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Rome as a Hegemon: A Portrayal and Database of Its Power Projection over Seven Hundred Years

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We wished to validate a very general agent-based model we had built concerning the rise of hegemony in different domains of international relations (<https://doi.org/10.1155/2018/9306128>). Our model focussed on the new domain of cyberspace, where the data are thin and the time series short. But with parameter changes it also spoke to the land, sea, air and space domains. So we sought validation in a time series from the land domain where the data are richer and the time series longer. We wished to compare the model's results—the emergence, power accumulation, and behavior of hegemony vis-à-vis the power accumulation and behavior of the remainder of the international order—to empirically observed historical hegemonic behavior. To this end, we built an exhaustive and novel database of the Roman Empire's accumulation and application of power—represented by the proxy of military power in terms of force size and deployment—over the seven centuries of Rome's undoubted hegemony. This historical record comfortably validates the main results of the model.

Introduction

The advent of each new domain in international relations—land leading to sea, then air, then space—has been defined by the contestation of status-quo power relations of the previous domain. However, the newest domain of cyberspace heralds unprecedented dynamism, because its novelty, structure and characteristics free states to a large degree from historical path-dependencies, geography, and entrenched power relations.

We are seeking to understand how states will behave in this new power-diffuse frontier of international relations (Nye 2011), with a particular focus on the prospects of hegemony in cyberspace. To this end, with our colleague Nathan Ryan, we built a simple agent-based simulation model of states interacting through competition and cooperation (Brizhinev et al. 2018). This model's approach to

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measuring and conceptualizing state behavior seeks to engage in the sort of analysis that international relations theories typically avoid.

The model generates different classes of dynamics for different classes of power diffusion, emulating each of the different domains within the one overarching model universe. We modelled power diffusion as a relationship between a state's wealth and its power.

In a world of low power diffusion, power grows rapidly with wealth so that wealthy states can project disproportionately large amounts of power compared to their poorer neighbors. In this world, a hegemon invariably emerges. In the real world, we would find examples such as the USA in the post-Cold War unipolar "moment," and in technologically advanced wealthy states in historical times such as the Venetian, Roman, and Chinese empires.

In a world of moderate power diffusion, power grows rapidly with wealth initially, but beyond a moderate level of wealth, power increases only marginally with further increases in wealth. In this world, real hegemons rarely emerge. Instead, a small group of states contest the high ground, with no state maintaining its supremacy for a long period. In the real world, we would find examples in groups of states that have achieved a technology edge over other states but not over each other: NATO and the Warsaw Pact during the Cold War, or the Spanish, English, French, and Dutch naval rivalries during the Early Modern period.

In a world of high power diffusion—Nye's (2011) power-diffuse world—power is easier to acquire by a state and then becomes harder to grow as wealth grows. Thus, poor states can project much more power than they can in any other world, and wealthy states do not gain a large power advantage just because they are wealthy. All states struggle for dominance, indeed for survival, in this world, with no state maintaining its dominance over the long term. In the real world we would see examples in cyberspace, where poorer states punch above their weight. North Korea and Iran are top-tier cyber powers and use their power in often successful asymmetric warfare against traditional great powers such as the USA.

Thus, the model allows different dynamics to emerge in different neighborhoods of the model universe, but all are representations of a common set of processes.

Because the model provides a unifying framework for all these behaviors, we sought to validate it with historical data. And we argue that the best neighborhood in which to see historical examples is the world of low power diffusion. This is because the emergence of hegemons is a clear-cut phenomenon. And in particular, it is also because we may observe long time series of a hegemon's reign. This allows us to "wash out" the local phenomena (such as the particular local advantages for the initial rise) and focus on the long-term process.

To help validate the model, we sought an historical analogue with which to compare our model results to help build our confidence in the generality of the model and its ability to capture dynamics in different power-diffusion settings. Sea, air, space and, especially, cyberspace are domains with only relatively short historical time series to compare with our models. In such short series, local perturbations could mask any long-term dynamics.

But the land domain, as the oldest domain of international relations, offers some possibilities for usefully long historical time series. So we sought a discrete geographical region where, over a long period of time, a set of powers competed and cooperated mainly on land, and where they left a good historical record of their wealth and/or power over time.

As described below, we chose the Roman Empire as our historical analogue to compare our model results against.

