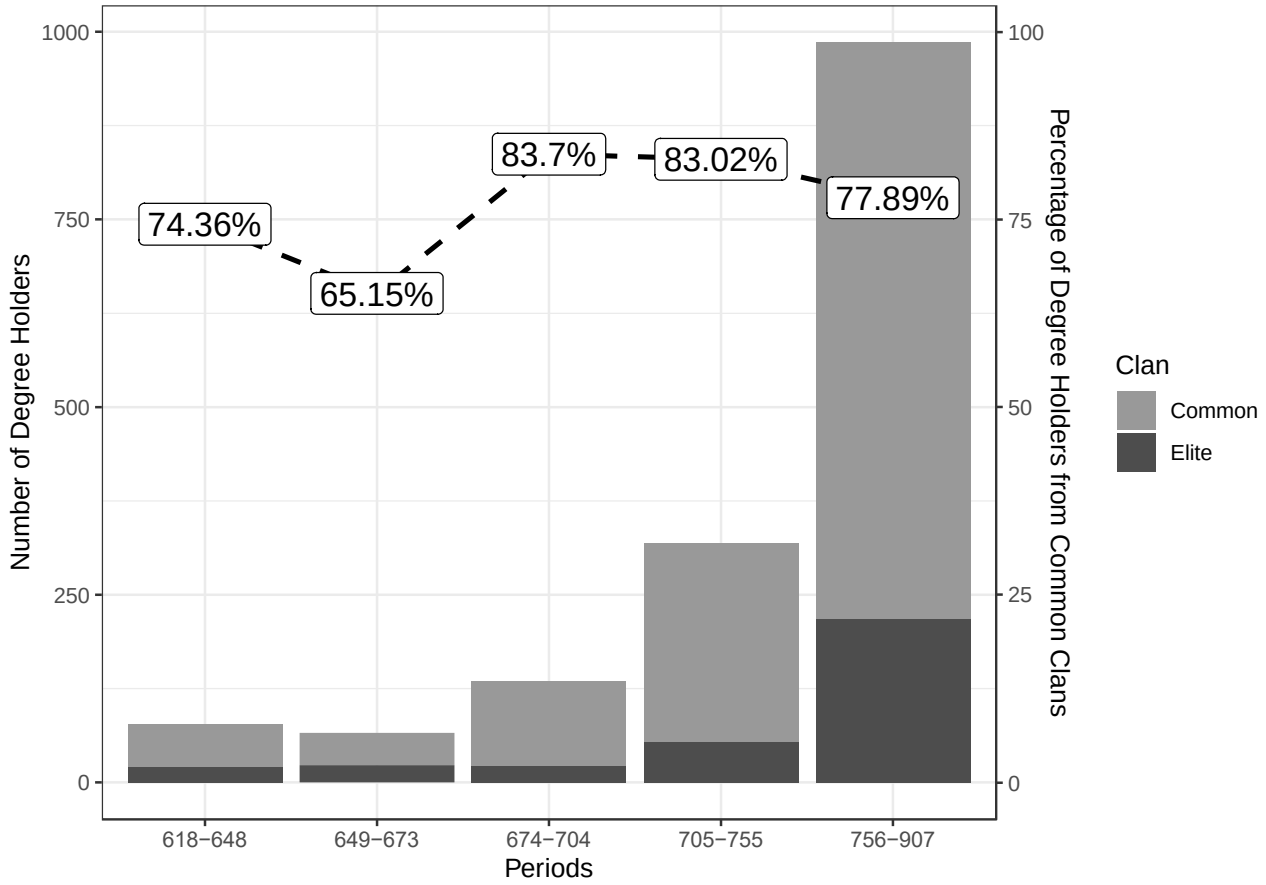

Figure 7. Trends in degree holders and the share from common clans, 618 to 907.

Notes: The percentages in the figure represent the proportion of degree holders from common clans during each period.

Sources: Gong (2021); Hong (2013).

