

Military Moral Hazard and the Fate of Empires

Charles Z. Zheng*

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Abstract

A contrast between the Roman and Chinese empires is that the military was empowered in Rome and disempowered in China. To explain the difference, this paper considers a principal-agent model where the military may revolt, the civilians may shirk, and the social planner chooses a degree of military empowerment, which affects the military's capability to defend, and that to usurp, the empire. It is proved that, according to the social optimum, the wealthier is the empire relative to the peripheral adversaries, the weaker her military should be. Hence the military divergence between the two empires, as well as the military inferiority of imperial China when she eventually collided with the West, is traced back to the different environments they faced, with imperial China surrounded by more indigent adversaries. This explanation is consistent with historical data constructed from records of battles and city sizes.

*Department of Economics, University of Western Ontario, London, Ontario, charles.zheng@uwo.ca, <http://economics.uwo.ca/faculty/zheng/>.

1 The Question

Each being a vast dominion of rich produce surrounded by so-called barbarians, both the Roman and Chinese empires relied on large armies to defend the frontiers. But the power of the military, to the empire and to the barbarians, was drastically different between the two empires. While 61.7% of the Roman emperors ascended the throne mainly due to military success or support from the military, only 20% of the Chinese emperors owed their accession to the military to some extent (Table 7, Appendix A). The Roman legions asserted dominance over barbarians in 71% of the empire's lifetime, from her foundation in year -27 to the death of the western empire in 476. By contrast, the corresponding period in imperial China was only 41% of her lifespan, from her foundation year -221 to the abdication of the last emperor in 1912 (Table 7). Such contrast of the military power, to be elaborated next, constituted a significant aspect of the institutional divergence between China and the West. Applying techniques of mechanism design, this paper finds a fundamental driving force of the military divergence. The theoretical finding is consistent with historical data constructed from records of battles and city sizes.

This research is closely related to the debate over Joseph Needham's [21] question why China fell behind the West or, more generally, Diamond's [8] question why a particular civilization was ahead of others. Some scholars have pointed to institutional aspects of imperial China that hindered growth and development. To Parente and Prescott [22], the monopoly rights in China constituted the barrier to riches. To Mokyr [19], the dissemination regime for useful knowledge was the key. To Li and van Zanden [17], the relatively low labor price in China might have discouraged investments in capital-intensive technologies. From the other side of the debate, Pomeranz [26] maintained that, at least until the British industrial revolution, China did not really fall behind technologically or economically. Recently Edwards [10] argued further that a Chinese counterpart of the British industrial revolution had already taken place in the Song dynasty of China.

Given China's backwardness so apparent when she collided with the West after 1839, the debate is really on the questions what caused her backwardness and whether it was transient or persistent. If the backwardness was more than transient due to aspects of the Chinese institutions that were persistently suboptimal, then why could not the Chinese improve upon those suboptimal mechanisms over her long imperial period, given the fact that

institutional reforms did occur between dynasties and sometimes during a dynasty? On the other hand, if China was not really that behind economically or technologically until almost 1800, and if the ensuing industrial revolution in the West should be taken as a consequence rather than a cause, then what caused her recent backwardness? Hoffman [15] provided an interesting explanation that imperial China fell behind in firearms technologies due to the lack of learning-by-doing opportunities to fight wars where firearms were effective. Since China was able to repel invasions from the West up to 1680s (detailed in §5.5) and by then the firearms military revolution had already started to bear fruit in the West,¹ the effect identified by Hoffman would have taken place mainly within the relatively short period from 1680 to 1839. Hence a longer-term explanation is needed.²

In search for a long-term explanation, inspired by the perspectives due to Diamond [8] and Morris [20] based on fundamental factors such as geographical constraints, this paper takes a mechanism-design approach. The main issue faced by a people is modeled as a problem of designing an optimal mechanism given an exogenous environment. If the optimal solution does not match the mechanism adopted by that people, then their backwardness can be attributed to their persistent mistakes, which future generations should learn to avoid. If the optimal solution and the observed institution do match, then the people given their environment could not have done better, and we can identify the crucial constraint in their environment as the cause of their backwardness. To decide whether the optimal solution matches the observed institution, it is helpful to compare two peoples who adopted different institutions independently. If the optimal solutions for the two are different in the same way that their actual institutions differed, then the matching conclusion may be drawn with reasonable confidence. That is why comparison between the Roman and Chinese empires is particularly relevant. The two were comparable in size and significance, which has been well recognized by Scheidel [27] and the comparative history literature.³ With the twain evolving

¹ Parker [23].

² The need for a long-term explanation for China's military disadvantage is also compelled by the fact that when the learning-by-doing opportunities returned to east Asia with the onslaughts from the West, China failed to pick up the modern military technology from the West while Japan managed to do so.

³ See for example the Stanford Ancient Chinese and Mediterranean Empires Comparative History Project described in a conference document "The first great divergence: China and Europe, 500–800 CE," Organized by Ian Morris, Walter Scheidel and Mark Lewis, Department of Classics and History, Stanford University, <http://web.stanford.edu/~scheidel/Divergence.pdf>.

separately without direct contact, the difference in their institutions may be traced back to the difference in their environments.

Next we shall contrast the two empires in military empowerment and pose the question what drove the difference. To look for an answer, we focus on military defense, a fundamental function of any empire. Hence the next section turns to a moral hazard problem inherent to any military, that the military may be tempted to revolt and that the more powerful the military the stronger is its potential threat to the state. Thus, how much the military should be empowered is a crucial policy issue for a state. To calculate the trade-offs involved, we need a mathematical model, which is formulated in §3. The model is analyzed in §4 with standard techniques in mechanism design; the main result (Proposition 1) is that the optimal degree of military empowerment is determined by a single parameter for the empire, which measures her relative wealth with respect to the peripheral peoples, scaled by the likelihood ratio of peace with them, and that the higher this parameter the weaker the military should be. Thus, our theory attributes the military contrast between the two empires to an observation that the parameter had a higher value for imperial China than for Rome. This observation is substantiated by data in §5 constructed from historical records of battles and city sizes. How our result might help to reconcile the great divergence debate and how the model might be extended are suggested in §6.

The military contrast between the two empires, that Rome was militaristic while China unwarlike, has been noted by Marco Polo [25, Ch. 68, p323] and Gibbon [14, v1, p22; v3, p21] in the past and Adshead [1] in recent time. Here we substantiate this contrast with some details in addition to the data mentioned at the opening paragraph. The Roman empire won 63.8% of her battles against “barbarians” and imperial China won 58.3% of hers (Table 7, Appendix A). While this difference might not be as large as one might have expected, there are larger differences on other military aspects.

The Roman empire was mostly governed through the military, and the military was a formidable, systematic warring instrument. The army was the main kingmaker, with only 1/3 of the emperors possibly attributed to hereditary succession (Table 7). Most emperors emerged from generals and remained their battlefield presence after accession. The crucial vote for the accession was the soldiers’ proclamation, which was often sufficient, with the senate merely concurring. In return, it was a norm for a new emperor to give soldiers large donatives upon accession. The army was organized in legions, each manned to an ample

size capable of going to battles as an independent force. Soldiers were well paid, rigorously trained, and uniformly equipped with thick armor and effective weapons.⁴ Provinces were governed by the commanders of the legions stationed there. Although Constantine the Great, after the empire had already passed 3/5 of her lifespan, separated the military from civil administration, generals remained to be the power behind the throne.⁵

By contrast, in imperial China the power of the military was systematically constrained. Ever since her start, the empire was governed through a bureaucracy recruited from the intelligentsia, who shared a value system, mainly Confucianism, which ranked the integrity of the empire above all. Hereditary succession, accounting for 91% of the emperors (Table 7, Appendix A), was the norm, and generals were not supposed to interfere with imperial succession. The emperor was insulated from the military; except the first and sometimes the second rulers of a dynasty, rarely did an emperor appear in the battlefield. Starting from the Song dynasty, about halfway in the empire's lifespan, civil and military administrations were carried out in strictly separate branches of the bureaucracy, and commanding posts of the military were occupied by officials selected not by valor but by performance in literary exams. While a Roman legate enjoyed undivided authority over his legion, a Chinese general's authority in his army was divided and checked, with the administration and dispatch of soldiers separately carried out by different branches of the bureaucracy.⁶ The number of Roman generals executed by the imperial court was only 10% of the number of Roman emperors, whereas the corresponding ratio was 21% in the Chinese empire (Table 7). While a Roman legionary was trained and treated as a professional soldier, a typical soldier in imperial China was half-peasant at best: unless during wartime, his daily duty was to work in the farmland assigned to the garrison to which he belonged.⁷ His armaments, supplied

⁴ Gibbon [14, v1, pp14–23] detailed the compensation, training and equipments for a legionary.

⁵ For example, Stilicho, Constantius III, Aëtius, Asper and Recimer.

⁶ In the Song dynasty, soldiers were administered by 三衙 and dispatched by 枢密院 (王曾瑜 [3, p5]). In the Ming dynasty, the administration of soldiers was further divided into five different branches of the bureaucracy (五军都督府), and battlefield commanders were appointed by the emperor (杨四维 [2, p112]).

⁷ Garrisons were assigned lands for the soldiers to farm. When a soldier died, his family, stationed to the allocated lot in that farmland, would supply a substitute to the garrison. Such a hereditary system that organized an army as a residential commune, usually called 屯田, 营田 or 世兵, and specifically called 府兵 in the Sui and Tang dynasties, 卫所 in Ming, and 八旗 in Qing, was meant to keep the army self-sufficient and stabilize soldiers with the farmland. By the time when a dynasty started to decline, however, many such military farmlands had been either deserted or taken over by powerful houses. With the stationed soldiers

locally, was often nonstandard.⁸

It should be noted that the rulers of each empire could have adopted an alternative similar to the mechanism of the other empire, for Rome to disempower the military or for China to empower hers. In fact, Diocletian and Constantine did reform the Roman empire towards the Chinese alternative, separating the civil administration from the military, elevating the emperor away from the military by bureaucrats, eunuchs and religions, and weakening the military through partitioning each legion to smaller units and keeping the flower of the army in secured cities far away from the borders.⁹ Symmetrically, the Sui and Tang dynasties of China moved near to the Roman path, with emperors dethroned and erected by mutinies, provincial military commanders¹⁰ obtaining both military and civil authorities over the regions, and the imperial army asserting dominance in the periphery including Central Asia. The deviation of the Diocletian-Constantine Later Roman empire from the Roman course, and that of the Sui-Tang dynasties from the Chinese course, are evidenced by the contrast between the corresponding columns in Table 7 (Appendix A). The dynastic cycle in imperial China, with the thoroughly destructive wars at the end of one dynasty clearing the way for the next, afforded the new rulers tremendous power to reform the institutions, and the founding emperors of each dynasty did exactly that. The Roman counterpart of such institutional reforms also occurred, conducted by Augustus, Diocletian and Constantine effectively, as well as by Julian and Theodosius I in less degrees.

The question is therefore Why did each empire opt for the particular system for her military? What was the fundamental difference between the two empires that compelled their rulers to empower the military in Rome and disempower the military in China? It is tempting to attribute historical patterns to cultures or religions such as Confucianism, which preached benevolence against military dominance.¹¹ But there was a rich variety of

melting into civilians, mercenary forces became the substitute, whose financial cost wore down the dynasty.

⁸ For examples of the lack of institutional establishment for the military, see Huang [16, pp159–161].

⁹ Gibbon [14, v2, pp124–127].

¹⁰ Called commissioners, or 节度使.