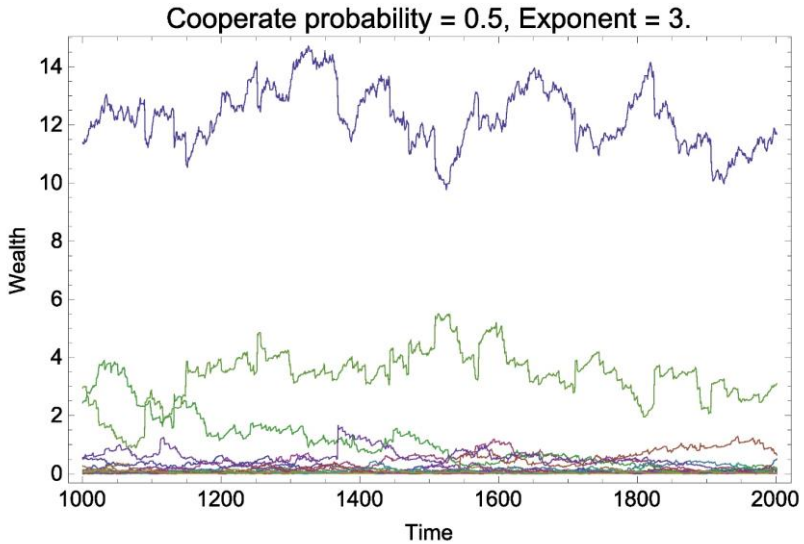


Figure 1. The emergence and longevity of a hegemon when power diffusion is low. The x axis is model time-steps, and the y axis is model wealth. There are 20 states in the model universe competing and cooperating, each represented by a colored line. After model initiation as equals and a period of “settling down,” one state rises to hegemonic status and suppresses the others despite periodic challenges. (After Figure 9(a) of Brizhinev et al. [2018]).

Our Model's Low Power-Diffusion World

Over time, in the low power-diffusion neighborhood of the model universe, the states in this domain rise and fall in power and wealth, but throughout these fluctuations a distinctive international order prevails. The key feature of this international order is the emergence of a single hegemon. The hegemon that emerges not only has unrivalled wealth and power, it also has significant longevity compared to any other state. Furthermore, it depresses the wealth and power of all rivals, who are generally shorter-lived.

In Figure 1 we show the modelled emergence and longevity of a single hegemon in a universe of 20 states when power diffusion (Nye 2011)—the ability to convert wealth into power—is low, as is the case for the land domain. The snapshot we show is from the “mature” phase of a model run (from time-steps 1000 to 2000). The 20 states all begin life equally, but then local variation invariably leads to one state rising to become a long-lived hegemon and suppressing the others. Such hegemon eventually succumb to a challenger, and are replaced, but the overall structure of the international order is maintained.

Rome: Our Test Case

The test case we chose was the (western) Roman Empire. Rome's predominance as a hegemon was one of the longest in history, providing us a long time series to relate to our model. We define this period as 304 BCE—when Rome gained control over central Italy following the Second Samnite War—to 410 CE, when the Visigoths sacked Rome. Rome—despite periods of civil war and the Third Century Crisis—retained unbroken dominance throughout its seven centuries as a hegemon. Furthermore, the Roman Empire was defined not only by its initial vast territorial expansion, but then by its subsequent efforts to co-opt, coerce, and integrate far-flung and diverse geographic and ethnic regions.

A further reason for our choice of Rome is that the regulated, uniform and well-documented nature of the empire, from its center out to its most remote regions, makes it possible to paint a picture of Rome's power for the majority of its existence as a hegemon. The healthy number of primary sources and the abundance of secondary literature provide a vast number of fragments that, if pieced together, enable Rome's power to be quantified to an acceptable and useful level of accuracy.

Rome's adversaries did not leave a comparable documented account of their own wealth or power through time—history is ever written by the victors. But we do have Roman accounts of the power Rome projected against each of them at any particular time.

Thus, by making a simplifying assumption that Rome, as a rational actor, would mostly project sufficient power to subdue an adversary—although sometimes losing as well as mostly winning—we argue that the amount of power projected by Rome against an adversary in a battle, campaign, or front is a fair proxy for the amount of power of the adversary at that time.

These two ideas—that the power of Rome over time could be extracted from the historical record, and that the power of its adversaries over time could be measured by Roman proxy—led to the creation of this database.

With these ideas, we reviewed the literature to build our database (see Supplemental Table S1).

