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The Sociopolitical Integrity of the Roman State: Intragroup Competition, Intergroup Competition, and Economic Dynamics

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1 Introduction

As exemplified by the history of the Roman State, economic distress can decrease the level of intrasocietal cohesion even in the absence of external pressures. Since its inception, the Roman Republic faced numerous foreign threats, from rival cites in the Italian peninsula to tribal confederacies in Gaul. A chronic state of intergroup conflict favored the evolution of cultural variants necessary for sustaining large-scale cooperation. These innovations allowed the Republic to conquer its neighbors and expand outside the Italian peninsula. Even though the spoils of war created a climate of macroeconomic prosperity in Rome, rising income and wealth inequality, along with the elimination of ultrasocial institutions, increased popular discontent. It was during these times of turmoil that ambitious men dismantled the foundations designed to guard the State from the exploitation of autocrats. Debates concerning land and wealth distribution, at first restricted to senatorial rhetoric, escalated into street

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revolts and political assassinations. The mobilization of "private armies," as part of a series of civil wars, would eventually lead to the end of the Republic.

Past the quasi-legendary Roman Monarchy (with seven kings purportedly reigning from 753 to 509 BC), most of the history of the Roman State can be roughly divided into at least three major political periods, sometimes prefixed with the adjectives *early* or *late* as subdivisions: (1) the Republic (509–27 BC), (2) the Principate (27 BC–AD 284), and (3) the Dominate (AD 284–476). Although both latter periods are often collectively referred to as the Roman Empire, the Principate maintained the outward forms of Republican government while being ruled by a de facto autocrat, whereas the Dominate was the culmination of a gradual transition to outright despotism. The rise of the Principate temporarily reestablished peace after the civil wars that wracked the Late Republic; however, the continuous territorial expansion, and its corresponding economic growth, once again decreased intragroup cooperation, bringing the Empire close to the brink of collapse during the third century AD. Even though the Roman State would survive for centuries to come, territorial fragmentation between East and West would mark the end of classical Rome. The case of the Roman State evidences the fragility of within-group cooperation once outside rivals are neutralized or eliminated. Though multiple volumes exist on the history of Rome, fewer studies have quantitatively examined the association between Rome's economic distress and its decline in State cohesion.[1] Hence, in addition to providing a historical overview of the dynamic interaction between external warfare, civil warfare, and economic growth, we present empirical data on the covariation of these factors within classical Rome.

2 Roman Physical Ecology

The geographical greatness of Rome, its vast holdings and far-flung outposts spanning the 24th to the 56th parallel (Harper, 2017) and ranging longitudinally between 9° East and 38° West (Harper & McCormick, 2018), requires one to speak of multiple climates (Blasi et al., 2014; Blasi,

Filibeck, Frondoni, Rosati, & Smiraglia, 2004). Bounded by the *Atlantic* climate of the Northern and Western reaches of the Empire to the north, and the once-fertile deserts of Northern Africa to the south, the heartland of the Roman Empire was a Mediterranean climate assembling the promising combination of arid summers and humid winters under a temperate constant. In addition, an extended warm period provided the Roman State with unusually mild and agriculturally favorable climatic conditions from about 250 BC to AD 400.

For as long as this *Roman Climate Optimum* prevailed, so did its correlative parameters, among which can be counted solar output, volcanic activity, surface temperatures, and precipitation.[2] Except for one significant event in the first century BC, ice core samples and dendrochronology indicate that Rome also enjoyed an extended length of low volcanic activity, which was only interrupted by a cluster of significant activity sixty years after the fall of the Western Roman Empire, beginning around AD 536 (Harper & McCormick, 2018). Without gasses, dirt, and dust occluding the atmosphere, there were then correspondingly higher temperatures (Koutsoyiannis, Montanari, Lins, & Cohn, 2009), which were exceptionally stable between 60 BC and AD 90, as established by dinoflagellate cysts sampled at the Po River Delta (Chen, Zonneveld, & Versteegh, 2011). Keeping in mind its relevance, we then consistently see warm, wet summers give way to stably low rainfall throughout the latter part of the third century AD. Despite briefly rebounding under the reigns of Emperors Constantine and Valentinian, adequate precipitation did not return until after 476 (Büntgen et al., 2011).