¹¹ The tendency of blaming the culture for military and political inferiority was endemic among Chinese intelligentsia in post-imperial China. To break away from the traditional culture, desperate measures were proposed, ranging from mere thoughts such as inviting the West to colonize China for three hundred years to attempted programs such as abolishing the written language of Chinese and culminating in Mao's cultural revolution. The colonization idea was suggested by Liu XiaoBo (刘晓波), later a Nobel peace prize laureate, in the November 1988 issue of a Hong Kong magazine 《解放月报》. The language abolition program,

competing ideologies up to the formation of the Chinese empire, and it was the Han Emperor WuDi's choice to promote Confucianism at the expense of "hundreds of other ideologies." In the course of the empire, Confucianism had its ups and downs, contending mainly with Taoism and Buddhism.¹² Plato, in rejecting democracy and putting his trust on philosopher-rulers,¹³ had a commonality with Confucius. Yet the Roman emperors, unlike their Chinese counterpart, did not try to establish a dominant culture or religion until the Crisis of the Third Century. Only then did the "one god, one empire" principle emerge in Aurelian's reign and later get implemented by Constantine. Rather than a fundamental force itself, the adoption of cultures or religions may be only the response to some elements more primitive.

2 Moral Hazard of the Military

Incentive became an acute issue of the military when it ceased to be composed of stakeholders, which took place during the Late Republic of Rome¹⁴ and after the Spring-and-Autumn of China. By the time when the empire was established, the Roman legionaries had degenerated to mostly plebeians, and the Chinese soldiers peasants. Compared to other agencies considered in the economic theory of incentives, the military has a unique feature like a double-edge sword, capable of both protecting and usurping the state and capriciously tempted to one alternative or the other. Hence a strong military, while keeping the vigor of the state, also threatens her integrity. The Roman sword and pilum that subdued the western world were also stained with the blood of numerous senators and emperors. The Tang army that marched into Vietnam, Korea and Inner Asia also sacked the Tang capital and eventually disintegrated the empire into dozens of warring states.

To keep the military from revolting, an empire must procure its loyalty with ample rewards, which had to be drawn from either the empire or the peripheral peoples in case

interestingly, was supported across the communist and anti-communist camps. Initially advocated by Qian XianTong (钱玄同) in a magazine 《新青年》, v4, n4, 1918, and a journal 《国语月刊》, v1, 1923, it was concurred by Chen DuXiu (陈独秀), the main founder of the Chinese communist party, Hu Shi (胡适), a leading scholar among Chen's anti-communist contemporaries, and Hu's political and literary adversary Lu Xun (鲁迅).

¹² Christianity also reached China, no later than the seventh century, before the mature stage of the empire (Gibbon [14, v5, pp61–62], including Oliphant Smeaton's note at the end of Footnote 2, p61).

¹³ Plato [24, Parts 7 & 9.6].

¹⁴ Ferrero [11, v1, pp42–43].

of military victories against them. Epitomized by Septimius Severus's motto "enrich the soldiers, and scorn all other men,"¹⁵ the Roman empire kept the soldiers well paid and ceded so much power to the military that it almost became her residual claimant. When domestic resources were insufficient to reward the soldiers, loots and plunders from enemies were counted on:

Riches are the object of your desires; those riches are in the hands of the Persians; and the spoils of this fruitful country are proposed as the prize of your valour and discipline. Believe me, the Roman republic, which formerly possessed such immense treasures, is now reduced to want and wretchedness.¹⁶

The military's loyalty could be less pricey if the military is less capable of threatening the center. Weakening her own military was a deliberate policy carried out in imperial China for almost a millennium starting from the Song dynasty. The flower of the army, instead of being stationed at the frontier, was recruited to the royal guard, stationed near the capital and spoiled by the distance from barbarians. It became the norm and policy that generals and military officers were marginalized from policymaking and subordinate to the civilian bureaucracy.¹⁷ Their authority in the military was divided and checked through the means described previously and, in the Ming dynasty, further curtailed by eunuchs stationed in the army.¹⁸ While the European states were undergoing military renovations such as adopting firepower to siege warfare, enlarging armies to exploit firepower with the relatively inexpensive infantry, reforming governments to mobilize and support the enlarged army, and building navies to project arms race overseas,¹⁹ imperial China did little to facilitate any large-scale adoption of firearms.²⁰ About 50 years before Columbus set sail for the ocean,

¹⁵ Cassius Dio [9, Book 77, Section 15]

¹⁶ Part of Julian's (inspiring) speech during his invasion to Persia, quoted by Gibbon [14, v2, pp485–486].

¹⁷ The policy was called 重文抑武. 顾宏义 [7] documented original sources about the lower status of military officers than their civilian counterparts in the Song dynasty. Particularly telling is an episode where a most capable general Di Qing (狄青) was suppressed by civilian ministers such as Han Qi (韩琦).

¹⁸ 杨四维 [2].

¹⁹ Parker [23].

²⁰ Huang [16, pp169–170] related a general Yü Ta-yu's (俞大猷) futile proposal to reform the military with firearms. Another general Ch'i Chi-kuang (戚继光), in building an army out of scratch to dispel the pirates whom the imperial army failed to resist, reluctantly resorted to mainly non-firearm weapons. Through an explicit calculation in his book 《练兵实纪·登坛口授》, Ch'i attributed the ineffectiveness of firearms to their small supply and unreliable quality, the time it took to reload them during battles and the likely human

the Chinese empire aborted her oceanic expeditions, which had reached the southern tip of Africa and could (and might) have reached further beyond. With her naval fleet abandoned to decay, the seas in east Asia were left to the pirates, consisting mostly of Chinese from coastal regions. Defeating Europeans at sea, the pirates controlled the trade routes in East and South China Seas and had fought for the empire. Instead of incorporating them into the military, however, the empire for most of the time treated the pirates as enemies and, in order to eradicate their home base, banned coastal Chinese from even going to the sea.²¹

While imperial China maintained a pacified rule based on the intelligentsia at the expense of military vigor, the Roman empire traded off domestic tranquility for external exploits. Each torn between military strength and domestic stability, the two empires came to different solutions. The trade-offs are not obvious, as one might think that a strengthened army may fare a better chance to defeat the barbarians thereby substituting external plunders for domestic expenses. To understand the driving force and rationale behind the difference, we need a model to facilitate calculations of the trade-offs.

3 The Soldier and the Farmer

Let us abstract the relationship between an empire and her military into a principal-agent model. With suspension of disbelief for the sake of a fable that could illuminate the trade-offs rigorously, assume a model empire consisting of two players, a farmer and a soldier. Parameters are functions $f, g : [0, 1] \rightarrow [0, 1]$ and numbers $\omega_a \in \mathbb{R}_{++}$, $\omega_b \in \mathbb{R}_+$, $\pi \in (0, 1)$, $p \in (0, 1)$ and $c_* \in \mathbb{R}_{++}$. Events are unfolded in four stages:

- a. An element x of $[0, 1]$ is chosen as the degree of military empowerment, and an allocation $(y, z) \in \mathbb{R}_+^2$, whose meaning will be clear at stage (d), is determined between the farmer and the soldier.

errors during the reload.

²¹ The most reconciliatory policy undertaken by the empire occasionally was to offer pirates amnesty (招安), whereby the pirate leader retired in peace with nominal, powerless titles and his followers were disbanded and supposed to retire as peasants, though they often resumed the more lucrative, pirate career. 陈钰祥 [6, pp122–123] related such an amnesty in the Qing dynasty. The empire used pirates for her military only during the collapse of the Ming dynasty, when a pirate leader Zheng ZhiLong (郑芝龙) defeated the Dutch for the empire and his son Zheng ChengGong (郑成功, known as Koxinga in the West) led an obstinate resistance against the Manchus and reclaimed Taiwan from the Dutch.

- b. The farmer chooses whether to work or shirk. If he works, the farmer bears a sunk cost c and produces a harvest equal to either ω_a with probability p or zero with probability $1 - p$. If the farmer shirks, the harvest is zero for sure. The cost c is the farmer's private information, regarded by others as a random variable distributed uniformly on $[0, c_*]$. The farmer's action, working or shirking, is also unobservable to others.
- c. If the aforementioned harvest is ω_a then with probability π the peripheral people, so-called barbarians, invades the empire. If invasion occurs, the soldier, fighting the barbarians, wins with probability $f(x)$. If the soldier wins, the empire has a total wealth $\omega_a + \omega_b$, including the farmer's harvest ω_a and the amount ω_b pillaged from the barbarians. If the soldier does not win, the barbarians pillage the entire harvest, leaving zero to both the soldier and the farmer. If no invasion occurs, the wealth of the empire is intact, the harvest ω_a . No war breaks out when the empire's realized harvest is zero, as neither the barbarians want to pillage the impoverished empire, nor is the empire able to mobilize an invasion into barbarian territories.
- d. If the realized wealth obtained by the empire is nonzero, $\omega_a + \omega_b$ or ω_a , the soldier decides whether to revolt or not. If not, then the total wealth is divided according to the agreement reached at stage (a): if the total wealth is $\omega_a + \omega_b$, the soldier gets y and the farmer gets $\omega_a + \omega_b - y$; if the wealth is ω_a , the soldier gets z and the farmer gets $\omega_a - z$. If the soldier revolts, then with probability $g(x)$ the soldier usurps the empire and obtains her entire wealth, leaving zero to the farmer; with probability $1 - g(x)$ the rebellion is cracked down so the soldier gets zero and the farmer gets the entire wealth.

Each player obtains a utility equal to the amount of wealth he gets in the end, with the farmer's subtracted by the sunk cost if he worked. Both players are assumed risk-neutral.

At stage (a), the way in which the endogenous variables (x, y, z) are determined depends on the particular political mechanism of the empire. To uncover the fundamental driving force of institutional patterns, to free our analysis from the artifice of suboptimal institutions or political bias toward one party or another, and to capture the long-run trend that interests of various parties tend to get expressed through procedures ranging from voting and bargaining to protests and bloodshed, albeit too complex to be incorporated in our model, let us assume that the endogenous variables are chosen by a neutral benevolent social planner. Hence we shall consider a principal's problem of maximizing the expected value of

social surplus for the empire subject to the incentive constraints of the two players.

Remark 1: While the military's moral hazard problem is the focus, the farmer is an indispensable construct in our consideration. Without the farmer's moral hazard problem, the model would offer an extreme implication that the socially first best could be achieved by military dictatorship, making the military residual claimant of the society.

Remark 2: A main assumption of the model is that the occurrence of warfares between the empire and the periphery is exogenous. While that assumes away many cases where a state can choose whether to wage a war or not in the short run, the assumption is consistent with the general pattern that in the long run the occurrence of external conflicts was by and large exogenous to each empire, Rome or China. In most of the time, whether it was before or after the formation of their empires, neither the Romans nor the Chinese could choose which foreign tribe to be their neighbors, and the kind of geopolitical conflicts between the neighbor and the core determined the long run likelihood of warfares between them.

4 Comparative Statics

On the model defined above an analysis is presented in this section. We shall see that the socially optimal solution for the empire is completely determined by a parameter θ , which encapsulates both the empire's relative wealth and the likelihood of border tranquility. It shall be proved that an empire with high θ finds it socially optimal to weaken her own military (Proposition 1) and, at the optimum, enjoys larger social surplus than an empire with low θ (Proposition 2). Proposition 1 suggests that the institutional divergence, with the military empowered in Rome and disempowered in China, as well as the military inferiority of the Chinese empire so brutally exposed to the world by the Opium War and many wars thereafter, can be traced back to a difference in the primitives faced by the two empires: that the Chinese empire was given a higher θ than the Roman empire, i.e., the Chinese were surrounded by poorer barbarians, or less harassed by them, than the Romans. Ironically, Proposition 2 suggests that the Chinese lived a better life than their western counterpart as long as the empire was insulated from another, militarily superior empire.²²

²² This theoretical result is consistent with an observation in the history literature, such as Finer [13, v3, p1130] and the sources cited there, that the Chinese peasants in the early Qing dynasty, up to merely five decades before the Opium War, were better-off than their European counterparts.