Building the Database

The key challenge for finding a unit that we could use for the *power* variable of our dataset was finding a unit that could be applied consistently across a large portion of Rome's existence as a hegemon. In the study of hegemonic formation and operation—particularly regarding the self-strengthening actions of a state in order to increase state capacity to the extent necessary to pursue domination—three elements are largely responsible: “higher economic capabilities, increased military strengths, and cleverer strategies” (Hui 2005: 225). The latter of these elements is clearly nigh on impossible to quantify or model, therefore rendering it inefficient for the purposes of this study. Regarding the first element, while economic histories of Rome do exist, the variables they delineate often apply to limited time spans of Rome's history due to fragmentary and limited evidence. Conversely, there are ample sources specifying the size of Rome's army throughout the duration of the empire. Furthermore, the machine of the Roman army was a colossal economic beast in its own right—the financial resources required to sustain it were immense. We assert that the size of the army is a valid first-order proxy for Roman power.

Thus, we chart Rome's power by measuring the total number of men the Roman military had at its disposal across the empire at any point in time, acknowledging that other, likely lesser factors were also involved. We measure an adversary's power as the deployment, or use, of Roman military personnel against them at some point in time. There are two categories of deployed power in our dataset. First is the size of the force used against a specific adversary, for instance Carthage, at specific battles or campaigns. Second is the size of the forces stationed across the various fronts—for instance the Eastern Front, Gallic Front and so on—into which the adversaries are grouped. The use of fronts as a unit of measurement—a concept inspired by Luttwak's (2016) work on Roman grand strategy—enables us to construct a quasi-international order comparable to that of our model.

Admittedly, the adversaries grouped together in these fronts are diverse—the Northern Front, for instance, canvasses numerous German and Gothic tribes. However, the fronts represent individual or unique spheres of strategic focus for Rome. By grouping each adversary into their corresponding geographical front—think of them as strategic theatres—we were able to establish a somewhat cohesive method of organization for Rome’s interaction with the international order. This is because the method of front-grouping enables a level of continuity in portraying this interaction. Due to the transient existences of Rome’s adversaries—with tribes subsuming tribes and dynasties begetting dynasties—if we were solely to list each adversary individually, the picture portrayed would be that of a chaotic multitude of fragmented and sporadic engagements with no coherent logic. Rome’s focus was typically gaining and maintaining control of certain geographical regions, or theatres. Its interaction with the international order is therefore best portrayed by capturing these strategic challenges in the data. This can be achieved by combining the multitude of engagements against adversaries into the corresponding front. Additionally, our temporal demarcation of the size of the forces stationed across the various fronts is a further, more illustrative, method of portraying these strategic challenges and interactions.

By recording the number of troops Rome needed to deploy against these adversaries, and by tallying this against how the campaign unfolded—the ease of Rome’s win, the severity of Rome’s loss, and the duration of the campaign—we are able to provide an indication of how strong the adversaries were. Recording the size of the front force works to a similar end, except that it is the strength of the challenge posed by a certain theatre that is instead delineated.

Interpretations in Creating the Database

There were numerous battles that occurred throughout the period analyzed here for which there are no sources to indicate the size of the force deployed. Occasionally, we have been able to come up with figures in instances like these by extrapolating from data in existence for contemporaneous force deployments. However, in some instances there wasn’t even the opportunity to use such methods of extrapolation. Rather than making a spurious guess in such instances, we have left the force deployment as zero—leaving an inaccurate (but unavoidably so) representation of the reality of the time.

From the beginning of the dataset until 290 CE, the figures that stipulate the size of the various fronts include only the legions that were deployed there and not the peripheral military personnel—cohorts, *alae*, *numeri*, *cunei* and so on—that most likely accompanied them. This is because the vast majority of sources refer only to legions deployed to certain areas at certain times; they typically do not mention the accompanying units. Hence, for the sake of consistency, we are not

including these peripheral units in our later estimates. As such, while the absolute number in these front figures is smaller than it was in reality, in a relative sense they still provide an accurate picture of the fluctuations in Rome's application of power.

However, the front figures listed from 290 CE onwards include all types of units. One of the only sources available for this period is the *Notitia Dignitatum* (Seeck 2019), and this source listed all types of units deployed to all regions of the empire. Furthermore, as the Diocletianic reforms of 290 CE drastically reduced the size of a legion (Southern and Dixon 1996), this would make continuing to rely on the legion as the standard unit of power inaccurate. While this complicates direct comparisons in the dataset before and after 290 CE, it is unavoidable.