During the Roman Climate Optimum, there was thus a spate of more than three centuries wherein the whole of the circum-Mediterranean region enjoyed an advantageous combination of relative stability and generous warmth (Harper & McCormick, 2018). Warmth and moisture rendered the southern reaches of Italy and the north of Africa sufficiently fertile to serve as net exporters of grain. It was upon such surpluses that the Roman Army was said to march. Rome was then a preindustrial, organic economy, deeply dependent on cereal crops for which reliable rains were necessary and providentially provided for a long spate (Harper, 2017) previous to decline and dissolution. In sum, the Romans leveraged

the Roman Climate Optimum to erect an ever-expanding supranational State out of the societal entropy of the ancient world. Even without reference to the direction or absolute value of any climatic parameter, change imparts stress and strain on a society in and of itself. In progressing from the Roman Climate Optimum (200 BC–AD 150) to the Transitional Period (AD 150–450), as Harper (2017) explains, stable conditions gave way to severe variability and thereafter to frigid temperatures, which were brought about by an atmosphere occluded by volcanism, even as there was a concomitant reduction in solar output.[3]

3 Intergroup and Intragroup Competition in the Roman Republic

Though historians continue to debate the veracity of some events regarding Rome's history,[4] little disagreement exists in terms of the influence that the threat of invasion had on the political evolution of Rome (Duncan, 2017; Turchin, 2007). In its early years, the Roman Republic frequently clashed with tribal societies, such as the Umbrians and the Aequi (Oakley, 2004; Rawlings, 2007), as well as with Italian city-states, including those of the Etruscans and the Latins (Cornell, 2012; Keppie, 2002). A combination of diplomacy and military innovations allowed the Republic to expand its sphere of geopolitical influence beyond the Italian peninsula.[5,6] The political, mercantile, and military influence of Rome in the Mediterranean inevitably led to conflict with other polities in Eurasia and North Africa (Duncan, 2017). The elimination of the rival city-state of Carthage by the end of the Third Punic War generated a cascade of geopolitical and macroeconomic changes that would alter Western history for centuries to come. This event would also modify the internal organization of the Roman State.

In the first half of the 2nd Century BC, the treasury of the Roman Republic reached a steady growth. Current historical reconstructions suggest wealth accrual fluctuated during this period. For instance, the economic landscape of the Middle and the Late Republic indicates the fortunes of the aristocracy grew from 4–5 million *sestertii* in the second

century BC to 25 million in the first century BC (Scheidel, 2017). The influx of goods and services facilitated this increase after the defeat of Carthage and Corinth (Duncan, 2017). For example, close to a third of the senatorial class augmented their fortunes, thanks to military campaigns (Scheidel, 2017). Rather than decreasing in subsequent decades, the wealth of the aristocracy grew to 200 million *sestertii* between 60 and 50 BC (Scheidel, 2017).

This level of prosperity, however, encountered a point of inflection. Current estimates suggest that external threats decreased the amount of wealth, forcing the Senate to either sell or melt valuable goods (Turchin & Nefedov, 2009). Even though military campaigns in the Late Republic initially represented opportunities for looting and raiding, the expenses required to sustain such confrontations in some circumstances exceeded the gains collected (Duncan, 2017). Hence, in contrast to the plunder acquired during conflicts, such as the war against Macedon (providing 120,000,000 *sestertii*; De Nardis, 2015a), confrontations against invading tribal groups, such as the Cimbri, did not fill the Republic's coffers (Duncan, 2017). Territorial reorganization, the implementation of new tax laws, as well as collecting tribute assuaged these financial shortfalls (Duncan, 2017). It was in this economic context that modifying the quality of the coins became a common alternative for supplementing the budget (Turchin & Nefedov, 2009). Metallurgical analysis suggests that during the Late Republic, senators and consuls implemented coin debasement as a tactic to counterbalance financial distress.[7] Debasing the currency was thought to both decrease the public debt and permit the continuation of expensive military campaigns (Turchin & Nefedov, 2009). Even though currency debasement temporarily balanced the state's finances, the reduction of metal content eventually increased inflation.