Let us start the analysis by observing that, according to stage (d) of the model, the soldier weakly prefers loyalty to revolt if and only if $y \geq g(x)(\omega_a + \omega_b)$, when he prevails in the event of barbarian invasion, and $z \geq g(x)\omega_a$, when barbarian invasion does not occur.

Lemma 1 *Any equilibrium-feasible choice (x, y, z) is outcome-equivalent to some (x, y', z') that satisfies the revolt-proof conditions $y \geq g(x)(\omega_a + \omega_b)$ and $z \geq g(x)\omega_a$*

Proof Suppose that (x, y, z) is equilibrium-feasible and violates at least one of the revolt-proof conditions, say $y < g(x)(\omega_a + \omega_b)$. Then in the event of his victory against barbarians, the soldier revolts for sure thereby obtaining a wealth equal to $g(x)(\omega_a + \omega_b)$ in expected value. This the farmer takes into account in the decision on whether to work or shirk. Thus, the equilibrium outcome is equivalent to replacing y by $y' := g(x)(\omega_a + \omega_b)$, which satisfies the constraint $y' \geq g(x)(\omega_a + \omega_b)$. The reasoning for $z \geq g(x)\omega_a$ is the same. ■

By Lemma 1, we may assume without loss of generality that the revolt-proof constraints are satisfied, which by a standard convention in mechanism design means that the soldier does not revolt. Then the farmer's best response at stage (b) is to work if and only if

$$p(\pi f(x)(\omega_a + \omega_b - y) + (1 - \pi)(\omega_a - z)) \geq c,$$

which, with the notation $\varphi(x) := \pi f(x)(\omega_a + \omega_b) + (1 - \pi)\omega_a$, is equivalent to

$$p(\varphi(x) - (\pi f(x)y + (1 - \pi)z)) \geq c.$$

For simplicity, assume—

Assumption 1 $c_* \geq p(\pi(\omega_a + \omega_b) + (1 - \pi)\omega_a)$.

Thus, with c distributed uniformly on $[0, c_*]$, the social surplus in expected value is equal to

$$\frac{1}{c_*} \int_0^{p(\varphi(x) - (\pi f(x)y + (1 - \pi)z))} (p\varphi(x) - c) dc. \quad (1)$$

Hence the principal's decision at stage (a) is to choose $(x, y, z) \in [0, 1] \times [0, \omega_a + \omega_b] \times [0, \omega_a]$ to maximize (1) subject to the soldier's incentive constraint, or the revolt-proof condition,

$$y \geq g(x)(\omega_a + \omega_b), \quad (2)$$

$$z \geq g(x)\omega_a. \quad (3)$$

A solution of the principal's problem is called *social optimum*.

Lemma 2 *By Assumption 1, at any social optimum (x, y, z) , the revolt-proof constraint (3) is binding, and if $f(x) > 0$ then the other revolt-proof constraint (2) is also binding.*

Proof If constraint (3) were not binding, then z can be reduced slightly without violating the constraints. The reduction increases strictly the upper limit $p(\varphi(x) - (\pi f(x)y + (1 - \pi)z))$ of the integral (1) since $\pi < 1$ and $p > 0$ by assumption. The mass of c added to the integration domain thereby strictly increases the integral, because for almost every such c , $p\varphi(x) - c > 0$ as $\varphi(x)$ is at least as large as the increased upper limit. The argument for constraint (2) is analogous when $f(x) > 0$. ■

Lemma 3 *By Assumption 1, the principal's problem is equivalent to*

$$\max_{x \in [0,1]} [\pi f(x)(\omega_a + \omega_b) + (1 - \pi)\omega_a]^2 (1 - g(x)^2). \quad (4)$$

Proof By Lemma 2, the principal's problem is equivalent to the one with the revolt-proof constraints replaced by the equations $f(x)y = f(x)g(x)(\omega_a + \omega_b)$ and $z = g(x)\omega_a$. Plugging both equations into the principal's objective (1), we obtain the principal's problem

$$\max_{x \in [0,1]} \int_0^{p(\varphi(x) - (\pi f(x)g(x)(\omega_a + \omega_b) + (1 - \pi)g(x)\omega_a))} (p\varphi(x) - c) dc.$$

With the definition of $\varphi(x)$, the upper limit of the above integral is equal to

$$p(1 - g(x))(\pi f(x)(\omega_a + \omega_b) + (1 - \pi)\omega_a) = p(1 - g(x))\varphi(x).$$

Therefore, the principal's objective is equal to

$$\begin{aligned} \int_0^{p(1-g(x))\varphi(x)} (p\varphi(x) - c) dc &= p\varphi(x)p(1 - g(x))\varphi(x) - \frac{1}{2}p^2(1 - g(x))^2\varphi(x)^2 \\ &= \frac{1}{2}p^2\varphi(x)^2(1 - g(x)^2), \end{aligned}$$

which, with the definition of $\varphi(x)$ plugged in, is equal to $p^2/2$ times the objective at (4). ■

Denote

$$\theta := \frac{1 - \pi}{\pi(1 + \omega_b/\omega_a)}. \quad (5)$$

Since $\pi(\omega_a + \omega_b) > 0$ by assumption, the principal's problem, by Lemma 3, is equivalent to

$$\max_{x \in [0,1]} 2 \ln(f(x) + \theta) + \ln(1 - g(x)^2), \quad (6)$$

with the optimal social surplus measured by the maximand of (6) plus $2 \ln(\pi(\omega_a + \omega_b))$. The parameter θ captures the empire's wealth relative to the barbarians', ω_a/ω_b , and the likelihood ratio of border tranquility, $(1 - \pi)/\pi$. Our analysis is focused on the comparative statics of the principal's problem with respect to θ .

Assumption 2 *f and g are differentiable on $[0, 1]$; $f' > 0$ and $g' > 0$ on $[0, 1]$; $g(0) = 0$; and $g(1) = 1$.*

The differentiability of f and g is assumed for calculation convenience. The rest of the assumption is intuitively plausible: a more powerful military is more likely to prevail in battles; a powerless military cannot usurp the empire, while a military with absolute power can usurp the throne absolutely.

Denote the objective in (6) by

$$U(x, \theta) := 2 \ln(f(x) + \theta) + \ln(1 - g(x)^2).$$

Lemma 4 *By Assumptions 1 and 2, $U(x, \theta)$ exhibits strictly increasing difference in $(x, -\theta)$, i.e., if $\theta' < \theta''$ and $0 \leq x' < x'' < 1$ then $U(x'', \theta'') - U(x', \theta'') < U(x'', \theta') - U(x', \theta')$.*

Proof For any $x \in [0, 1)$ and any $\theta \geq 0$, by differentiability of f and g (Assumption 2),

$$\frac{\partial}{\partial x} U(x, \theta) = \frac{2f'(x)}{f(x) + \theta} - \frac{2g(x)g'(x)}{1 - g(x)^2}, \quad (7)$$

which, coupled with the assumption $f'(x) > 0$ (Assumption 2), implies $\frac{\partial^2}{\partial \theta \partial x} U(x, \theta) < 0$. Thus, by the second fundamental theorem of calculus,

$$\frac{\partial}{\partial x} U(x, \theta'') - \frac{\partial}{\partial x} U(x, \theta') = \int_{\theta'}^{\theta''} \frac{\partial^2}{\partial \theta \partial x} U(x, \theta) d\theta < 0$$

since $\theta'' > \theta'$; furthermore,

$$U(x'', \theta'') - U(x', \theta'') = \int_{x'}^{x''} \frac{\partial}{\partial x} U(x, \theta'') dx < \int_{x'}^{x''} \frac{\partial}{\partial x} U(x, \theta') dx = U(x'', \theta') - U(x', \theta'). \quad \blacksquare$$

Eq. (7) encapsulates the trade-offs faced by the empire. Empowering her own military, i.e., increasing x , would improve the chance of protecting her harvest from barbarians, by a magnitude in the order of $f'(x)(1 - g(x)^2)$. The downside, however, is that the military would become more capable of usurping the empire thereby robbing the harvest from the

farmer, by a magnitude in the order of $g'(x)g(x)(f(x) + \theta)$, rendering the farmer less willing to work and hence the harvest smaller in expectation. Note that the downside is heavier when θ is bigger, with more to lose to domestic tyrants and less to pillage from barbarians, or rarer occurrence of barbarian invasion and hence less needed is the military. Thus, from the standpoint of social welfare, there is a stronger push for weakening one's own military with bigger θ . This we formalize in the rest of the section.

Lemma 5 *By Assumptions 1 and 2, for any $\theta \geq 0$, any socially optimal degree of military empowerment is interior to $[0, 1]$.*

Proof Let $x^* \in [0, 1]$ be an optimum for the principal. By Eq. (7), $\frac{\partial}{\partial x}U(x, \theta)|_{x=0} > 0$ because $f'(0) > 0$ and $g(0) = 0$ (Assumption 2), hence $x^* \neq 0$; $\frac{\partial}{\partial x}U(x, \theta)|_{x=1} = -\infty$ because $g(1) = 1$ and $g'(1) > 0$ (Assumption 2), hence $x^* \neq 1$. Thus, x^* is interior to $[0, 1]$. ■

Lemma 6 *By Assumptions 1 and 2, if x' is socially optimal given θ' , and x'' socially optimal given θ'' , with $\theta', \theta'' \in \mathbb{R}_+$, then $\theta' \neq \theta'' \Rightarrow x' \neq x''$.*

Proof Suppose not, i.e., $x' = x'' =: x_*$ is optimum for both θ' and θ'' . With x_* interior to $[0, 1]$ (Lemma 5), x_* satisfies the first-order condition $\frac{\partial}{\partial x}U(x, \theta)|_{x=x_*} = 0$ whether $\theta = \theta'$ or $\theta = \theta''$. But that violates the fact $\frac{\partial^2}{\partial \theta \partial x}U(x_*, \theta) < 0$ obtained in the proof of Lemma 4. ■

Proposition 1 *By Assumptions 1 and 2, if x' is a socially optimal degree of military empowerment given θ' , and x'' socially optimal given θ'' , then $\theta' < \theta'' \Rightarrow x' > x''$.*

Proof Let $\theta' < \theta''$. By Lemma 6, $x' \neq x''$. Hence it suffices to show that $x'' \leq x'$. Suppose, to the contrary, that $x'' > x'$, which means by Lemma 5 that $0 < x' < x'' < 1$. Then Lemma 4 applies and gives the desired contradiction:

$$0 \leq U(x'', \theta'') - U(x', \theta'') < U(x'', \theta') - U(x', \theta') \leq 0,$$

with the first and last inequalities due to optimality of x'' given θ'' and that of x' given θ' . ■

Lemma 7 *By Assumptions 1 and 2, for any $\theta \geq 0$, there exists a social optimum.*

Proof With the principal's problem equivalent to the one in (4), her objective in (4) is a continuous function of x (Assumption 2) on the compact set $[0, 1]$. ■

Proposition 2 *By Assumptions 1 and 2, if $\theta' < \theta''$ and $\pi'(\omega'_a + \omega'_b) \leq \pi''(\omega''_a + \omega''_b)$, with θ' derived from $(\omega'_a, \omega'_b, \pi')$ according to Eq. (5) and likewise for θ'' , then the optimal expected social surplus for the empire is strictly higher given $(\omega''_a, \omega''_b, \pi'')$ than given $(\omega'_a, \omega'_b, \pi')$.*

Proof Since the optimal social surplus is equivalently equal to $\max_{x \in [0,1]} U(x, \theta)$ plus $2 \ln(\pi(\omega_a + \omega_b))$, by the hypothesis $\pi'(\omega'_a + \omega'_b) \leq \pi''(\omega''_a + \omega''_b)$ it suffices to prove that $\max_{x \in [0,1]} U(x, \theta)$ is strictly increasing in θ . Note that $\frac{\partial}{\partial \theta} U(x, \theta) = 2/(f(x) + \theta) > 0$, that $2/(f(x) + \theta)$ is an integrable function of θ on $[0, \theta_*]$ for any $\theta_* \geq 0$, and that an optimum of the principal's problem exists for any θ (Lemma 7). Thus, the envelope theorem of Milgrom and Segal [18, Theorem 2] applies to interval $[0, \theta_*]$ and hence $\max_{x \in [0,1]} U(x, \theta)$ is strictly increasing in θ on $[0, \theta_*]$. This being true for any $\theta_* \geq 0$, the proposition follows. ■

Corollary 1 *By Assumptions 1 and 2, at any social optimum (x, y, z) , both revolt-proof constraints (2) and (3) are binding.*

Proof Lemma 5 implies $x > 0$. With $f' > 0$ by Assumption 2, $f(x) > f(0) \geq 0$ and hence Lemma 2 implies that both constraints are binding. ■

For simplicity, only one peripheral people has been assumed present in our model so far. To confront the data let us relax the assumption.