While the *Notitia Dignitatum* directly refers to a period of around 390–415 CE, most secondary sources assert that it is possible to backdate the figures outlined in the *Notitia* to the reign of Diocletian, starting in 290 CE (for instance, Jones 1986). We have followed this assertion in our dataset.

During the time of the Roman Republic until around 91 BCE, the number of legionaries (troops in a legion) in a Roman force was typically matched and accompanied by a comparable number of allied troops (Cornell 1995). Accordingly, if a source from that period outlined the number of legions used in a battle or campaign, it is a roughly accurate method to derive the overall size of the Roman force by doubling the number of legionaries. However, from 91 BCE onwards the ratio of allied troops Rome deployed alongside legionaries became flexible, changing frequently. Therefore, we are unable to use this doubling method from that point onwards. If sources in this post-91 BCE period only delineated the number of legions used in a battle or campaign, then we are unable to derive the number of auxiliaries that invariably accompanied the legionaries, and we can only measure the legionary troops. While this certainly provides an overall force size smaller than it would have been in reality, there is no alternative. However, the metrics provided are still accurate in a relative or comparative sense.

Related to the previous point, some sources in this post-91 BCE period provide the exact number of men in a Roman force deployed in a battle or campaign. As mentioned, other sources provide only the number of legions used. Accordingly, the metrics that have been derived from sources that display an exact number represent a complete picture of that force, whereas the metrics derived from sources that outline only the number of legions involved give an incomplete picture. Therefore, in a comparative sense, we have a somewhat inaccurate picture of the force sizes deployed in this period. Unfortunately, this too is unavoidable.

As mentioned, we delineate the power of an adversary by looking at the amount of power Rome had to deploy against the adversary to defeat it. There are two shortcomings of this method. First, it clearly falls down when Rome lost against the

adversary, as usually this meant that Rome deployed insufficient power. Second, this method is also frail when Rome defeated an adversary easily or by a large margin, as this usually meant that Rome deployed too much power. These methodological frailties mean that some of the metrics in the database must be interpreted with a degree of latitude. However, as the literature provides only sporadic or fragmented delineations of the sizes of adversary forces, we are left with no alternative but to employ this methodology due to its ability to be used consistently.

Structure of the Database

We have organized the database as a standard spreadsheet in Microsoft Excel. It is a flat database in the sense that it is simply a two-way array of dates by events, with each event split into a numerical value representing the size of the military force involved in the event, a literature reference, and any interpretive comments. The events are grouped by the particular strategic front involved (such as Italy, Gaul, Spain), and, if necessary, the fronts are further divided into particular campaigns (for example, Gaul is divided up into the Cisalpine Gaul and Transalpine Gaul campaigns).

The dates, as rows, range from 650 BCE to 419 CE. The fronts, as columns, are Italian, Gallic, African, Eastern, British, Hellenistic, Spanish, Central, and Northern.

In more detail, all numbers in the database refer to the number of soldiers (except the dates in the first column). In terms of power metrics, the database reflects three categories. First is total Roman power—i.e., the total size of Rome’s military. Second is the power of Rome’s adversaries, as amalgamated into unitary adversaries occupying strategic theatres using our unique construction (e.g., African Front). The power of these amalgamated adversaries can be found in columns. Third is the power of the specific adversaries that make up these amalgamated versions (e.g., Carthage). These specific adversaries can be found to the right of their corresponding amalgamated version (e.g., Carthage can be found next to the African Front). Both before and after specific engagements between Rome and an adversary, the size of the force applied against the adversary by Rome is zero. In reality, the Roman garrisons that existed in the regions of these adversaries (both before and after direct engagements between Rome and an adversary) were a form of directly applied force against specific adversaries. But the garrisons were also applied force against other adversaries in the various regions, so it is tenuous to try and delineate what amount of each garrison was applied vis-à-vis a specific adversary, and to what “intensity” the garrison was operating (say, open conflict representing 100%, but a tense peace representing 40%).

The sources from which we derived our data can be found in the *References* column to the right of columns that contain metrics. To the right of some *References*

columns there are *Comments* columns. Here we provide useful information that illustrates and contextualizes the data point—giving meaning to the data and helping to build a narrative for the database. If there is no reference outlined next to a metric, that is because we have had to derive the value ourselves, i.e., it is an original assertion. The method we use to derive a particular value is outlined in the corresponding *Comments* cell.