Resource competition (wealth accumulation and skewed distribution) was among the core causes of the various civil wars. Two factions dominated the political theater between 80 BC and 30 BC: the *Optimates*, interested in the preservation of the political and economic platform of the *patrician* aristocracy, and the *Populares*, agitating for improvement in the condition of the *plebian* lower classes by proposing wealth redistribution schemes, such as agricultural reforms based on land expropriation (Duplá, 2011). Although

clashes between *Optimates* and *Populares* were initiated as heated senatorial debates, conflict escalation frequently led to expulsions, executions, and even assassinations (Scheidel, 2017). Between 90 and 80 BC, 291 senators died violently (Scheidel, 2017). The violent elimination of political competitors allowed senators to seize the wealth of other magistrates, further increasing the economic inequality and exacerbating the underlying competition among social classes (Scheidel, 2017). The imperial system emerged from chronic economic and political discontent, as well as the exacerbation of past grievances, which escalated to a series of internal wars during the Late Republic, including the (1) Social Wars, (2) Sullan Wars, (3) Servile Wars, (4) Caesar's Civil War, (5) Liberators' Civil Wars, and (6) the final civil war that ended the Roman Republic (Duncan, 2017).

To this day, the causes behind the end of the Republic remain open to discussion. Barton (2001), for example, argued that the last century of the Roman Republic witnessed the abandonment of codes of honor along with symbols, rituals, and gestures associated with these ultrasocial cultural institutions. Furthermore, traditions proscribing certain forms of intragroup competition became ignored or actively modified (Barton, 2001). The elimination of regulations promoting within-group cooperation enabled the rise of political upstarts who would continue to dismantle the remaining sociopolitical safeguards against the emergence of autocrats. Golden (2013) reached a similar conclusion. The author argued that the modification of institutions and roles associated with crisis management paved the way for the eventual end of the Republican organization. During the Early and Middle Republic, the State had at its disposal a series of institutional measures destined to preserve Rome's safety. When armed forces threatened the security of the State, the senate could declare a *tumultus*, or a *senatus consultum ultimum*, and thereby suspend some civil liberties. According to Golden, Roman politics in the Early Republic specified that executive leaders should be granted temporary dictatorial powers to address the urgency of the threat. As Rome expanded outside of Italy, however, the flexibility of the Roman political system phased out the office of the dictator to manage crises occurring abroad (Golden, 2013). Instead, the Roman Senate became the main governmental body responsible for addressing an emergency. This institutional reorganization allowed the Roman Republic to outlast the

Second Punic War. As per Golden, Rome reached a political impasse due to the growing social discontent between commoners and the aristocracy after the Punic Wars. This rivalry led some senators to employ crisis response institutions against political rivals, setting a precedent for future autocrats to follow.

Even though the Roman State exhibited sociopolitical stratification before the ignition of the crisis of the Late Republic, the presence of ancestral ultrasocial traditions decreased the likelihood of minor disagreements escalating into lethal outcomes (Barton, 2001). Concerning the association between territorial expansion and increased intragroup competition, Barton pondered that

> When, as a result of the imperial expansion of Rome, the spiritual walls around the city were irreparably breached, *urbanitas,* originally the ways and manners peculiar to those who lived within the walls of the city of Rome, took on the connotation of our modern "urbanity" or "cosmopolitanism." The citizen of Rome became a citizen of the world. And because, for the cosmopolite, limits, like definitions, had to be chosen, morality and adhesion to particular traditions and limits required a prodigious act of will. Preserving a sense of being, of identity, thus became a continuous—and ultimately exhausting—assault on the will. As a result, the enervating power of unrelieved good fortune became as common a theme in Roman literature as the annealing power of adversity. (p. 95)

Barton's argument gravitates around the impact of cultural heterogeneity eroding the persistence of Roman cultural variants, including those associated with intragroup cooperation. Hence, Roman settlements located close to the State's borders should have exhibited higher levels of within-group competition due to their exposure to cultural variants developed by outside groups. Although theoretically plausible, it is worth remembering that mathematical models suggest cultural group differences are more pronounced closer to ethnolinguistic boundaries (McElreath, Boyd, & Richerson, 2003). Similarly, subsequent models have also demonstrated that intragroup cooperation tends to decline closer to the center of the polity (Turchin, 2003). Hence, future studies are required to determine how Roman morality, and consequently intragroup cooperation, varied depending on its territorial expansion and its proximity to other cultures.