Multiple-tribe extension The game defined in §3 is modified as follows: At stage (c), in the event that the farmer's harvest is ω_a , either no barbarian invasion occurs or the empire is invaded by exactly one barbarian tribe, labeled as an element of a finite set B ; for each $b \in B$, the invading tribe is b with probability π_b such that $0 < \sum_{b \in B} \pi_b < 1$. In the event that tribe b invades the empire and is defeated, the total wealth of the empire becomes $\omega_a + \omega_b$. At stage (a), the allocation $y \in \mathbb{R}_+$ is replaced by vector $(y_b)_{b \in B} \in \prod_{b \in B} [0, \omega_a + \omega_b]$, so that at stage (d) if the soldier does not revolt after defeating barbarian tribe b then he gets y_b and the farmer gets $\omega_a + \omega_b - y_b$. Assumption 1 is replaced by $c_* \geq p(\sum_{b \in B} \pi_b(\omega_a + \omega_b) + (1 - \sum_{b \in B} \pi_b)\omega_a)$, and Assumption 2 is unchanged.

Corollary 2 *In the multiple-tribe extension, all previous results remain true with*

$$\theta := \frac{1 - \sum_{b \in B} \pi_b}{\sum_{b \in B} \pi_b(1 + \omega_b/\omega_a)} \quad (8)$$

and the expression $\pi(\omega_a + \omega_b)$ in Proposition 2 replaced by $\sum_{b \in B} \pi_b(\omega_a + \omega_b)$.

Proof The reasoning parallels the steps from Lemma 1 to Corollary 1. The revolt-proof conditions become $y_b \geq g(x)(\omega_a + \omega_b)$ for each $b \in B$ and $z \geq g(z)\omega_a$; the farmer’s expected wealth from working is equal to $p \left(f(x) \sum_{b \in B} \pi_b (\omega_a + \omega_b - y_b) + (\omega_a - z) \left(1 - \sum_{b \in B} \pi_b \right) \right)$ at any revolt-proof choice $(x, (y_b)_{b \in B}, z)$ according to the extended model; and the binding constraints at Lemma 2 become $f(x) \sum_b \pi_b y_b = f(x)g(x) \sum_b \pi_b (\omega_a + \omega_b)$ and $z = g(x)\omega_a$. ■

5 Historical Evidence

According to Proposition 1, the military divergence between the two empires, with Rome militaristic and China unwarlike, can be understood as a consequence of the two empires’ different best responses to a single difference in their environments, that the parameter θ had a higher value for China than for Rome. In other words, by the definition of θ , our model traces the divergence back to a fundamental difference between the two empires: the wealth of the peripheral peoples relative to that of the empire, scaled by the likelihood of wars between them, was lower for China than for Rome. Let us substantiate this environmental difference with historical data.

5.1 Measuring θ through City Sizes and Battle Records

Given the fact that each empire is surrounded by multiple tribes of peripheral peoples, we shall measure θ according to the multiple-tribe formula, Eq. (8).²³ For a proxy of the probability π_b of wars between an empire and a peripheral people say b , I use the frequency of battles $\hat{\pi}_b$ between this people and the empire, which is calculated by dividing the number of such battles by the length of the period under consideration. Battles for each empire are listed in Wikipedia.²⁴ To measure the wealth of a historical people, I use Morris’s [20, pp148–152] idea that a people’s social development is indicated by its level of urbanization, or the population of its large cities. Records of historical populations in large cities are listed

²³ The formula assumes away the possibility that the empire is engaged in the same battle with multiple tribes of barbarians, a rare occurrence for both Rome and China.

²⁴ Roman battles: http://en.wikipedia.org/wiki/List_of_Roman_battles, Sep. 8, 2014; Chinese battles: <http://zh.wikipedia.org/wiki/中国战争列表>, Sep. 12, 2014, supplemented with the English version, http://en.wikipedia.org/wiki/List_of_Chinese_wars_and_battles, Sep. 8, 2014.

in Wikipedia.²⁵ For each nation b that had warfare with the empire, we can identify its cities that show up in the list and calculate the total population across these cities as a proxy $\hat{\omega}_b$ of the nation's wealth ω_b .²⁶ Divide this “city population” of the nation by that of the empire to obtain a proxy $\hat{\omega}_b/\hat{\omega}_a$ for the nation's relative wealth with respect to the empire's. Plug the proxies $\hat{\omega}_b/\hat{\omega}_a$ and $\hat{\pi}_b$ into Eq. (8) and we obtain a proxy $\hat{\theta}$ for the parameter θ .

The periods based on which the θ is measured for the two empires are chosen to reflect, not the imperial institutions per se, but the environments in response to which the institutions were established. Hence the data count for Rome starts from 200 BCE because by then the Roman dominance had started to be felt around the Mediterranean. By the same token, the period prior to the Qin dynasty is excluded from the θ calculation for China because the Qin kingdom back then was not that dominant, with major defeats of its army observed up to a decade before the year -221, the first unification of the empire.²⁷ In addition, the Qin dynasty lasted merely 15 years and the next, long-lasting Han dynasty started with a system quite different from Qin's; hence whatever worldview the Qin emperor might have obtained from the earlier period did not predetermine the system adopted by Han. I also exclude the ending period of imperial China, 1801–1912, because the environment then, marked by the collision between the oblivious empire and the West, was utterly unexpected and world-shattering to the Chinese. Finally, the 46 years of Mongolian invasion to southern China, 1234–1279, are excluded. That is because the Chinese fought only the Mongols during this period and those battles were not stochastically independent as in our model but were serially correlated, with the Mongols waging campaigns after campaigns and the Chinese resisting obstinately until the extinction of the Chinese army and royal house at Yamen (崖门) in a similar manner of Masada. All these campaigns might have been counted as one single protracted battle, but then its effect to our measurement of θ is negligible.

²⁵ It is http://en.wikipedia.org/wiki/Historical_urban_community_sizes, dated September 6, 2014. Two Chinese cities, Datong aka Pingcheng and Jiankang aka Nanjing, are each listed by this webpage in multiple entries under their different names. For each city I have combined the corresponding entries.

²⁶ If the population record of a city is absent while a contemporary record of another city is present, I count the population of the former city as zero, as record preservation should also indicate the level of social development. Then I take the average of these population counts within the period under consideration for the “city population” over that period.

²⁷ For example, the Battle of E'yu (阏与之战) in year -269, the Battle of Handan (邯郸之战) around the year -258, the Battle of Hewai (河外之战) in -247, the Battle of Fei (肥之战) in -233 and the Battle of PoWu (番吾之战) in -232.

5.2 Aggregate Contrast

Such measurements of θ for the two empires are listed in Tables 1 and 2. These tables demonstrate at their last rows the measurement of θ as 4.4622 for Rome and the higher 5.5430 for China, which is consistent with the hypothesis of our main result, Proposition 1. The measurements for $\sum_b \pi_b(\omega_a + \omega_b)$ are also consistent with the hypothesis of Proposition 2.

Table 1: **The θ for Rome, -200–476**

	battles	$100\hat{\pi}_b$	city population	$\hat{\omega}_b/\hat{\omega}_a$	$100\hat{\pi}_b(\hat{\omega}_b/\hat{\omega}_a)$
Core (Romans)			852500		
Alans/Huns	3	0.4438	0	0	0
Armenians	4	0.5917	0	0	0
British	6	0.8876	0	0	0
Carthaginian	4	0.5917	18750	0.0220	0.0130
Celtic (Spain)	3	0.4438	0	0	0
Dacians	6	0.8876	0	0	0
Egyptians	2	0.296	106250	0.1246	0.0369
Gauls	13	1.9231	0	0	0
Germanic	34	5.0296	0	0	0
Greeks (Asia)	16	2.3669	233750	0.2742	0.6490
Greeks (Europe)	10	1.4793	13750	0.0161	0.0239
Jewish	4	0.5917	106250	0.1246	0.0737
Numidians	2	0.2959	0	0	0
Persians	12	1.7751	31250	0.0367	0.0651
Total	119	17.6038			0.8616
$\hat{\theta}$	4.4622		$\sum_b \hat{\pi}_b(\hat{\omega}_a + \hat{\omega}_b)$		157417

Sources: (i) Battles: http://en.wikipedia.org/wiki/List_of_Roman_battles, Sep. 8, 2014; (ii) city populations: http://en.wikipedia.org/wiki/Historical_urban_community_sizes, Sep. 6, 2014; (iii) Ferrero [11, v4, pp21–23], based on which I added to the list Antony’s battle of Phraaspa; (iv) first-century population in Jerusalem: http://en.wikipedia.org/wiki/Demographic_history_of_Jerusalem, Sep. 13, 2014.

Table 2: **The θ for China, -221–1234 & 1280–1800**

	battles	$100\hat{\pi}_b$	city population	$\hat{\omega}_b/\hat{\omega}_a$	$100\hat{\pi}_b(\hat{\omega}_b/\hat{\omega}_a)$
Core (Chinese)			1147130		

Continued on next page

Table 2 – Continued from previous page

	battles	$100\hat{\pi}_b$	city population	$\hat{\omega}_b/\hat{\omega}_a$	$100\hat{\pi}_b (\hat{\omega}_b/\hat{\omega}_a)$
CentralAsian (西域)	15	0.7595	0	0	0
Di (氐)	4	0.2025	0	0	0
Dutch	2	0.1013	13520	0.0118	0.0012
Hiong-Nou (匈奴)	18	0.9114	0	0	0
Japanese	6	0.3038	221600	0.1932	0.0587
Java (爪哇)	1	0.0506	0	0	0
Jie (羯)	4	0.2025	0	0	0
Jürchen (女真)	47	2.3797	4190	0.0037	0.0087
Khitani (契丹)	22	1.1139	13710	0.0120	0.0133
Korean	15	0.7595	20000	0.0174	0.0132
Liuqiu (流求)	1	0.0506	0	0	0
Mongol	25	1.2658	0	0	0
Myanmar	4	0.2025	32160	0.0280	0.0057
Nepalese	2	0.1013	0	0	0
Portuguese	2	0.1013	0	0	0
Qiang (羌)	7	0.3544	0	0	0
Russian	1	0.0506	17430	0.0152	0.0008
Sienpi (鲜卑)	30	1.5190	0	0	0
Sri Lankan	1	0.0506	2420	0.0021	0.0001
Tangut (党项)	7	0.3544	0	0	0
Tibetan (吐蕃)	30	1.5190	3230	0.0028	0.0042
Turkic (突厥)	23	1.1646	0	0	0
Xinjiang (新疆)	6	0.3038	0	0	0
Viet (越)	16	0.8101	0	0	0
Yunnan/Guizhou	11	0.5570	9350	0.0082	0.0045
total	300	15.1899			0.1105
$\hat{\theta}$	5.5430		$\sum_b \hat{\pi}_b (\hat{\omega}_a + \hat{\omega}_b)$		175515

Sources: (i) Battles: <http://zh.wikipedia.org/wiki/中国战争列表>, Sep. 12, 2014, supplemented with the English version, http://en.wikipedia.org/wiki/List_of_Chinese_wars_and_battles, Sep. 8, 2014; (ii) city populations: http://en.wikipedia.org/wiki/Historical_urban_community_sizes, Sep. 6, 2014 (Footnote 25).

