**Affluence, Agricultural Productivity and the Rise of Moralizing Religion in the Ancient Mediterranean**

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<tbody>
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<td><strong>Manuscript ID</strong></td>
<td>Draft</td>
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<td><strong>Manuscript Type:</strong></td>
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In this commentary, we focus on the way the authors of the target article approach affluence and its role in the emergence of moralizing religions. In their analysis, they employ agricultural productivity as a proxy for affluence and operationalize it by means of Seshat’s Agri variable. While we believe that Agri might offer useful insights concerning the history of agriculture, we argue that it is not appropriate to employ it as a proxy for affluence in assessment of affluence-based accounts of moralizing religions (esp. Baumard et al., 2015). In support of our argument, we offer a more detailed look at the Agri data for four Seshat’s natural geographic areas (NGAs) from the Mediterranean Sea region (MSR) from ca. 1000 BCE to 1000 CE and compare them with alternative approaches to affluence commonly used in the literature.

The four MSR NGAs are Latium (modern date Italy), Paris Basin, Konya Plain (central Turkey), and Upper Egypt. All four NGAs were under the control of the Roman Empire through the four consecutive time steps of 0, 100, 200 and 300 CE. During the first three time steps, the Roman Empire in Seshat is represented by the “Roman Empire - Principate” polity (ItRomPr), while during the fourth time step it is the “Roman Empire - Dominate” polity (TrRomDom). This implies that, in accordance with Seshat’s overall approach (Turchin et al., 2020, pp. 43–44), during this period, the four NGAs inherit all variable values from the two polities occupying them.¹

The primary interest of Seshat researchers in agricultural productivity is to use this information to estimate the carrying capacity of an area, independently of estimates of its population size (Currie et al., 2015, p. 29). In this context, carrying capacity is defined as the maximum human population size that can be supported in a given area in dependence on
physical and biological characteristics of the area and on the types of agricultural technology and techniques possessed by the population inhabiting the area (ibid.). The main task is then to identify the factors and processes affecting annual yields of the focal crop for a given area (e.g. wheat for Latium, millet for Middle Yellow River Valley, or rice for Cambodian Basin). The resulting Agri variable is then expressed in tons of the main carbohydrate crop per hectare per year (see Turchin et al., 2021).

Figure 1-A depicts the trajectories of the Agri variable across the four MSR NGAs over the period from 1000 BCE to 1000 CE. It clearly shows that the values were relatively stable over the whole period, with a few abrupt increments, associated mainly with an advent of new technologies. From our standpoint, one of the most striking features of the Figure is that it does not capture any visible decrease in the values of the target variable over the whole period under scrutiny. While this is perhaps plausible from the perspective of history of agriculture (2015, pp. 33-39), it also makes the data highly questionable as a proxy of affluence. Further, what is even more problematic, it becomes evident that the Agri variable does not take into account the historical reality that the consumption in certain regions went beyond their carrying capacity. Roman Italy heavily depended on grain import and there are data suggesting that, at the peak of the Roman economic integration, only ca. 10 percent of grain consumed in the city of Rome was grown in Italy (Hornborg, 2021, pp. 442–443). In this light, carrying capacity without any consideration for trade can yield a potentially distorting picture of affluence in the analyzed NGAs.

In the affluence-based account of the rise of moralizing religions proposed by Baumard and colleagues (2015), affluence is approximated by means of the energy capture measure derived from Morris (2013). Morris defines energy capture as closely associated with physical well-being and common measures of economic prosperity, such as real wages or gross domestic product per capita (Morris, 2013, pp. 53–54). In regard to our point here, Morris suggests that the disruptions set off by the so-called antonine Plague (165-180 CE) had begun driving energy capture of the Roman Empire down already before 200 CE and that “the third century certainly saw decline, especially in the western parts of the Roman Empire” (Morris, 2013, p. 82).

Next to Morris’ energy capture, other indicators of economic performance and well-being during the Roman times and beyond have been employed in the scholarly literature and they eloquently suggest a more fluctuant development than the overall stability accompanied by a few abrupt increases characterizing the trajectories of the Agri variable. There is a wide range of data used to document the development of Roman economy and its impact on prosperity and well-being, such as traces of pollution from Roman mining in Greenland’s ice cores (Callataÿ, 2005; Hong et al., 1994; Malanima, 2013), animal bones as proxy for Roman diet (Jongman, 2007; King, 1999), ancient Mediterranean shipwrecks documenting the intensity of maritime trade (Parker, 1996; Strauss, 2013), wood finds as evidence for building activity (Hollstein, 1980; Jongman, 2014). They all reveal a bell-shaped temporal distribution,
peaking in the first or 2nd century CE and followed by a decline starting during the reign of the Severan dynasty (193-235 CE) at the latest (For an overview, see Jongman (2007, 2014)).