4 Intergroup and Intragroup Competition During the Principate and the Dominate

Military campaigns after the collapse of the Roman Republic allowed the Principate to reach its maximum geographical extension, such as at the time of the Marcomanni Campaigns or the Britannic Wars of Consolidation (Potter, 2014). This territorial growth generated a period of prosperity and peace,[8] as evidenced in the declining frequency and lethality of external wars (Rankov, 2015; Whatley, 2015). Imperial campaigns became asymmetrical confrontations wherein Roman legions frequently fought against tribal societies (Levick, 2002). Rather than encountering well-organized enemies during the Principate, the imperial army faced ambushes, raids, and other forms of guerilla tactics with higher frequency (Thorne, 2015a, 2015b). During the Dominate and the Late Empire, external wars continued to transpire. Despite noticeable political differences between the late republican and imperial structures, the Empire remained vulnerable to the occurrence of military clashes among generals by inheriting the military practices of the Late Republic. While earlier Republican morality enjoined the armies to protect the abstract notion of a unified state, the legions' allegiance during the Principate and the Dominate lay personally with their commanders.[9] (Drinkwater & Lee, 2015). Under these conditions, military capacity had considerable political repercussions[10] (Campbell, 2015). Hence, victories bolstered the political stance of the ruler, whereas military defeats could lead to the questioning of their commanding competency (Drinkwater & Lee, 2015).

The Roman State required a constant influx of wealth to continue with its military campaigns. The fiscal and monetary crises ensuing by the end of the Late Republic-Early Principate forced Emperor Augustus to implement radical institutional reforms to restore the Roman State to its former levels of political, social, and economic stability. Military expenditures, however, remained a lingering issue during the rest of Principate, with military campaigns consuming a sizeable portion of the state's budget

(Turchin & Nefedov, 2009). Some estimates suggest that military expenditures required over 500 million *sestertii* every year during the first century AD (De Nardis, 2015b). Private fortune accumulation, however, continued to grow during the Empire. Current reconstructions suggest that the wealth of the aristocracy in the Principate and the Late Empire ranged between 300 and 400 million *sestertii*, 80 times higher than the elites' wealth of the late second century BC (Scheidel, 2017). Augustus, for example, received over 1.4 billion *sestertii* from other aristocrats during his reign as *Princeps* (Scheidel, 2017). In response to the State's debt, Nero debased the denarius from 3.72 grams of silver to 3.14 (Turchin & Nefedov, 2009). Nero's[11] decision would set a precedent for future emperors who would devalue the currency repeatedly, considering this practice as an alternative to selling the palace's treasury (Turchin & Nefedov, 2009). During Commodus's reign,[12] the silver content per coin declined rapidly. The Severan dynasty temporarily halted this financial disaster (Turchin & Nefedov, 2009). However, climatic, political, and social instability during the third century once again generated a financial crisis that would plunge the Empire into a series of civil wars[13] (Harper, 2017).

Akin to the fate of the *denarius*, other currencies experienced similar devaluations. For example, the *sestertius* was frequently melted down and combined with other metals (Harper, 2017). Although the *antoninianus* was introduced to dampen the monetary crisis, this currency was also debased by becoming an alloy coin (Harper, 2017). Emperor Aurelian tried to contain the economic freefall; however, despite his efforts, inflation continued to escalate during his reign (Harper, 2017). Diocletian[14] also attempted to decrease financial stress by replacing the *denarius* with the *argenteus* (Burgess, 2015). By the turn of the fifth century, the devaluation of silver and bronze finally led to a complete halt in production (Burgess, 2015). During this time, inflation not only increased the cost of everyday goods, such as wheat (Harper, 2017), but also increased the price of gold (Burgess, 2015). In five centuries, the value of a pound of gold rose from 1500 *denarii* in 46 BC to 5184 billion in AD 400 (Burgess, 2015). Although there is no consensus concerning the association between wealth accumulation, currency debasement, and inequality,

trend examinations across 9000 years of European history indicate that one of the highest peaks in inequality occurred between AD 125 and 425 in Rome (Scheidel, 2017).[15] These dire socioeconomic conditions became the catalysts for lethal internal strife, ranging from minor revolts and rebellions limited to a specific province, to full-fledged civil wars involving multiple regions.

In contrast to the Principate, civil wars during the Dominate and the Late Empire became considerably bloodier relative to external wars (except for the battle of Adrianople in AD 378; Whatley, 2015). These internal conflicts, in turn, decreased the ability of the Empire to defend its borders, and this led to chronic confrontations with tribes such as the Alamanni and the Goths (Stickler, 2007). In this state of political despair, the Empire opted for the recruitment of *foederati*, which temporarily decreased the frequency of conflict (Stickler, 2007). Unfortunately, the recurrent invasions of Vandals, Alans, and Huns overwhelmed these defenses, and this led to the abandonment of the Western Roman Empire's borders and facilitated its fall in AD 476 (Duncan, 2017). The military history of the Roman State depended on its treasury, with successful campaigns returning on its investment and defeats draining its coffers. Consequently, to sustain its expansion and defense of its borders, the Roman State opted for various economic practices, some of which would eventually lead to significant internal crises.