Tables 1 and 2 demonstrate a pattern that Romans fought wars with wealthy nations more frequently than Chinese did. The wealth of such nations, the Carthaginians, the Greeks spreading across Europe and Asia, the Jewish and the Persians, is indicated by their city populations in Table 1. Even the Gauls and British were of some considerable wealth by

anecdotal evidence though their city population records are absent.²⁸ While most of these wealthy nations were eventually internalized into the empire, the Persians remained a wealthy adversary throughout the life of the Roman empire. As we have seen from Julian’s speech cited previously, the wealth of the Persians remained in the Romans’ calculations up to the very end of the era in which the Roman army could dominate its adversaries.

The Chinese empire, by contrast, fought most of her foreign wars with indigent peoples, first the Hiong-nou, later the Sienpi and Turkic, and then the Mongols, all from the Gobi Desert or the bleak steppe beyond. In Table 2, they had no record of city population of their own²⁹ and were among those who had fought Chinese in higher frequencies. The other three peoples who had also fought the empire frequently, the Jürchens, Khitans and Tibetans, had but tiny city populations relative to the empire.³⁰

5.3 Periodwise Contrast and the Diocletian-Constantine Reform

The environmental contrast between the two empires becomes even sharper if we dissect the aforementioned data of each empire into two periods and compare the values of θ periodwise. For Rome I separate the two periods by the year 192, the end-time of the Antonine dynasty, after which was the declining period of the empire according to Gibbon [14]. For China the two periods are divided by the year 960, when the Song dynasty was founded and the empire matured into institutionalized military disempowerment. Table 3 shows that the θ for the Roman empire doubled from 3.3428 in the early period to 6.7792 in the later period. Consequently, according to Proposition 1, the Diocletian-Constantine reform in the later period, which deviated significantly from the previous Roman institution (Table 7, Appendix A), can be understood as the empire’s best response to the changed environment. Table 4 shows that the θ for imperial China increased only moderately from 6.0539 earlier to 7.1374 later, which was higher than the Roman θ in either period and significantly so

²⁸ It was the prospect of Gaul’s becoming as wealthy as Egypt that determined Augustus’s mind to firm up his military grip on Gaul (Ferrero [11, v5, pp111–116]). The British back then were thought to be endowed with pearl fishery for a while (Gibbon [14, v1, p5]).

²⁹ The cities that awed Marco Polo [25] were captured from the Chinese by the Mongols during their invasion. As the Mongols were the ruler of the core during the ensuing 89 years of Mongolian occupation, I count those cities toward the wealth of the core instead of the periphery.

³⁰ Youzhou (幽州), Jinzhou (锦州) and Shangjing (上京, present-day 赤峰) were Khitan cities in the period 1000–1100, after which the present-day Beijing was the city under Jürchen control until 1215.

in the early period. That again is consistent with our theoretical explanation on the sharp contrast between the empires in their early periods and resemblance in their later ones.

Table 3: **The θ for Rome doubled**

period	battle frequency (%)		$\frac{\text{cityPop}}{\text{CoreCityPop}}$		battleFreq \times $\frac{\text{cityPop}}{\text{CoreCityPop}}$	
	before 192	after 192	before 192	after 192	before 192	after 192
Alans/Huns	0	1.0563	0	0	0	0
Armenians	1.0204	0	0	0	0	0
British	1.5036	0	0	0	0	0
Carthaginian	1.0204	0	0.0493	0	0.0503	0
Celtic (Spain)	0.7653	0	0	0	0	0
Dacians	1.5306	0	0	0	0	0
Egyptians	0.5102	0	0.2791	NA	0.1424	0
Gauls	3.0612	0.3521	0	0	0	0
Germanic	3.0612	7.7465	0	0	0	0
Greeks (Asia)	3.3163	1.0563	0.5649	0.0397	1.8732	0.0420
Greeks (Europe)	2.5510	0	0.0361	NA	0.0922	0
Jewish	1.0204	0	0.2791	NA	0.2848	0
Numidian	0.5102	0	0	0	0	0
Persians	1.2755	2.4648	0	0.0662	0	0.1632
Total	21.1463	12.676			2.4429	0.2052
$\hat{\theta}$					3.3428	6.7792

Sources: Same as Table 1.

Table 4: **The θ for China stayed high**

period	battle frequency (%)		$\frac{\text{cityPop}}{\text{CoreCityPop}}$		battleFreq \times $\frac{\text{cityPop}}{\text{CoreCityPop}}$	
	before 960	after 960	before 960	after 960	before 960	after 960
CentralAsian (西域)	1.2712	0	0	0	0	0
Di (氐)	0.3390	0	0	0	0	0
Dutch	0.1695	0.1795	0	0.0194	0	0.0035
Hiong-Nou (匈奴)	1.5254	0	0	0	0	0
Japanese	0.0847	0.4488	0.0464	0.2886	0.0039	0.1295
Java (爪哇)	0	0.0898	0	0	0	0
Jie (羯)	0.3390	0	0	0	0	0

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Table 4 – Continued from previous page

period	battle frequency (%)		$\frac{\text{cityPop}}{\text{CoreCityPop}}$		$\text{battleFreq} \times \frac{\text{cityPop}}{\text{CoreCityPop}}$	
	before 960	after 960	before 960	after 960	before 960	after 960
Jürchen (女真)	0	4.2190	0	0.0060	0	0.0255
Khitan (契丹)	0.9322	0.9874	0.0072	0.0151	0.0067	0.0149
Korean	1.1864	0.0898	0	0.0288	0	0.0026
Liuqiu (流求)	0.0847	0	0	0	0	0
Mongol	0	2.2442	0	0	0	0
Myanmar	0	0.3591	0.0173	0.0350	0	0.0126
Nepal	0	0.1795	0	0	0	0
Portuguese	0	0.1795	0	0	0	0
Qiang (羌)	0.5932	0	0	0	0	0
Russian	0	0.0898	0	0.0251	0	0.0022
Sienpi (鲜卑)	2.5424	0	0	0	0	0
Sri Lankan	0	0.0898	0	0.0035	0	0.0003
Tangut (党项)	0	0.6284	0	0	0	0
Tibetan (吐蕃)	1.8644	0.7181	0.0071	0	0.0133	0
Turkic (突厥)	1.9492	0	0	0	0	0
Xinjiang (新疆)	0	0.5386	0	0	0	0
Viet (越)	0.6780	0.7181	0	0	0	0
Yunnan/Guizhou	0.5932	0.3591	0.0068	0.0091	0.0040	0.0032
Total	14.153	12.118			0.0280	0.1944
$\hat{\theta}$					6.0539	7.1374

Sources: Same as Table 2.

5.4 Military Empowerment in the Sui-Tang Dynasties

The Sui-Tang dynasties, whose early stage shined with such an extraordinary degree of military vigor unsurpassed in Chinese history, were built upon a Sinicized barbarian state in the north. After the Han dynasty, the Chinese empire was disrupted by over three centuries of partition. Most of the nobility took refuge in the south, leaving the north to be rampaged by various barbarian tribes. A Sienpi state founded in 386 eventually united the north and adopted the Chinese language and the Confucian meritocratic bureaucracy. It was named North Wei (北魏) initially and renamed variously, by one usurping general after another, East Wei, West Wei, North Qi (北齐), North Zhou (北周) and Sui (隋). Sui reunified the empire in the year 589 and became the Sui dynasty, which was soon replaced by the Tang

(唐) dynasty, established by a noble house of Sui.

To the founding emperors of the Sui-Tang dynasties, brought up in the north and partially of barbarian extraction,³¹ the wealthy south would have been part of the periphery. Table 5 shows that the θ for the Sienpi state, which these emperors came from, was 3.5198, almost as low as the early Roman empire (Table 3). Thus, the relatively high degree of military empowerment in the Sui-Tang dynasties demonstrated in Table 7 (Appendix A) can be understood as the institutional response to the environment familiar to these northern emperors in accord with Proposition 1. Frontier governance was entrusted to generals, whose armies prevailed in Vietnam, Korea, Mongolia and for quite a while Central Asia. But eventually the wealthy south became internalized, and the north and west periphery too indigent or tough to provide loots for the troops.³² That raised the value of θ back up, rendering the military-empowering mechanism suboptimal. Lasting for about 170 years, the glorious period was followed by 150 years of numerous mutinies and devastating rebellions, which eventually disintegrated the empire into warring states.

Table 5: The θ for the Northern State in China, 400–600

	battles	$100\hat{\pi}_b$	city population	$\hat{\omega}_b/\hat{\omega}_a$	$100\hat{\pi}_b (\hat{\omega}_b/\hat{\omega}_a)$
Core (Wei, Qi, Zhou, Sui)			832770		
Southern State (宋齐梁陈)	20	10	334170	0.4013	4.0128
Korean	1	0.5	0	0	0
Northern Liang (北凉)	1	0.5	0	0	0
Rouran (柔然)	1	0.5	0	0	0
Turkic	8	4	0	0	0
Tuyuhun (吐谷浑)	2	1	0	0	0
Yan (燕)	1	0.5	0	0	0

Continued on next page

³¹ The founder of the Sui dynasty had adopted a Sienpi surname and become a powerful general in the Sienpi state North Zhou before he usurped its throne. The first emperor of the Tang dynasty after the short-lived Sui was born to a house whose members had been generals of Sienpi states for generations. His maternal grandfather was a Sienpi general. The second emperor of Tang, the celebrated warrior-emperor Tang TaiZong (唐太宗), was son of a granddaughter of the founder of the Sienpi state North Zhou.

³² To reward soldiers, the Tang empire’s reliance on loots from the enemies (因粮于敌) gradually gave way to domestic funding, as noticed by 贾志刚 [4, pp48–50]. The empire’s westward expansion peaked at the Battle of Talas (怛罗斯战役) in 751, where a Tang army was vanquished by the Abbasid Caliphate (黑衣大食), though before long a Tang general 封常清 scored a couple of victories in the region.

Table 5 – Continued from previous page

	battles	$100\hat{\pi}_b$	city population	$100\hat{\omega}_b/\hat{\omega}_a$	$\hat{\pi}_b (\hat{\omega}_b/\hat{\omega}_a)$
Yunnan/Guizhou	1	0.5	0	0	0
Xia (夏)	3	1.5	0	0	0
Total	38	19			4.0128
$\hat{\theta}$	3.5198				

Sources: Same as Table 2; the second source there lists the city populations, in the period 500–600, of Chang’an (长安), Datong/Pingcheng (大同/平城), Luoyang (洛阳) and Ye (邺城) in the north, and of Jiankang/Nanjing (建康/南京), Suzhou (苏州) and Wuchang (武昌) in the south.