Tables

Table 1 Rise of Empress Wu and inter-class marriages: Baseline results

	Dependent variable: Inter-class marriage				
	(1)	(2)	(3)	(4)	(5)
Common Clan×Post	0.246***	0.246***	0.236***	0.239***	0.238***
	(0.056)	(0.057)	(0.055)	(0.055)	(0.055)
Post	-0.121**	-0.121**	-0.117***	-0.120***	-0.113**
	(0.043)	(0.044)	(0.042)	(0.042)	(0.045)
Common Clan	-0.430***	-0.428***	-0.437***	-0.432***	-0.432***
	(0.043)	(0.043)	(0.042)	(0.043)	(0.043)
Father Prestige	NO	YES	YES	YES	YES
Royal Family	NO	NO	YES	YES	YES
Capital Clan	NO	NO	NO	YES	YES
Reign	NO	NO	NO	NO	YES
Mean of the dependent variable	0.332	0.332	0.332	0.332	0.332
Number of observations	1,261	1,261	1,261	1,261	1,261
Pseudo R^2	0.076	0.076	0.097	0.097	0.097

Notes: All columns report the marginal effects using a logistic approach. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2 Rise of Empress Wu and inter-class marriages: Robustness checks

	Inter-class marriage	Inter-class marriage	Inter-clan marriage	Chief minister's clan marriage
	(1)	(2)	(3)	(4)
Common Clan×Post	0.246***	0.296***	0.135**	
	(0.056)	(0.062)	(0.067)	
Common Clan	-0.428***	-0.398***	-0.445***	
	(0.043)	(0.050)	(0.049)	
Post	0.112	0.160	0.074	0.002
	(0.129)	(0.050)	(0.144)	(0.068)
Minister Intensity ×Post				-0.040*
				(0.022)
Minister Intensity				0.006
				(0.009)
No. of Brothers		0.017***	0.037***	0.008***
		(0.004)	(0.005)	(0.003)
War Years		0.008	-0.001	0.078***
		(0.062)	(0.058)	(0.030)
Cohort Fixed Effect	YES	YES	YES	YES
Father Prestige	YES	YES	YES	YES
Royal Family	YES	YES	YES	YES
Capital Clan	YES	YES	YES	YES
Number of observations	1,261	983	983	959
Pseudo R2	0.110	0.132	0.187	0.093

Notes: All columns report the marginal effects using a logistic approach. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3 Other major events and inter-class marriage: Placebo treatments

	Dependent variable: Inter-class marriage				
	(1)	(2)	(3)	(4)	(5)
Common Clan×Post 674	0.154***	0.251***	0.269**	0.166***	0.156***
	(0.049)	(0.068)	(0.129)	(0.056)	(0.055)
Common Clan×Post 638	0.120				
	(0.080)				
Common Clan×Post 660		-0.099			
		(0.080)			
Common Clan×Post 664			-0.024		
			(0.137)		
Common Clan×Post 686				0.033	
				(0.058)	
Common Clan×Post 690					0.052
					(0.076)
Number of observations	1261	1261	1261	1261	1261
Pseudo R^2	0.102	0.101	0.103	0.100	0.101

Notes: Robust standard errors are in parentheses. All specifications include controls of father's prestige, number of brothers, fixed effects of the royal family, capital clan, reign, and war years. *** p<0.01, ** p<0.05, * p<0.1.

Table 4 Rise of Empress Wu, *keju* expansion and inter-class marriage

	Dependent variable: Inter-class marriage			
	(1)	(2)	(3)	(4)
Common Clan×*Post*× *Jinshi* (logged)	0.122*	0.160***		
	(0.063)	(0.061)		
Common Clan×*Post*×*Printing Centre*			0.320**	0.250*
			(0.135)	(0.140)
Jinshi (logged) ×*Post*	-0.086	-0.106		
	(0.068)	(0.065)		
Printing Centre×*Post*			-0.037	0.001
			(0.152)	(0.152)
Common Clan×*Post*	-0.224	-0.325	0.186*	0.219**
	(0.264)	(0.256)	(0.099)	(0.101)
Jinshi (logged)	0.018	0.015		
	(0.044)	(0.041)		
Printing Centre			-0.080	-0.073
			(0.122)	(0.123)
Common Clan	-0.303***	-0.281***	-0.318***	-0.298***
	(0.084)	(0.083)	(0.080)	(0.081)
Post	0.188	0.274	-0.136**	-0.099
	(0.268)	(0.264)	(0.053)	(0.096)
Father Prestige	NO	YES	NO	YES
Royal Family	NO	YES	NO	YES
Capital Clan	NO	YES	NO	YES
Reign	NO	YES	NO	YES
Number of observations	568	568	583	583
Pseudo R^2	0.029	0.060	0.036	0.054

Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5 Rise of Empress Wu and officeholding: Career channel

	Dependent variable: Officeholding				
	(1)	(2)	(3)	(4)	(5)
Common Clan×Post	0.142*	0.153*	0.129	0.164**	0.169**
	(0.085)	(0.085)	(0.084)	(0.075)	(0.075)
Post	0.043	0.063	0.102	0.017	-0.129
	(0.071)	(0.068)	(0.067)	(0.057)	(0.090)
Common Clan	-0.154**	-0.198***	-0.207***	-0.119*	-0.120*
	(0.067)	(0.069)	(0.068)	(0.061)	(0.061)
Father Prestige		0.110**	0.113***	0.078**	0.083**
		(0.044)	(0.044)	(0.039)	(0.039)
No. of Brothers		-0.030***	-0.025***	-0.029***	-0.030***
		(0.006)	(0.007)	(0.006)	(0.006)
Royal Family	NO	NO	YES	YES	YES
Capital Clan	NO	NO	NO	YES	YES
Reign	NO	NO	NO	NO	YES
War Years FE	NO	NO	NO	NO	YES
Number of observations	625	522	522	522	522
Pseudo R^2	0.021	0.056	0.067	0.208	0.230

Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6 Logit regression results for marriage into the Guanlong clans

	Dependent variable: Marrying Guanlong women				
	(1)	(2)	(3)	(4)	(5)
Guanlong ×*Post*	-0.143**	-0.148**	-0.145**	-0.109*	-0.112*
	(0.060)	(0.061)	(0.061)	(0.060)	(0.060)
Guanlong	0.171***	0.171***	0.177***	0.145***	0.145***
	(0.051)	(0.051)	(0.056)	(0.054)	(0.054)
Post	0.070**	0.076**	0.076**	0.052	0.072**
	(0.032)	(0.032)	(0.032)	(0.032)	(0.035)
Father Prestige	NO	YES	YES	YES	YES
Royal Family	NO	NO	YES	YES	YES
Capital Clan	NO	NO	NO	YES	YES
Reign	NO	NO	NO	NO	YES
Number of observations	1261	1261	1261	1261	1261
Pseudo R^2	0.009	0.011	0.012	0.038	0.040

Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7 Logit regression results for marriage into elite and Guanlong clans

	Dependent variable:			
	Marrying elite women		Marrying Guanlong women	
	(1)	(2)	(3)	(4)
Guan Long ×Post	-0.057	-0.045		
	(0.064)	(0.064)		
Common Clan×Post			0.019	0.003
			(0.056)	(0.056)
Guan Long	0.224***	0.145**		
	(0.053)	(0.058)		
Common Clan			-0.080*	-0.062
			(0.047)	(0.047)
Post	0.012	-0.003	0.029	0.045
	(0.033)	(0.037)	(0.045)	(0.048)
Father Prestige	NO	YES	NO	YES
Royal Family	NO	YES	NO	YES
Capital Clan	NO	YES	NO	YES
Reign	NO	YES	NO	YES
Number of observations	1,261	1,261	1,261	1,261
Pseudo R^2	0.026	0.052	0.006	0.038

Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendices

Knowledge for Lineage: Queen, *Keju* and Social Mobility in Tang China

A. Additional Tables and Figures

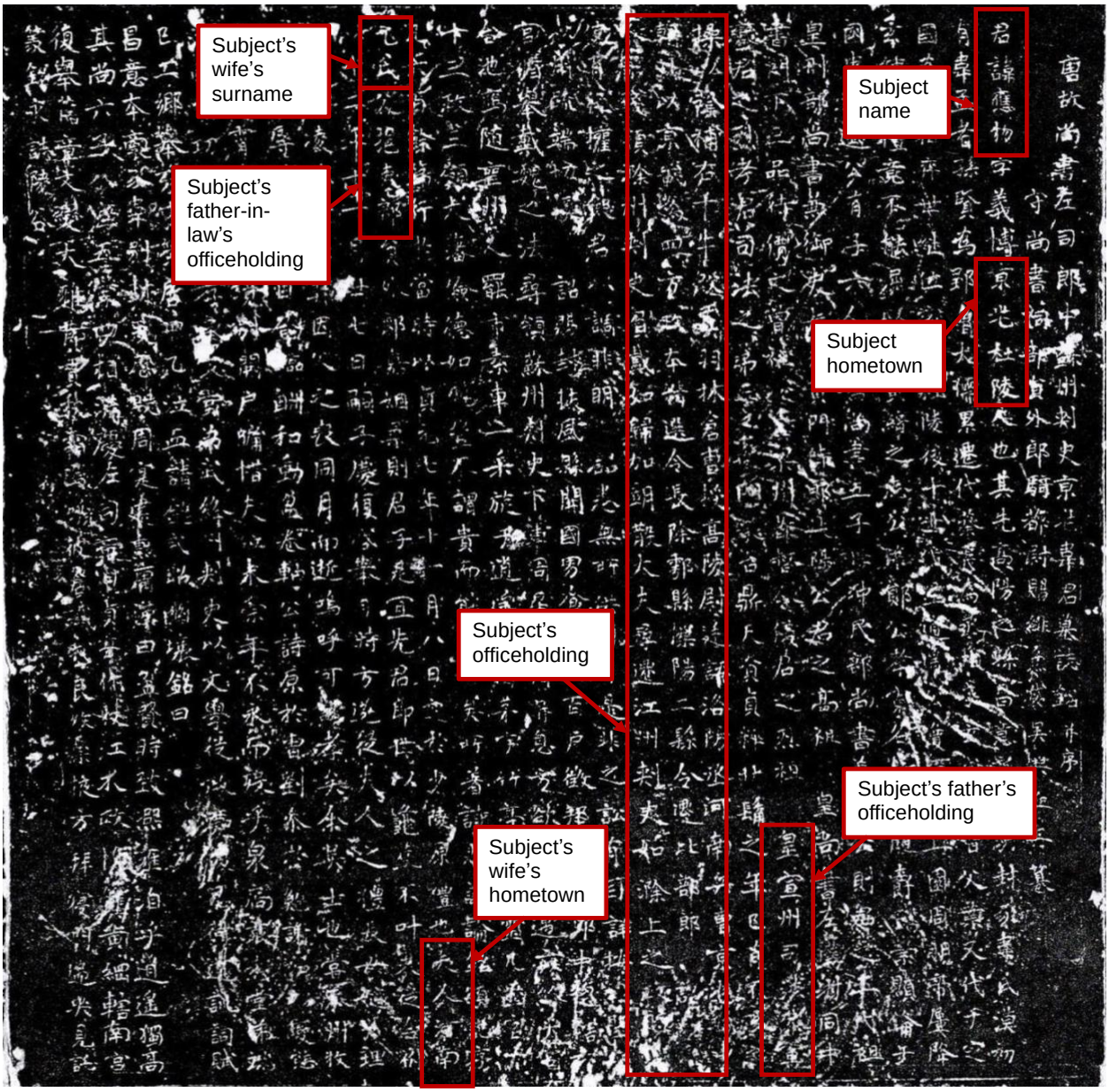

Figure A1 The Rubbing of Wei Yingwu's Tomb Epitaph.