5 Empirical Examination: Methods

The present study examined the association between economic distress and cohesion in the Roman State. Biographical data of 190 *Roman Chief Executives* (RCEs) were collected from various historical sources, including (1) Broughton's *The Magistrates of the Roman Republic* volumes I (Broughton, 1951) and II (Broughton, 1952), (2) Livy's collection on *The History of Rome* (1982, 2006), (3) *The Roman Antiquities* (Cary, 1937), (4) Potter's *Emperors of Rome* (2014), (5) Matyszak's *Chronicle of the Roman Republic* (2008), (6) Scarre's *Chronicle of Roman Emperors* (1995), (7) *The Encyclopedia Britannica*, and (8) the *De Imperatoribus Romanis* online website. Some of the measures extracted from these

sources included the RCE's age at the start of rule, the time of government, the age of death, and the cause of death. Mortality rates per 100,000 ruler-years were also estimated (ruler-years were used instead of person-years due to our interest in the risk period associated with their time of rule, rather than their overall lifetime). Following Eisner's publication on European regicide (Eisner, 2011), causes of death were classified as *suicide*, *accident*, *warfare*, *assassination*, *execution*, or *natural*. Killings were further classified based on the degree of doubt or certainty, which was determined based on the level of consistency across literary reports (Eisner, 2011). As the Republican political system differed from the dynastic rule observed in imperial times, the time for which each senator occupied the office of consul was used instead for Republican magistrates.

Data on two indicators of physical ecology, *solar irradiance*, and *precipitation* were collected from Steinhilber, Beer, and Fröhlich (2009) and Büntgen et al. (2011). According to Steinhilber et al. (2009), estimation of solar irradiance is based on cosmogenic radionuclide ^{10}Be extracted from ice cores. Büntgen et al. (2011) estimated the level of precipitation according to the tree-ring samples collected from Germanic locations. This measure has been found to predict social unrest and the assassinations of Roman emperors (Christian & Elbourne, 2018). Data from 504 external and civil war battles were counted.[16] The average weight (in grams) of silver and bronze coins per decade was collected from the *Coinage of the Roman Republic Online* (American Numismatic Society & The British Museum, 2018) and the *Online Coins of the Roman Empire* databases (American Numismatic Society & The Institute for the Study of the Ancient World, 2018). The frequency of battles in external and civil wars was computed based on the information provided by Don Taylor's compendiums on battles in the Roman Republic (Taylor, 2017) and Empire (Taylor, 2016).

Information on coin hoard frequency was gathered from the Coin Hoards of the Roman Republic (Lockyear, 2018) and the Coin Hoards of the Roman Empire (Thyssen-Bornemisza, 2018) databases. It is relevant to provide an additional explanation regarding the scientific relevance of coin hoards for examining economic fluctuations. According to Crawford, different from other forms of monetary collection, such as

depositing coins in an *arcas*, or an *armariums* (Crawford, 1969), coin hoards reflect social circumstances in which the hoarder was forced, due to dangerous sociopolitical conditions, to hide his wealth in hopes of retrieving it sometime in the future (Crawford, 1974). For Crawford (1969), the presence of external and internal wars encouraged people to use caches, hoping others would not loot their wealth. In his examination of coin hoards from Italy, Corsica, Sardinia, and Sicily dating from 218 to 03 BC, he found the frequency of hoards increased during the Second Punic War, the Social War, Caesar's Civil War, and the Final War of the Republic[17] (Crawford, 1969). In contrast to these results, previous publications had found coin hoarding increased in the absence of any particular social disturbance (Aitchison, 1988). If this is indeed the case, coin hoards should not be used as the sole indicator of sociopolitical instability but in conjunction with other variables reflecting these crises. Coin hoards had also been interpreted as a proxy for monetary savings (Aitchison, 1988). Due to the fact hoarders are assumed to cache goods based on the value of the items at the time of their burial (Reece, 1988), the frequency of caches may also be considered as a metric of wealth accumulation (see Martin, 1995, for another perspective concerning the difficulties of reconstructing the monetary value associated with each hoard).