5.5 Military Disability in the Qing Dynasty

Up to the the transition from the Ming dynasty to Qing, the last dynasty of the empire, the Chinese military as a whole could still resist invasions from the West and Japan. The Ming army dispelled the Portuguese from the Cantonese coast around 1520 and repelled the Japanese from Korea in 1590s. The Ming navy, reinforced by the Fukien pirates, defeated the Dutch at sea in 1633. A naval spinoff from the collapsed Ming, again reinforced by pirates, drove the Dutch out of Taiwan in 1661.³³ And finally the Qing army kept the Russians out of southeast Siberia in the border conflicts during 1652–1689. But in 150 years the Chinese military became defunct. The Qing army was decisively defeated in all but three of the twenty-three battles against the West and Japan from 1839 till the empire’s end. And the humiliation culminated in a war between Russia and Japan fought in Manchuria, the home base of the Qing royal house, with the Qing army not even a participant.

What happened in those 150 years, with the military capable before and defunct after, was that the empire was spoiled by unprecedented border tranquility. Among the two main adversaries of the Ming empire, the Mongols and the Manchus (called Jürchens in earlier periods), the former had degenerated into small, divided tribes after two centuries of wars against the Ming empire, and the latter, the survivor, had now usurped the empire and become her residual claimant. Hence the θ in the early Qing period shown in Table 6 became 8.7089, highest in the second millennium of imperial China. Thus, by Proposition 1, the social optimum would require weakening the military further. Military officers were given tiny divided authorities that overlapped with those of the others, and the Manchu army

³³ More in Footnote 21.

degenerated into a hereditary welfare system for Manchu descendants to live on subsidies.³⁴

Table 6: The high θ in early Qing, 1644–1800

	battles	$100\hat{\pi}_b$	city population	$\hat{\omega}_b/\hat{\omega}_a$	$100\hat{\pi}_b (\hat{\omega}_b/\hat{\omega}_a)$
Core (Chinese)			1784500		
CentralAsian (西域)	0	0	0	0	0
Di (氏)	0	0	0	0	0
Dutch	0	0	89750	0.0503	0
Hiong-Nou (匈奴)	0	0	0	0	0
Japanese	0	0	1215600	0.6812	0
Java (爪哇)	0	0	0	0	0
Jie (羯)	0	0	0	0	0
Jürchen (女真)	0	0	0	0	0
Khitan (契丹)	0	0	0	0	0
Korean	0	0	123750	0.0693	0
Liuqiu (流求)	0	0	0	0	0
Mongol	1	0.6410	0	0	0
Myanmar	1	0.6410	0	0	0
Nepalese	2	1.2820	0	0	0
Portuguese	0	0	0	0	0
Qiang (羌)	0	0	0	0	0
Russian	1	0.6410	135060	0.0757	0.0485
Sienpi (鲜卑)	0	0	0	0	0
Sri Lankan	0	0	0	0	0
Tangut (党项)	0	0	0	0	0
Tibetan (吐蕃)	4	2.5641	0	0	0
Turkic (突厥)	0	0	0	0	0
Xinjiang (新疆)	6	3.8462	0	0	0
Viet (越)	1	0.6410	0	0	0
Yunnan/Guizhou	0	0	0	0	0
total	16	10.2563			0.0485
$\hat{\theta}$	8.7089				

Sources: Same as Table 2.

Upon the onslaught of foreign invasions starting from 1839, the empire did try to learn

³⁴ 金普森 and 姚杏民 [5, pp91–92].

the modern military technology, sending students overseas and building up a navy largest in east Asia. In history, it was not uncommon for a technologically disadvantaged nation to quickly master a new technology thereby leveling the playing field. The Mongols, adopting arabian cannons and building up naval units, eventually conquered the Song empire that was advanced in firearms and water battles back then. The Manchus, learning firearms from defecting Ming soldiers, turned the tables on the firearm-equipped Ming empire in less than two decades. In three decades the Japanese transformed their military from a disadvantaged one like the Qing army to a modern one that vanquished Qing's larger navy and defeated the Russians. Yet the Qing empire failed to join the list of quick learners. Time was not enough to accomplish a radical turnaround of a military disempowerment system that was socially optimal for the empire in most of the past two millennia.

6 Conclusion

This paper contributes to the comparative analysis between China and the West by (i) constructing a tractable mathematical model that explains the institutional contrast between the Chinese and Roman empires in terms of military empowerment and (ii) presenting historical data that substantiate this military contrast and confirm the theoretical explanation. With military defense an essential function of an empire, the paper also suggests a fundamental driving force of the divergence between the two. Our results might help to reconcile both sides of the debate over the “great divergence” between China and the West. Claims of the relatively advanced technology and economy in ancient China do not necessarily contradict her recent backwardness, because instead of being caused by inferior technology or economy the recent backwardness could simply be a consequence of her persistent choice to weaken her own military, an optimal institutional response to her environment, relatively stable in the past two millennia, where most peripheral adversaries were indigent (Proposition 1). Moreover, according to Proposition 2, whose hypothesis is consistent with the data in Tables 1 and 2, the prosperity of ancient China can be understood as another consequence of the same environmental constraint that caused the military backwardness of China.

Since our notion of empires abstracts away specifics such as cultures and political regimes, our model has the potential of being developed into a framework relevant to present-day international politics. It is conceivable to combine two copies of the model into a game

of interacting empires, in each of which a social planner chooses a degree of military empowerment to best reply the other empire's choice subject to domestic incentive constraints.

While this paper concerns mainly the question how an empire is governed given the premise that she continues being an empire, the model has the potential to be extended, with dynamic elements incorporated, to explain the evolution and decline of an empire. An overlapping-generation framework where each generation confronts the mechanism-design problem modeled in this paper, with an additional constraint due to the institutional legacy from previous generations, could capture the path-dependent aspect of history. For example, given their different environments, the Roman and Chinese empires started out with different institutions, with the former governed mainly through the military and the latter through an intelligentsia bureaucracy. With the legions occupied by military control and defense, local governance and cultures in the Roman provinces were left mostly intact. By contrast, the Chinese bureaucracy, with post-rotation across the empire and a uniform Confucian ideology, which the imperial court deliberately promoted to elevate the authority of the center, had mostly evened out various cultures by the end of her early stage, the Han dynasty.³⁵ Consequently, when the composition of peripheral adversaries for the Roman empire became similar to its Chinese counterpart, the institutional reformers such as Diocletian and Constantine were constrained by the east-west divide within the empire.³⁶ To govern the diverging empire, the Roman emperor had to entrust half of it to one of his colleagues. Consequently, civil wars between the two halves interrupted the centralizing effort, which failed to keep pace with the widening divide and the deluge of indigent barbarians.

A Quantifying the Degree of Military Empowerment

Military empowerment between the two empires are compared on five aspects, with the first three concerning domestic power and the last two external strength.

- a. Military accession: The number of emperors who owed their accession to the military divided by the total number of emperors. I take the Senate's endorsement as the

³⁵ See Finer [13, v1, p532] for a concise contrast between the Roman and Han empires on local governance.

³⁶ Christianity back then could not help to mend the divide. Whereas Confucianism owed its dominance to the imperial court, Christianity was independent of the empire because it survived despite imperial persecution. In addition, when needed as a unifying force during the Constantinian dynasty, Christianity was itself caught in bloody internal rivalries between the Trinitarians and Arians.

criterion for a Roman emperor,³⁷ and the status of reigning over the core as that for a Chinese emperor.³⁸

- b. Hereditary succession: The number of emperors who owed their accession to their hereditary status divided by the total number of emperors.
- c. Generals executed by emperors: The number of major generals executed by the imperial court divided by the total number of emperors.
- d. Years of external dominance: This is the number of years in which the imperial army dominated the peripheral peoples divided by the length of the period under consideration, which are -27–476 for the Roman empire and -221–1912 for the Chinese empire. Two abnormal periods are also considered: the Later Roman empire in 284–476 (with 284 the starting year of Diocletian’s reign) and the Sui and Tang dynasties in 581–907.
- e. Foreign war victories: The fraction of the number of battles won by the empire among all her battles against “barbarians” within the period under consideration, with the periods defined above in (d). Indecisive outcomes are counted as 0.5.

Items (a), (b) and (c) are counted according to the lists of emperors in Tables 8 and 9, Appendix B. Item (e) is calculated from the lists of battles for each empires, which are posted in Wikipedia (cited in Footnote 24). Item (d) is based on the following observation.

The Roman legions lost their dominance over the barbarians temporarily from 235 (assassination of Alexander Severus) to 268 (reunification due to Claudius Gothicus) and then permanently from 363 (death of Julian during his invasion to Persia) to the end-time 476. The Chinese empire dominated the periphery in the following periods: the Qin (秦) dynasty from year -221 to -206, much of the Han dynasty and her afterglow, from year -141 the start of Emperor WuDi’s (汉武帝) reign to the fall of the West Jin dynasty (西晋) in

³⁷ When the Roman empire was divided in the Theodosian dynasty, both the eastern and western emperors are counted, as neither contended for the throne of the other.

³⁸ In the case where the core shrank geographically, to identify the “core” I put more weight on the cultural and institutional aspects and consider whether the region was the focal point of contending groups. For example, the Southern Song emperors are counted because the shrunk empire back then still embodied the Chinese institution and was the target of conquering attempts by first the Jürchens and then the Mongols. The southern state during the partition period between the Han and Sui dynasties, by contrast, was not counted as the core, as the south and the north mostly ran their courses separately.

year 316, Sui (隋) and early Tang (唐) dynasties from 581 to 755 (outbreak of An LuShan’s rebellion, or 安史之乱), early Ming (明) dynasty from 1368 to 1449 (the capture of Emperor ZhengTong, or 土木堡之变), and the early Qing (清) dynasty from 1644 to 1796. Not counted as such a period is the 89 years of Mongolian occupation, which Chinese history textbooks usually treat as a dynasty of imperial China. I think it is rather a period of foreign occupation because the Chinese and Mongols had not assimilated into one people by the end of the 89 years, immediately after which the Mongols were dispelled from the empire (more explanations in Footnote 76).

Table 7 lists these items for both empires, as well as their abnormal periods—the Later Roman empire, starting from the row “Diocletian” to the end of Table 8, and the Sui-Tang dynasties, from rows “Sui WenDi (隋文帝)” to “Tang AiDi (唐哀帝)” in Table 9.

Table 7: **Military Empowerment**

	Roman empire	Chinese empire	Later Roman empire	Sui-Tang dynasties
Military accession	61.7%	20%	50%	32%
Hereditary succession	33.3%	91%	50%	84%
Generals executed by emperors	10%	21%	22%	16%
Years of external dominance	71%	41%	41%	53%
Foreign war victories	63.8%	58.3%	54.5%	76.8%

Source: Wikipedia lists of battles cited in Footnote 24; Tables 8 and 9, Appendix B.

B Imperial Succession in Rome and China

Table 8: **Succession of Roman Emperors**

Emperor	dynasty/period	military acces’n	hereditary succession	generals executed	kinslay	killed/suicide
Augustus	Julio-Claudian	1	0	0	0	0
Tiberius	Julio-Claudian	1 ³⁹	0	0	0	0
Caligula	Julio-Claudian	0	1	0	0	1

Continued on next page

³⁹Albeit a Claudius, Tiberius was selected to be the successor because he was the only capable general surviving during the old age of Augustus (Ferrero [11, v5, pp222-226]).