Table A1 Summary statistics

	Source	No. of obs	Mean	Std. Dev
Dependent Variable:				
Inter-class marriage	A, B	1261	0.33	0.47
Independent Variables:				
Common clans (Male)	A, B	1261	0.69	0.46
Officeholding clans (Male)	A, B, C	1261	0.09	0.29
Marriage-ban clans (Male)	A, B, C	1261	0.15	0.36
Year of Marriage	A, B	1261	693.13	38.78
Jinshi (logged)	D	568	57.78	38.03
Printing Center	E	583	0.14	0.35
Control Variables:				
Father Prestige	A, B	1261	0.36	0.48
No. of Sons	A	983	2.92	3.74
Royal Families	A, B	1261	0.18	0.38
Clan regions:				
Capital Clan	A, B	1261	0.70	0.46
Other Region Clan	A, B	1261	0.12	0.33
Unknown Region Clan	A, B	1261	0.18	0.39
Reign:				
Taizong Reign	A, B	1261	0.16	0.36
Gaozong Reign	A, B	1261	0.26	0.44
Wu Zhou Reign	A, B	1261	0.12	0.33
Xuanzong Reign	A, B	1261	0.37	0.48
War Year	A	1261	0.10	0.30

Sources: A. TBDB015 Database (https://history.berkeley.edu/nicolas-tackett); B. CBDB Database (https://projects.iq.harvard.edu/cbdb); C. Wikipedia (https://zh.wikipedia.org/)； D. Historical Database of Successful Civil Examination Candidates (https://examination.ancientbooks.cn/docDengke/); E. Cheng, Stasavage, and Wang (2023).

Table A2 Balance test: Keju reform and inter-class marriage

	Inter-class Marriage		
	Pre-Keju Reform	Post-Keju Reform	Difference
Common clan male	0.167	0.274	-0.108
	(0.022)	(0.018)	(0.031)
Elite clan male	0.616	0.486	0.130
	(0.044)	(0.032)	(0.054)
Difference	0.449	0.212	0.237
	(0.044)	(0.035)	(0.058)

Notes: Standard errors are in parentheses.

Table A3 OLS regression: Baseline results

	Dependent variable: Inter-class marriage				
	(1)	(2)	(3)	(4)	(5)
Common Clan×Post	0.254***	0.254***	0.270***	0.261***	0.259***
	(0.060)	(0.060)	(0.060)	(0.061)	(0.061)
Post	-0.148***	-0.147***	-0.174***	-0.181***	-0.163**
	(0.052)	(0.052)	(0.053)	(0.054)	(0.070)
Common Clan	-0.466***	-0.464***	-0.448***	-0.437***	-0.437***
	(0.048)	(0.048)	(0.048)	(0.050)	(0.050)
Father Prestige	NO	YES	YES	YES	YES
Royal Family FE	NO	NO	YES	YES	YES
Capital Clan FE	NO	NO	NO	YES	YES
Reign FE	NO	NO	NO	NO	YES
Mean of the dependent variable	0.332	0.332	0.332	0.332	0.332
Number of observations	1,261	1,261	1,261	1,261	1,261
R-squared	0.098	0.098	0.107	0.140	0.141

Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4 Mean difference on information recorded between common and elite clans

	Mean (Common)	Mean (Officeholding)	Mean (Diff)
	(1)	(2)	(3)
Death Year	0.89	0.91	0.498
Clan Type	1.00	1.00	.
Clan Region	0.93	0.98	2.223*
Career	0.25	0.32	1.730
Birth Order	0.11	0.11	0.020
Relationships	0.89	0.92	0.781
Target Clan Type	0.92	0.94	0.819
Target Region	0.75	0.87	3.004**
Observations	966		

Notes: This table compares the completeness of the information recorded in epitaphs for men from common and poor clans to men from the nine officeholding clans. Each variable denotes whether a specific piece of information is recorded (1 if recorded and 0 if not recorded). The variables 'Target clan type' and 'Target clan region' refer to the wives' information, while all other variables refer to the men's personal information.

The first column shows the means of completeness for each variable for the poor and common clan group and the second column exhibits the means for the office-holding clan group. The third column displays the t-statistic values of the differences between columns 1 and 2. The null hypothesis (H0) tested in this table is that the mean of Group 1 (common and poor clans) minus the mean of Group 2 (elite clans) is zero.