6 Empirical Examination: Analyses

Parametric examinations require the data to be statistically independent. This assumption, however, is not met when examining temporal patterns. The presence of serial autocorrelations in the data increases the likelihood of incurring Type I errors when exploring the covariation between two variables. Statistical methods, such as linear and nonlinear time series analyses, provide an alternative by circumventing these issues. In the current chapter, however, multiple linear mixed models with random intercepts, based on maximum likelihood estimation and specifying a residual covariance matrix of single-lagged heterogeneous serially autoregressive effects (*ARH1*), were computed with the decade as a predictor. This procedure extracted residualized values, after controlling for temporal and

autoregressive effects, for the various indicators used in subsequent analyses for this chapter. The current study employed unit-weighted factor scoring to examine the underlying factorial structure of three factors evidencing: (1) intragroup competition; (2) intergroup competition; and (3) economic distress. The *intragroup competition factor* contained the standardized rate of RCEs killed in civil war battles per 100,000 ruler-years per decade, the standardized rate of RCEs assassinated per 100,000 ruler-years per decade, and the standardized number of civil war battles per decade. The *intergroup competition factor* included the standardized rate of RCEs killed in external battles per 100,000 ruler-years per decade and the standardized number of external battles fought per decade. Similarly, a higher-order factor containing the standardized intragroup competition factor scores (reverse scored) and the standardized intergroup competition factor scores was also estimated to explore the overall level of the State cohesion. In terms of the economic variables, a lower-order factor was calculated based on the standardized values of the weight loss of silver and bronze coinage per decade, relative to their baseline weight in 220 BC (the oldest coins in the dataset). In turn, the standardized values of this metallurgic factor, along with the standardized frequency of coin hoards per decade, served to compute a general *economic distress factor.*

7 Empirical Examination: Results

As explained above, all the following results are based on standardized MLM residuals adjusted for both the effects of time and serial autocorrelations among the successive decadal observations. The main measurement model is shown in Fig. 10.1. The *intra*state conflict factor loaded onto the frequency of civil wars per decade, the rate of RCEs civil war battle deaths per 100,000 years in office per decade, and the rate of RCEs assassinations per 100,000 years in office per decade. The *inter*state conflict factor loaded onto the frequency of external battles per decade and onto the rate of RCEs' external battle deaths in external warfare. This latent variable, in turn, loaded negatively onto the intrastate conflict factor and positively onto the intergroup conflict factor.

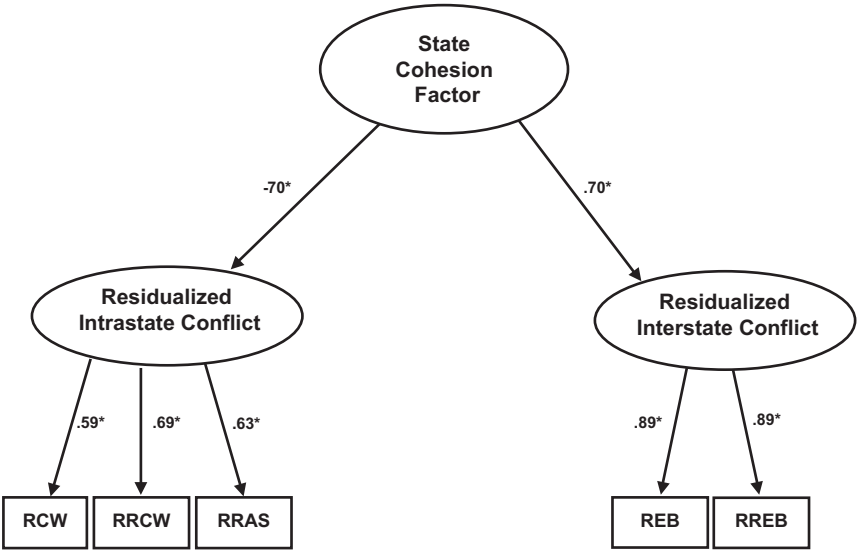

Fig. 10.1 The latent hierarchical structure of the general State cohesion factor (REB, residualized frequency of external battles per decade; RREB, residualized rate of RCEs' deaths in external battles per 100,000 ruler-years per decade; RCW, residualized frequency of civil war battles per decade; RRCW, residualized rate of RCEs' deaths in civil war battles per 100,000 ruler-years per decade; RRAS, residualized rate of RCEs' assassinations per 100,000 ruler-years per decade). (* $p < 0.05$)