Highly valuable sources of spatio-temporal data for MSR are epigraphic databases. The LIRE dataset contains 136,190 Latin inscriptions from the Roman imperial period, with numbers sharply rising since the late 1st century BCE, peaking in the 1st half of the 2nd century CE and declining since the early 3rd century CE (Kaše et al., 2021). The PHI dataset consists of 136,190 Greek inscriptions (Kaše & Hefmánková, 2021), which have an important value for documenting the economic development of the eastern Mediterranean. Approximately one half of them is from the Roman imperial period and follows a similar temporal distribution as LIRE. The other half is from the previous period and reflects especially the economic performance of Greek city states, which controlled a substantial portion of MSR a few centuries before Rome. According to some scholars, the extent of affluence in Greece during the 4th century BCE was even higher than during the Roman period in the same region and has not been achieved again until the 19th century (Ober, 2015). Naturally, the dynamics of classical Greece cannot be fully reflected by the four MSR NGAs involved in the current study. However, it serves us here as another example of substantial fluctuations in affluence undetected by the Agri variable. These fluctuations in affluence might also be causally associated with fluctuations of certain moral and religious values. Thus, for instance, the relative frequency of the term δικαιοσύνη (righteousness) peaks on inscriptions from the 4th century BCE and declines during the hellenistic period (Kaše et al., 2022).

Turchin et al. recognize some limitations of the Agri variable in respect to assessment of Baumard’s et al. affluence account of moralizing religion. Thus, after noticing that Baumard et al. (2015) proxied affluence with an index of energy capture, Turchin et al. fully acknowledge that they “do not yet have a Seshat variable for a direct comparison” (p. 22, line 16-17), that they “need to develop better and more nuanced instruments to unravel this complex nexus of environmental and productivity influences on religion” (p. 22, line 31-33). They also inform us that the “coding efforts for such a measure are underway” (p. 22, line 17). We look very much forward to reading more about this progress and hope that the future analyses will be more sensitive to spatio-temporal variations and fluctuations.

Notes

1. As a consequence of this approach, for instance, in the dataset of polities underlying the analyses of the target article, the value of the language variable for Upper Egypt and Konya Plain during the period from 0 is 300 CE is Latin, since it is the official language of the polity occupying the NGAs, i.e. Roman Empire. Without going into much detail, this is a problematic inference, since the dominant language in these areas was Greek, which also served here as the official language. As the comments in the Seshat Databank entry for ItRomPr clearly indicate, Seshat editors are well aware of this fact: “Latin was the lingua franca of the western half of the empire, Greek of the eastern half” (http://seshatdatabank.info/browser/ItRomPr). However, it is not reflected in the quantitative analyses built on the top of these data.

2. During the Roman Imperial period (represented by the ItRomPr and TrRomDom polities), there is only one visible change in the Agri values in the dataset, taking place in the Konya plain between 300 and 400 CE. As obvious from a closer look at the data from Turchin et al.
(2021), this abrupt increase in agricultural productivity is associated with application of animal manure as fertilizer in the NGA since 400 CE on. It is also interesting to notice that, according to the Seshat data, the same change appeared in the remaining three MSR substantially earlier: at 4000 BCE in Latium, at 3100 BCE in Upper Egypt, and at 1500 BCE in Paris Basin (see Supplemental Materials to Turchin et al. 2021, HistYield_out.csv).

3. However, there are data demonstrating that it is not possible to consider Roman development as a straightforward process (Harper, 2017). For example, different lengths of femurs in pre-Roman, Roman and post-Roman times from Britain and Italy indicate that people were taller before and after the time of the Roman Empire (Giannecchini & Moggi-Cecchi, 2008; Roberts & Cox, 2003). This is interpreted by Kyle Harper (Harper, 2017, pp. 75–80) and Walter Scheidel (Scheidel, 2009, pp. 23–24) as a sign that the strong economic development in Roman times sometimes failed to fully distribute the well-being across all segments of its population.

4. In the Seshat’s team article by Mullins et al. (2018), there is an explicit attention to ancient Greek history. But since there is no NGA directly associated with core Greece, it is there substituted by data from Crete, which is one of the additional NGAs behind the representative sample (see http://seshatdatabank.info/databrowser/crete.html).

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Supplementary Online Materials

The supplementary online materials associated with this commentary are available from https://zenodo.org/record/5851662#.YehjOi8w1QI.

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https://doi.org/10.1177/0959683621994644

Turchin, P., Hoyer, D., Bennett, J., Basava, K., Cioni, E., Feeney, K., Francois, P., Holder,
https://doi.org/10.21237/C7clio11148620
Figure 1: A - trajectories of Agri variable from the four MSR NGAs for the period from 1000 BCE to 1000 CE; B - temporal distributions of LIRE and PHI datasets, depicted as a cumulative KDE plot of 100 simulated time series (Kaše, 2021).

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