Table 8 – *Continued from previous page*

Emperor	dynasty/period	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Claudius	Julio-Claudian	1 ⁴⁰	1	0	0	0
Nero	Julio-Claudian	0	1	1 ⁴¹	1	1
Galba	Yr of 4 Emp'rs	1	0	0	0	1
Otho	Yr of 4 Emp'rs	1	0	0	0	1
Vitellius	Yr of 4 Emp'rs	1	0	0	0	1
Vespasian	Flavian	1	0	0	0	0
Titus	Flavian	1 ⁴²	1	0	0	0
Domitian	Flavian	1 ⁴³	1	0	0	1
Nerva	Nerva-Antonine	0	0	0	0	0
Trajan	Nerva-Antonine	1	0	0	0	0
Hadrian	Nerva-Antonine	0	0	1 ⁴⁴	0	0
Antoninus Pius	Nerva-Antonine	0	0	0	0	0
Marcus Aurelius	Nerva-Antonine	0	0	0	0	0
Commodus	Nerva-Antonine	0	1	0	0	1
Pertinex	Yr of 5 Emp'rs	1	0	0	0	1
Didius Julianus	Yr of 5 Emp'rs ⁴⁵	1	0	0	0	1
Septimius Severus	Severan	1	0	0	0	0
Caracalla	Severan	0	1	0	1	1
Macrinus	Severan	0	0	0	0	1
Elagabalus	Severan	1	0	0	0	1
Alexander Severus	Severan	1 ⁴⁶	1	0	0	1

Continued on next page

⁴⁰ Claudius was selected by the Praetorian Guard soldiers while the senate was deliberating on picking the successor, with some hope, indicated by their honoring the assassin of Caligula, of restoring the old republic (Ferrero and Barbagallo [12, pp161–162]).

⁴¹ General Gnaeus Domitius Corbulo.

⁴² Upon his victory in Judea, Titus was hailed imperator by the soldiers and feared to rebel. His father, Vespasian, accommodated him with a triumph and power sharing.

⁴³ Upon the death of Titus, Domitian went to the Praetorian Guard and was declared emperor there.

⁴⁴ Shortly after Hadrian's accession was the execution of Lusius Quietus, an accomplished general under Trajan, and other three former consuls, on a vague charge of conspiracy by a secret court.

⁴⁵ Immediately after Didius Julianus bought the throne from the Praetorian Guard soldiers (via an ascending-bid open-outcry auction), Pescennius Niger was proclaimed emperor by the legions in Syria, Clodius Albinus by the armies in Britain and Gaul, and Septimius Severus by the troops in Illyricum and Pannonia. The former two were sequentially defeated and killed in civil wars with Severus.

⁴⁶ With soldiers upset by emperor Elagabalus's religious and sexual eccentricities, the emperor was pressured to name his cousin Alexander Severus as heir and share power with him. When Elagabalus recanted,

Table 8 – *Continued from previous page*

Emperor	dynasty/period	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Maximinus Thrax	Crisis3rdCent'ry	1	0	0	0	1
Pupienus	Crisis3rdCent'ry	0	0	0	0	1
Balbinus	Crisis3rdCent'ry	0	0	0	0	1
Gordian III	Crisis3rdCent'ry	1 ⁴⁷	0	0	0	1
Philip the Arab	Crisis3rdCent'ry	1	0	0	0	1
Decius	Crisis3rdCent'ry	1	0	0	0	1
Trebonianus Gallus	Crisis3rdCent'ry	1	0	0	0	1
Aemilianus ⁴⁸	Crisis3rdCent'ry	1	0	0	0	1
Valerian	Crisis3rdCent'ry	1	0	0	0	1
Gallienus	Crisis3rdCent'ry	1	1	0	0	1
Claudius Gothicus	Crisis3rdCent'ry	1	0	0	0	0
Quintillus	Crisis3rdCent'ry	1 ⁴⁹	0	0	0	0
Aurelian	Crisis3rdCent'ry	1	0	0	0	1
Marcus Tacitus	Crisis3rdCent'ry	0	0	0	0	0
Marcus Probus	Crisis3rdCent'ry	1	0	0	0	1
Carus	Crisis3rdCent'ry	1	0	0	0	0
Carinus	Crisis3rdCent'ry	0	1	0	0	1
Numerian	Crisis3rdCent'ry	0	1	0	0	1
Diocletian	Tetrarchy	1	0	0	0	1
Constantius Chlorus	Constantinian	1	0	0	0	0
Constantine I	Constantinian	1	0	1 ⁵⁰	2	0
Constantine II	Constantinian	0	1	0	0	1
Constans	Constantinian	0	1	0	1	1

Continued on next page

stripped the title from Alexander and spread rumors of his death, both were summoned by the Praetorian Guard to their camp. The soldiers hailed Alexander emperor and killed Elagabalus and his mother.

⁴⁷ After killing Emperors Pupienus and Balbinus, the Praetorian Guard hailed Gordian III as the emperor.

⁴⁸ While his reign was short and his name absent in Gibbon's [14, Appendix II, v6, p658] list of emperors, the rise and fall of Aemilianus were typical in that era. A commander at the Danube frontier, Aemilianus defeated a Gothic invasion and was proclaimed emperor by his soldiers on the battlefield. The incumbent emperor, Gallus, was murdered by his own soldiers, attracted by Aemilianus's offer of pay increases. The senate then legally recognized Aemilianus as emperor. When a larger force led by Valerian closed in, however, Aemilianus was in turn killed by his own soldiers (Gibbon [14, v1, pp280–281]).

⁴⁹ Immediately after Claudius Gothicus's death, Quintillus assumed emperorship while commanding a considerable force, and the senate concurred.

⁵⁰ It was Constantine's oldest son Crispus, well-recognized as a successful general in foreign and civil wars.

Table 8 – *Continued from previous page*

Emperor	dynasty/period	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Constantius II	Constantinian	0	1	0	9	0
Julian	Constantinian	1	0	0	0	1
Jovian	Constantinian	1 ⁵¹	0	0	0	0
Valentinian I	Valentinian	1	0	0	0	0
Valens I	Valentinian	0	1	0	0	1
Gratian	Valentinian	0	1	1 ⁵²	0	1
Valentinian II	Valentinian	1 ⁵³	0	0	0	1
Theodosius I	Theodosian	1	0	0	0	0
Arcadius	Theodosian	0	1	0	0	0
Honorius	Theodosian	0	1	1 ⁵⁴	0	0
Theodosius II	Theodosian	0	1	0	0	0
Valentinian III	Theodosian	1 ⁵⁵	0	1 ⁵⁶	0	1 ⁵⁷

Continued on next page

⁵¹ When Emperor Julian died, Jovian was the commander of the imperial bodyguard and, possibly misidentified with more illustrious figures, was elected by the army to be the next emperor.

⁵² Theodosius the Elder, the general who restored Britain and Africa for the empire.

⁵³ When Valentinian I died in the camp, his generals, despite the fact that the older son Gratian had been entitled Augustus, acclaimed as Augustus the four-year old, hence manipulable, Valentinian II.

⁵⁴ Master general Stilicho.

⁵⁵ Upon the death of Honorius, to counter the threat of the usurper Joannes in the western empire, the eastern emperor Theodosius II installed Valentinian III as the western emperor by naming him Caesar of the west and defeating Joannes.

⁵⁶ After the death of Attila and consequently the end of the threat from the Huns, Valentinian III killed Aëtius in the court and was soon assassinated by two Hunnish followers of Aëtius.

⁵⁷ After Valentinian III died, the throne of the western empire was briefly assumed by a senator Petronius Maximus before he was stoned to death by a mob when the Vandal king Genseric was about to capture Rome. Genseric sacked Rome. Then the Visigoth king Theodoric II and Gallic chiefs proclaimed Avitus as emperor, who was dethroned by rebelling generals Ricimer and Majorian. With Ricimer of Gothic origin and intending to be the power behind the throne, Majorian became the next emperor and carried out a series of reforms to restore the western empire. His effort offended the aristocrats and got him killed by Ricimer, who then installed Libius Severus as a puppet emperor until Severus died. With the consent of Ricimer, the eastern emperor Leo I sent to the throne his officer Anthemius, who was killed by Ricimer in a power contest. Then Olybrius, backed by the Vandal king Genseric and consented by Ricimer, assumed the throne briefly but soon died of illness. As Ricimer also died, his nephew Gundobad, the new master general, put Glycerius to the throne. Regarding Glycerius as a usurper, the eastern imperial court named Julius Nepos, ruler of Dalmatia, as the western emperor, who invaded Italy and dethroned Glycerius. But soon he was forced to flee back to Dalmatia by his own master general Orestes. Not a Roman citizen himself, Orestes appointed

Table 8 – Continued from previous page

Emperor	dynasty/period	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Pulcheria/Marcian	Theodosian	0	1 ⁵⁸	0	0	0
Total: 60 emperors		37	20	6	14	35

Table 9: Succession of Chinese Emperors

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Qin ShiHuang (秦始皇)	Qin (秦)	1 ⁵⁹	1	0	0	0
Qin ErShi (秦二世)	Qin (秦)	0	1	1 ⁶⁰	1	1
ZiYing (秦王子婴)	Qin (秦)	0	1	0	0	0
Han GaoZu (汉高祖)	Han (汉)	1	0	4 ⁶¹	0	0
HuiDi (汉惠帝) ⁶²	Han (汉)	0	1	0	0	0
ShaoDi (少帝刘弘)	Han (汉)	0	1	0	0	1
WenDi (汉文帝)	Han (汉)	1 ⁶³	1	0	0	0
JingDi (汉景帝)	Han (汉)	0	1	0	0	0
Han WuDi (汉武帝)	Han (汉)	0	1	0	2	0
ZhaoDi (汉昭帝)	Han (汉)	0	1	0	0	0
Liu He (刘贺)	Han (汉)	0	1	0	0	0
XuanDi (汉宣帝)	Han (汉)	0	1	0	0	0

Continued on next page

his 12-year old son Romulus Augustulus as the western emperor. Within a year, a foreign mercenary revolt led by Odoacer killed Orestes and forced Romulus to abdicate. The Western Emperor as an institution was discontinued afterwards.

⁵⁸ Pulcheria was an elder sister of the eastern emperor Theodosius II, who was under her regency during his minority, when she was declared as Augusta. Marcian was a general and senator. After Theodosius II died, Pulcheria came to power and married Marcian thereby making him emperor of the eastern empire.

⁵⁹ Qin ShiHuang ascended the throne of the Qin kingdom by hereditary succession, though he proclaimed himself Emperor the First (“ShiHuang”) only after his military conquest of the other kingdoms.

⁶⁰ General Meng Tian (蒙恬).

⁶¹ After reuniting the empire, Han GaoZu executed, through arrests or wars, most of the generals to whom he had awarded kingdoms, including Han Xin (韩信), Peng Yue (彭越), Ying Bu (英布) and Chen Xi.

⁶² Puppet of Dowager Lü Hou (吕后), so was the next emperor, ShaoDi.

⁶³ After Dowager Lü Hou died, a coalition of ministers, generals and members of the royal family launched a coup, which cleansed the offsprings of her paternal family, dethroned and executed Emperor ShaoDi. Then the ministers selected the oldest surviving son of Han GaoZu as the successor, known as WenDi.

Table 9 – Continued from previous page

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
YuanDi (汉元帝)	Han (汉)	0	1	0	0	0
ChengDi (汉成帝)	Han (汉)	0	1	0	0	0
AiDi (汉哀帝)	Han (汉)	0	1	0	0	0
PingDi (汉平帝)	Han (汉)	0	1	0	0	1
RuZi Ying (孺子婴)	Han (汉)	0	1	0	0	1
Wang Mang (王莽)	Xin (新)	1 ⁶⁴	0	0	0	1
GuangWu Di (光武帝)	Han (汉)	1	0	0	0	0
MingDi (汉明帝)	Han (汉)	0	1	0	0	0
ZhangDi (汉章帝)	Han (汉)	0	1	0	0	0
HeDi (汉和帝)	Han (汉)	0	1	0	0	0
ShangDi (汉殇帝)	Han (汉)	0	1	0	0	0
AnDi (汉安帝)	Han (汉)	0	1	0	0	0
ShunDi (汉顺帝)	Han (汉)	0	1	0	0	0
ChongDi (汉冲帝)	Han (汉)	0	1	0	0	0
ZhiDi (汉质帝)	Han (汉)	0	1	0	0	1
HuanDi (汉桓帝)	Han (汉)	0	1	0	0	0
LingDi (汉灵帝)	Han (汉)	0	1	0	0	0
XianDi (汉献帝)	Han (汉)	1 ⁶⁵	1	0	0	0
Jin WuDi (晋武帝)	Jin (晋)	1 ⁶⁶	0	0	0	0
Jin HuiDi (晋惠帝)	Jin (晋)	0	1	0	0	1
Sui WenDi (隋文帝)	Sui (隋)	1	0	0	0	0
Sui YangDi (隋炀帝)	Sui (隋)	0	1	2 ⁶⁷	1	1
Tang GaoZu (唐高祖)	Tang (唐)	1	0	0	0	0

Continued on next page

⁶⁴ Member of a powerful family and nephew of the dowager, Wang Mang became the master general of the empire and took the throne from the puppet emperor RuZi Ying.