An additional examination determined that the relative loss of coinage metal quantity had a positive correlation with the frequency of coin hoards per decade ($r = .315$, $p = .001$). A single economic distress factor thus loaded onto the coinage weight loss and the coin hoard indicators ($r = .811$, $p = .001$). As expected, this economic distress factor then negatively predicted the State cohesion factor ($r = -.256$, $p = .029$). In an alternative analysis, we also considered the ratio between the levels of intergroup and intragroup conflict in place of the additive estimate for the State cohesion factor. The economic distress factor, however, did not significantly predict this conflict ratio ($r = .068$, $p = 568$). Given that the Mediterranean location and Roman Climate Optimum were considerably important to the growth and productivity of the Roman State, we also decided to explore the possible confounding influence of climatic factors on State cohesion. A hierarchical general linear model examined

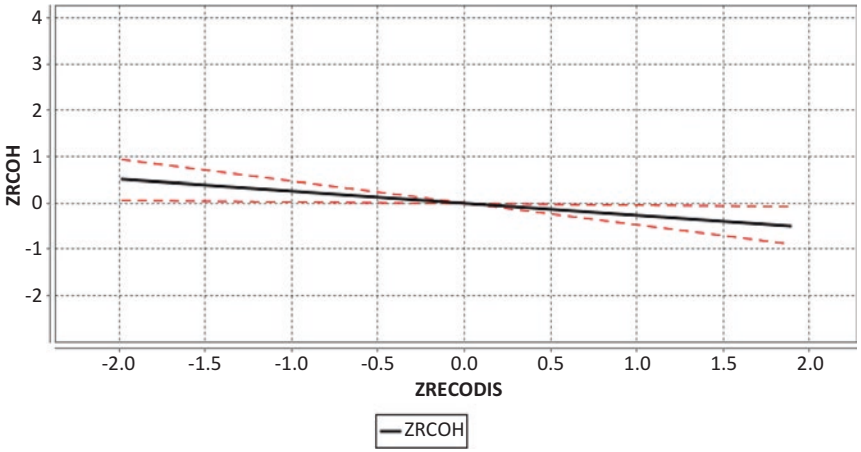

Fig. 10.2 Time-adjusted MLM-standardized residuals of State cohesion (Z-RCOH) predicted by time-adjusted MLM-standardized residuals of economic distress (Z-RECODIS), after accounting for the physical ecology factor

the effect a common factor of physical ecology,[18] the economic distress factor, and the interaction the two predictors had on the general State cohesion factor. The overall model accounted for 33% of the variance. The economic distress factor negatively predicted the level of State cohesion ($r = -.260$, $p = .02$; see Fig. 10.2) above and beyond the effects of physical ecology ($r = .080$, $p = .50$). The interaction between economic distress and physical ecology did not predict the State cohesion factor ($r = .140$, $p = .22$). These analyses demonstrated that the influence of economic distress on the integrity of the Roman State was not affected by climate.

8 Conclusions

The looming threat of external wars promoted the evolution of political and social institutions in Rome favoring large-scale endeavors, such as the defense of the State's territorial integrity (Turchin, 2007). The establishment of coalitions and alliances with other Italian city-states allowed

Rome and its allies to concentrate on defending against the frequent invasions of Celtic tribes (Duncan, 2017; Turchin, 2007). Moreover, even after experiencing repeated defeats during the Second Punic War, Rome's political and military organization allowed it to defeat Carthage and its allies in the long run. While the loss of competing polities brought considerable wealth to the Roman State (in the form of enslaved captives, tribute, and loot), it also eliminated any external pressures promoting intragroup cooperation. The Roman Republic transitioned from experiencing considerable levels of macroeconomic prosperity to facing financial distress and suffering from lethal internal clashes, which in turn led to the emergence of the Principate with Augustus. The history of the Roman Principate echoes the fate of the Roman Republic, wherein a period of territorial expansion, eliminating major external threats, is followed by an increase in magnicides, revolts, and civil wars. The numismatic, biographic, and military information collected for this chapter supports the hypothesized association between Rome's economic distress and its decline in State sociopolitical integrity.