Preliminary Analysis of the Database

Figure 2 shows that from ca 600 BCE to 304 BCE—when Rome gained control over central Italy following the Second Samnite War—Rome had no overwhelming advantage over its adversaries. It was in no wise a hegemon. But after ca. 300 BCE, Roman power progressively eclipsed its adversaries'. There were setbacks and defeats, but after this date, Rome was clearly an expanding hegemon in its growing world.

Rome's longevity as a power of any consequence extended over far greater a period than its closest rivals. The seemingly large, sustained challengers of the later periods (see Figure 2) are more akin to coalitions as opposed to unitary actors. Figure 2 shows that, over the period of our analysis, Rome as the single hegemon successfully worked to depress notable or rapid increases in the power of unitary rivals throughout the period shown on the graph, until it collapsed suddenly in 410 CE when the city of Rome was sacked by the Visigoths.

Indeed, throughout the period of Roman hegemony, the only times that Rome had to deploy the entirety of its power in order to maintain its predominance were (see Figure 2):

- 225 BCE—Battle of Telamon against Cisalpine Gaul
- 91–88 BCE—Social War against the Italian tribes
- 297 CE—Diocletian's military reforms

There is one other wrinkle in this narrative of Rome's rise as a hegemon: the Crisis of the Third Century. In the period 235–84 CE (see Figure 2) all but the Spanish, African and Eastern Fronts "disappear" before reappearing again suddenly. In this period, Rome turned inwards on itself, with unceasing civil war between Roman factions and leaders competing for Roman leadership. This incessant internal conflict saw the frontiers of the empire collapse, as Roman troops were pre-occupied fighting each other. During this period, the only territory outside of Italy controlled by the central Roman authority was that of the African Front (Ferrill 1991). In lieu of maintaining frontier presence, Roman strategy was to deploy forces to meet invading adversaries only as the invasion arose (Ferrill 1991). This is seen in the deployments to the Eastern Front during this period, as the Persians were launching a steady stream of campaigns against Rome throughout the Crisis.

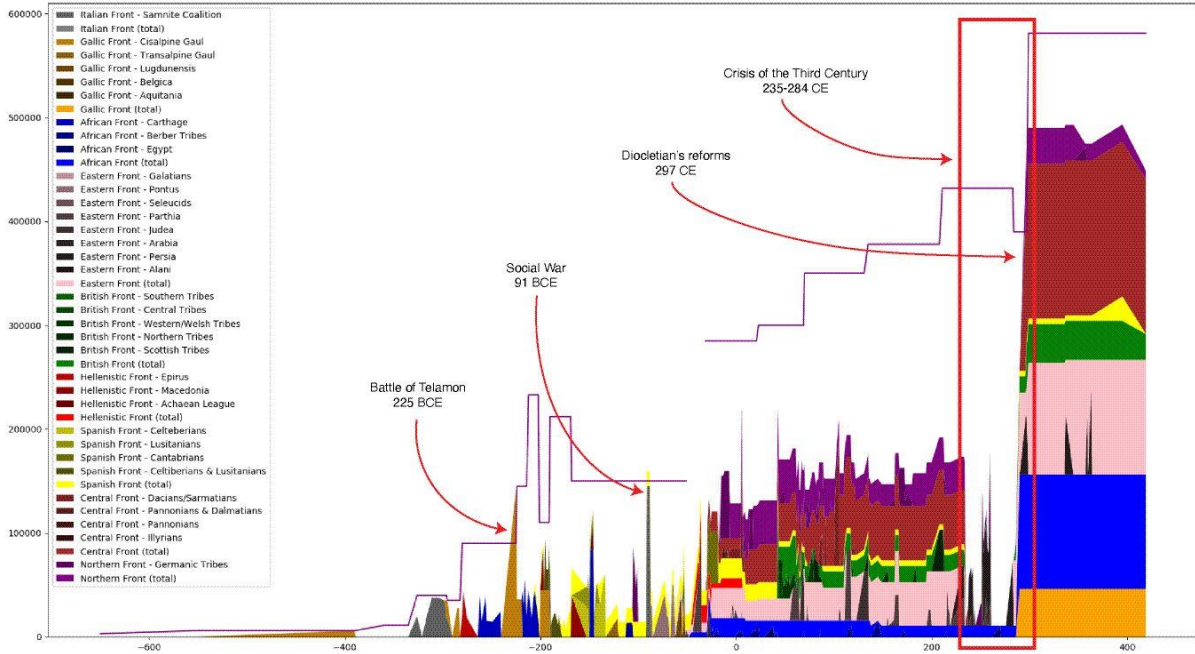


Figure 2: Total Roman power (the single colored line) and the power of the individual fronts and campaigns projected against it (the stacked, solid, colored bars) over the period ca. 600 BCE to 410 CE. The x axis is years from 600 BCE to 410 CE. The y axis is number of legionaries or equivalents as described above. The particular events marked in the figure are described in the main text.