⁶⁵ Upon the death of Emperor LingDi, the ministers cleansed the eunuchs through inviting the help from a general Dong Zhuo (董卓). Quickly establishing his despotism in the capital, Dong Zhuo elevated XianDi as the puppet emperor instead of the designated heir. Although the ministers managed to assassinate Dong Zhuo, he was replaced by a capable and intelligent general, Cao Cao (曹操), who eventually occupied the north of the disintegrated empire. After his death, Cao's son usurped the throne from Emperor XianDi.

⁶⁶ Born to a house that controlled the military of the kingdom established by general Cao's offsprings, Jin WuDi usurped the throne and reunited the empire briefly, soon overrun by barbarians.

⁶⁷ They were 贺若弼 and Gao Jiong.

Table 9 – Continued from previous page

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Tang TaiZong (唐太宗)	Tang (唐)	1 ⁶⁸	1	0	2	0
GaoZong (唐高宗)	Tang (唐)	0	1	0	0	0
Wu ZeTian (武则天)	Tang (唐)	1 ⁶⁹	0	0	0	0
ZhongZong (唐中宗)	Tang (唐)	1 ⁷⁰	1	0	0	1
Tang ShangDi (唐殇帝)	Tang (唐)	0	1	0	0	0
RuiZong (唐睿宗)	Tang (唐)	1 ⁷¹	1	0	0	0
Tang XuanZong (唐玄宗)	Tang (唐)	0	1	0	5	0
SuZong 唐肃宗	Tang (唐)	0	1	0	0	0
DaiZong (唐代宗)	Tang (唐)	0	1	0	0	0
DeZong (唐德宗)	Tang (唐)	0	1	0	0	0
ShunZong (唐顺宗)	Tang (唐)	0	1	0	0	0
XianZong (唐宪宗)	Tang (唐)	1 ⁷²	1	2	0	1
MuZong (唐穆宗)	Tang (唐)	0	1	0	0	0
JingZong (唐敬宗)	Tang (唐)	0	1	0	0	1
WenZong (唐文宗)	Tang (唐)	0	1	0	0	0
WuZong (唐武宗)	Tang (唐)	0	1	0	0	0
XuanZong (唐宣宗)	Tang (唐)	0	1	0	0	0
YiZong (唐懿宗)	Tang (唐)	0	1	0	0	0
XiZong (唐僖宗)	Tang (唐)	0	1	0	0	0
ZhaoZong (唐昭宗)	Tang (唐)	0	1	0	0	1
Tang AiDi (唐哀帝)	Tang (唐)	1 ⁷³	1	0	0	0

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⁶⁸ A valorous soldier and brilliant general, Tang TaiZong was a driving force of his father's revolt and military accession. In a coup, he killed two of his brothers, including the heir apparent. His father was forced to acquiesce and abdicate the throne to him. Tang TaiZong completed the reunification of the empire.

⁶⁹ Wu ZeTian became the de facto ruler when her husband, Emperor GaoZong was disabled by illness. After his death, she ruled through puppet emperors (her sons), cracked down several revolts led by members of the royal house, and proclaimed herself Empress.

⁷⁰ When Empress Wu ZeTian was sick, several ministers and imperial guard officers, in fear of her passing the throne to offsprings of her paternal family, launched a coup and forced her to abdicate to the designated heir, ZhongZong.

⁷¹ RuiZong's son Li LongJi (李隆基) launched a coup that elevated RuiZong to the throne, who in a year abdicated to Li LongJi, known as Tang XuanZong.

⁷² XianZong ascended the throne since the eunuchs and commissioners pressured his father to abdicate.

⁷³ He was picked by his father's killer, general Zhu Wen (朱温), to be the puppet emperor and was later forced to abdicate to Zhu Wen.

Table 9 – Continued from previous page

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
Song TaiZu (宋太祖)	Song (宋)	1	0	0	0	1 ⁷⁴
TaiZong (宋太宗)	Song (宋)	0	1	0	4	0
ZhenZong (宋真宗)	Song (宋)	0	1	0	0	0
Song RenZong (宋仁宗)	Song (宋)	0	1	0	0	0
YingZong (宋英宗)	Song (宋)	0	1	0	0	0
ShenZong (宋神宗)	Song (宋)	0	1	0	0	0
ZheZong (宋哲宗)	Song (宋)	0	1	0	0	0
Song HuiZong (宋徽宗)	Song (宋)	0	1	0	0	1
Song QinZong (宋钦宗)	Song (宋)	0	1	0	0	1
Song GaoZong (宋高宗)	Song (宋)	0	1	1 ⁷⁵	0	0
XiaoZong (宋孝宗)	Song (宋)	0	1	0	0	0
GuangZong (宋光宗)	Song (宋)	0	1	0	0	0
NingZong (宋宁宗)	Song (宋)	0	1	0	0	0
LiZong (宋理宗)	Song (宋)	0	1	0	0	0
DuZong (宋度宗)	Song (宋)	0	1	0	0	0
GongDi (宋恭帝)	Song (宋)	0	1	0	0	1
DuanZong (宋端宗)	Song (宋)	0	1	0	0	1
Song ShaoDi (宋少帝)	Song (宋) ⁷⁶	0	1	0	0	1

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⁷⁴ Song TaiZu died suddenly on a snowy night after a mysterious conversation with his brother TaiZong, who immediately ascended the throne. After his accession, TaiZong persecuted his emperor brother's two sons (赵德昭 and 赵德芳) and his other brother (赵廷美), who all died of the persecution. Evidence of the suspected assassination, however, is circumstantial at best.

⁷⁵ When the Jürchens sacked the capital Kaifeng and captured his brother and parents, Song GaoZong escaped, assumed the vacant throne, and eventually resettled the capital in the south. While the Jürchens had occupied the traditional center of the empire, their further inroads were defeated by local armies led by generals such as Yue Fei (岳飞), whose infantry defeated the Jürchen heavy-armored cavalry. Instead of attempting to recover the lost territory and revenge his family shame, the emperor opted for removing the military powers from those generals and signing a peace treaty with the Jürchens, whereby the Jürchens kept the north and the empire, or the remains thereof, secured herself in the south. Immediately before signing the peace treaty, the emperor executed Yue Fei, the most vocally pro-war general. In addition, Yue Fei might have crossed the line by requesting the emperor to designate an heir, while generals were not supposed to get involved in imperial succession.

⁷⁶ The 89 years of Mongolian occupation, between the Song and Ming dynasties, is not classified as a dynasty of the empire here, but rather a period of foreign occupation that ended with the Mongols being dispelled. During the period, China was only part of a much larger dominion of the Mongols, which after

Table 9 – Continued from previous page

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
HongWu (明太祖)	Ming (明)	1	0	10 ⁷⁷	0	0
JianWen (建文帝)	Ming (明)	0	1	0	0	0
YongLe (明成祖朱棣)	Ming (明)	1	1	0	0	0
HongXi (洪熙帝)	Ming (明)	0	1	0	0	0
XuanDe (宣德帝)	Ming (明)	0	1	0	1	0
ZhengTong (正统帝)	Ming (明)	0	1	0	0	0
JingTai (景泰帝)	Ming (明)	1 ⁷⁸	1	0	0	0
ChengHua (成化帝)	Ming (明)	0	1	0	0	0
HongZhi (弘治皇帝)	Ming (明)	0	1	0	0	0
ZhengDe (正德帝)	Ming (明)	0	1	0	0	0
JiaJing (嘉靖帝)	Ming (明)	0	1	0	0	0
LongQing (隆庆帝)	Ming (明)	0	1	0	0	0
WanLi (万历帝)	Ming (明)	0	1	0	0	0
TaiChang (泰昌帝)	Ming (明)	0	1	0	0	0
TianQi (天启帝)	Ming (明)	0	1	0	0	0
ChongZhen (崇祯帝)	Ming (明)	0	1	1 ⁷⁹	0	1
ShunZhi (顺治帝福临)	Qing (清)	1 ⁸⁰	1	0	0	0

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its disintegration never got back to one entity, and the Chinese were treated as the bottom-class subjects, with the Mongols on the top and central/western Asians in the middle. Had this period been counted as a dynasty of China, the percentage of military accession among Chinese emperors would be 21.6%, and that of hereditary succession 85.6%. There were eleven khans during the occupation. Four of them ascended the throne through military conquests, coups or assassinations: Kublai (忽必烈), Külüg (武宗), Yesün Temür (泰定帝) and Jayaatu (文宗). While all became final contenders due to hereditary status, only four of them, Ayurbarwada Buyantu (仁宗), Gegeen (英宗), Rinchinbal (宁宗) and Toghon Temür (顺帝), ascended the throne without serious contention within the royal family.

⁷⁷ They were 廖永忠, 陆仲亨, 唐胜宗, 朱亮祖, 李文忠, 蓝玉, 周德兴, 傅友德, 王弼 and 冯胜.

⁷⁸ JingTai was elevated to the throne by the ministers after his emperor brother, ZhengTong, was captured by the Oirats (瓦剌). Pushed back by the Ming army, the Oirats later released ZhengTong, who was kept under house arrest by his brother, the current emperor. Seven years later, ZhengTong managed to launch a coup and resume the throne when JingTai was seriously ill, who died a month later.

⁷⁹ General Yuan ChongHuan (袁崇焕).

⁸⁰ The Manchus were organized by their chieftain Nurhaci (努尔哈赤) in eight tribes or eight banners (八旗), each acting as a military-administrative unit, represented by a banner. When he died, his successor Hong Taiji (皇太极) was selected among Nurhaci's sons by the heads of the eight banners. Hong renamed his khanate Qing and started to adopt the Ming institutions. When he died, his brother Dorgon (多尔衮),

Table 9 – Continued from previous page

Emperor	dynasty	military acces'n	hereditary succession	generals executed	kinslay	killed/ suicide
KangXi (康熙帝玄烨)	Qing (清)	0	1	0	0	0
YongZheng (雍正)	Qing (清)	0	1	0	0	0
QianLong (乾隆)	Qing (清)	0	1	0	0	0
JiaQing (嘉庆)	Qing (清)	0	1	0	0	0
DaoGuang (道光)	Qing (清)	0	1	0	0	0
XianFeng (咸丰)	Qing (清)	0	1	0	0	0
TongZhi (同治) ⁸¹	Qing (清)	0	1	0	0	0
GuangXü (光绪)	Qing (清)	0	1	0	0	0
XuanTong (宣统溥仪)	Qing (清)	0	1	0	0	0
Total: 100 emperors		20	91	21	16	19

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who controlled two of the eight banners, became the de facto ruler through the nominal successor, Hong Taiji's son Fulin, who was still in his minority. Led by Dorgan and let in by a Ming general Wu SanGui, the Manchus captured the empire, and Fulin became Emperor ShunZhi.

⁸¹ Puppet of Dowager CiXi (慈禧太后), so was the next emperor, GuangXü.

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