Notes

1. The expression *State cohesion* herein refers to the integration of Stratum III, defined as per Chap. 7, as opposed to Stratum II regional polities that might have retained internal unity during civil wars and rebellions.
2. Concerning the solar output, Harper and McCormick (2018) presented descriptive data showing lows of below 1365 watts/per square meter, bracketing the Empire's rise and fall, with the Roman Climate Optimum enjoying relatively higher and less variable insolation.
3. According to Harper and McCormick (2018), circa AD 250 brought "a phase of instability and general cooling that lasts until the Medieval Climate Anomaly."
4. Including Rome's regal period, the expulsion of the last Tarquin king and the foundation of the Republic.
5. Albeit wars of conquest under the Middle Republic were detained by foreign invasions such as that of the Pyrrhic and the Punic Wars (Keppie, 2002), after the resolution of these conflicts, Roman borders extend beyond the Italian peninsula (Beard, 2015).

6. In the Late Republic, Carthage's defeat and the annexation of Corinth also saw the transformation of military campaigns from affairs circumscribed to the season cycle to prolonged endeavors lasting for years (Duncan, 2017). In later years, institutional changes, such as Marius' reforms, allowed the Roman State not only to defend its territorial integrity but also to wage wars at any point in time (Duncan, 2017).
7. For example, between 48 BC and 28 BC, Caesar and Mark Anthony, after him, debased the denarius to 92% of its original silver content (Turchin & Nefedov, 2009).
8. Except for the Parthian and Sasanian Wars (Farrokh, 2007).
9. Although the office of the princeps relied on the senate's legitimation (Hekster, 2015), most of the emperor's legitimacy came from the support of the army (Ando, 2007; Drinkwater & Lee, 2015).
10. For example, in the late imperial period, the imperial authority was mainly contested by imperial officers who grew in military might due to their defense of the borders but also by establishing patronage relationships with local *foederati* (Liebeschuetz, 2007).
11. Initially, the political reorganization of the Principate saw a decline in major internal conflicts, such as civil wars, though provincial revolts remained a pervasive nuisance (Cosme, 2015). This tranquility was eventually interrupted by intense domestic crises. The first one occurred after Nero's suicide, with the empire falling into its first major civil war in AD 68, since the Final War of the Roman Republic (Turchin & Nefedov, 2009). Following this period of instability, the ascension of the Nerva-Antonine Dynasty saw a period of political and social growth (Turchin & Nefedov, 2009).
12. After Commodus' murder in AD 192, once again, a period of political unrest between AD 193 and 197 ensued, leading to a civil war between Clodius Albinus, Septimius Severus, and Pescennius Niger (Cosme, 2015).
13. Interestingly, the frequency of assassinations occurring during this period decreased the regularity and intensity of civil wars, with rulers being killed before armies could face in battle (Drinkwater & Lee, 2015).
14. Even though the reign of figures such as Diocletian increased the level of political security, civil wars during the Dominate, such as the wars of the Tetrarchy, as well as those in the Late Empire, remained recurrent affairs (Drinkwater & Lee, 2015).

15. Although further analyses are required to determine the effect of inequality upon social disturbances in Antiquity, robust evidence across contemporary nation-states had found inequality indicators. The Gini coefficient, for example, is correlated with metrics of internal social upheaval, such as homicide rates (Daly, Wilson, & Vasdev, 2001; Figueredo et al., 2017; Peñaherrera-Aguirre et al., 2019). Hence, across societies, income, and wealth inequality covary with lethal competition within social organizations (Daly, 2017).
16. We would like to thank Maya Louise Bose, Garrett Dien, and Jonathan Revel for their help in collecting these data.
17. More recently, Turchin and Nefedov (2009) further examined Crawford's data and its correspondence with an instability index (based on the occurrence of rebellions, magnicides, civil wars, and wars with other nation-states and tribes), indicating an overlap between the frequency of hoards found on each decade and the degree of social disruption. Even though the association between coin hoarding and this index is noticeable during the Republic, it is less clear for the Principate. Turchin and Nefedov (2009) found an overlap between the frequency of coin hoards in Britain and Alexandria and the instability observed in the second half of the third century AD. This general trend, however, indicated considerable variation depending on where the hoards were found, suggesting local crises could also impact the frequency of hoarding. Although suggestive, the authors recognized this association might be confounded by the level of monetization of the economy, as well as how long the hoard was buried, with older caches having a higher risk of being found and looted (Turchin & Nefedov, 2009).
18. This factor loaded onto the average precipitation per decade and the average solar irradiance per decade ($r = 0.645$, $p = 0.0001$).

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