These events can be seen as outliers to a general trend of Rome's total power (its total military size) and deployed power (the total amount deployed against adversaries) both tracking upwards at roughly equivalent rates. Put simply, Rome operated at a roughly constant portion of full capacity throughout the period before and after the Crisis. Before the Crisis it was around 50%, and afterwards it was around 80%.

Power of Rome's Adversaries

The advent of Rome's adversaries as a consistent presence clearly illustrates the demarcation between Republican and Imperial Rome. A few years either side of Rome's transition from the Republican to Imperial period (49–27 BCE), the number of fronts, and therefore adversaries, with which Rome established ongoing engagements rose from one to five (see Figure 2). The key strategic development between the two periods was the transition from projecting Roman power through isolated wars or campaigns to projecting power by maintaining a constant military frontier presence in the adversaries' locations.

The developments of the respective adversaries' power present an interesting counterpoint to the development of Roman power, as various tribes in contested territory amalgamated to form unitary adversaries, such as the Spanish Front or the Northern Front.

The sudden appearance of a collection of adversaries with constant and enduring power around 30 BCE should not be taken to represent the sudden "birth" of these adversaries and their power. Rather, this data reflects the transition from the Roman Republic to the Roman Empire. Here, Rome's approach changed from intermittent military campaigns to instead expanding and consolidating Roman territory by maintaining a baseline constant military presence across its ever-expanding frontiers, augmented occasionally with troop surges in times of campaigns.

The Spanish Front was overwhelmingly the strongest adversary throughout the second century BCE. This Front's resistance required the application of Roman power constantly throughout this century. However, the Spanish Front declined in power around the turn of the millennium at the same time as other adversaries rose in power, and then remained at a constant low level of power for the remainder of Rome's hegemonic epoch.

The Central Front's power slowly increased from its advent until 122 CE, when its power dipped slightly and plateaued until the Diocletianic reform period. From around 85 CE onwards it was the most powerful of Rome's adversaries, to be matched only by the Eastern Front around 195 CE.

The Eastern Front was relatively comparable in power to the Central Front throughout the century preceding the Crisis of the Third Century. From its advent

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until the time of the Crisis, the Eastern Front experienced a relatively constant gradual increase in power.

The African Front maintained a small amount of power until the period of Diocletian's reforms, at which point its power increased suddenly by a factor of nine.

Apart from the Northern Front, the power of Rome's adversaries throughout the post-Diocletianic reform period remained relatively constant.

Comparison of the Dynamics of Roman Hegemony with Modelled Hegemony

Our primary motivation in assembling the database, as explained in the Introduction, was to compare our modelled results of the dynamics of a hegemon (see Figure 1) with a real instance of historical hegemony (see Figure 2).

The main structural features of each case are very similar when there is similar power diffusion: a single hegemon emerges with overwhelming power, the hegemon is long-lived, and adversaries may challenge it but, for long periods, are successfully suppressed. Figure 1 shows a very stable configuration after the model has "settled down." Figure 2 shows the rapid emergence of Roman hegemony through to the first century BCE, then a stable hegemony through to the Crisis of the Third Century, followed by further hegemony, albeit on the decline, through to the early fifth century CE.

These findings add weight to our hypothesis (Brizhinev et al. 2018) that hegemony is an emergent property of a complex adaptive system—the international order—of competing and cooperating states, rather than due to any special properties of the hegemon itself. While there may be particular local events or processes—such as Rome's unique structural and cultural make-up—involved in the initial rise of one particular state, system processes at the higher level of the international order give rise to the emergent phenomenon of hegemony.

Invitation for Corrections

There may be minor errors and unintended omissions in the data despite our best efforts. And the occasionally fragmented, incomplete or questionable nature of the source data available means we have had to employ some significant interpretation to produce a coherent dataset. (We have noted this as comments on the data points.) We are, after all, trying to recreate a dynamic process that is two thousand years old. We welcome and encourage those who spot missteps or believe our interpretations are incorrect to contact us so we can improve the database.

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