Is it possible to quantify the ancient economy?

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JOSÉ REMESAL RODRÍGUEZ, VÍCTOR REVILLA CALVO y JUAN MANUEL BERMÚDEZ LORENZO (edd.), *CUANTIFICAR LAS ECONOMÍAS ANTIGUAS. PROBLEMAS Y MÉTODOS* (Collecció Instrumenta 60; Universitat de Barcelona 2018). Pp. 390. ISBN 978-84-9168-107-6.

The last two decades have shown that archaeological evidence can be extremely useful for studying the ancient economy.[1] Archaeology, with its millions of pottery sherds, provided a means for rejecting M. I. Finley's vision of the ancient economy.[2] Nevertheless, questions regarding the randomness and representativeness of archaeological material remain. Science, and not least statistics, has aidedthe proper assessment of archaeological data. Nonetheless, the lack of a theoretical background with respect to the appropriate and consistent way to gather and use ceramic material in a quantitative manner was evident. This gap has now been filled by the book *Cuantificar las economías antiguas* edited by three scholars from Barcelona. It addresses the numerous problems encountered when using archaeological material as evidence for production, trade and the economy. It also presents methods that could be applied when dealing with such problems.

The book is an interdisciplinary scientific work that originated in a workshop "Cuantificar: qué, cómo y para qué", held in February 2017 at the University of Barcelona. It included scientists from CEIPAC, Complexity lab Barcelona and the Barcelona Supercomputing Center. Following an introduction by J. Remesal Rodríguez, its 16 chapters are penned by more than 30 specialists, with conclusions by C. Panella. Since its broad scope and the multitude of chapters make it impossible to critique every aspect, I will provide only a brief general summary.

The book begins with general issues regarding the quantification of ceramic material, such as the methods of counting fragments. G. Rizzo (chapt. 1) presents the most popular methods of registering sherds, such as counting all fragments, all diagnostic fragments, the minimal number of vases (MNI), and the vessel equivalent (EVE). He concludes that the method should be guided by the state of preservation of the material and the questions that one is seeking to answer. Similar problems are dealt with by C. Fabião (chapt. 2), who also provides examples of how to measure importations in transport containers and how the context from which the data derive can influence the results. F. Laubenheimer (chapt. 3) then presents broad-scale quantifications of amphoras and their distribution in Gaul.

Three chapters (4, 7 and 8) address more complex issues regarding mathematical and especially statistical approaches to ceramic material. With their treatment of the Seville protocol (Protocolo de Sevilla – PRCS/14), developed within the framework of the project "Amphorae ex Hispania" (http://amphorae.icac.cat), they occupy a considerable part of the book. The protocol's aim is to present a standardized way of documenting ceramic material, one that allows for the subsequent use of all methods of quantification, as well as making ceramic assemblages comparable. The Seville protocol is presented and explained by C. Carreras Monfort (chapt. 4), who also concentrates on a the utility of GIS in estimating the density of production and/or the scale of amphora imports. This estimation provides a better understanding of the routes of networks. For example, points of higher density may reflect a change in container type, which in turn suggests a change in the means of transport. J. Molina Vidal (chapt. 7) explains the advantages of using the Seville protocol. He also provides a mathematical formula for *modulo de ruptura aproximado* (MR), the use of which is crucial for assessing the quantified material; it also helps to avoid the under- and overestimating of certain groups of containers. Nevertheless,

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1 E.g.: F. de Callataÿ, "The Graeco-Roman economy in the super-long run: lead, copper, and shipwrecks," *JRA* 18 (2005) 361-72; W. Scheidel, "In search of Roman economic growth," *JRA* 22 (2009) 46-70; A. I. Wilson, "Indicators for Roman economic growth: a response to Walter Scheidel," *JRA* 22 (2009) 71-82; A. Bowman and A. Wilson (edd.), *Quantifying the Roman economy: methods and problems* (Oxford 2009); F. de Callataÿ (ed.), *Quantifying the Greco-Roman economy and beyond* (Bari 2014).

2 M. I. Finley, *The ancient economy* (rev. edn.; Berkeley, CA 1999).

no quantification method is totally free from drawbacks: as some miscalculations are inevitable, it is necessary to understand the limits of each method. The best examples demonstrating how a particular quantification method may influence the proportional share of different categories of pottery are provided by A. M. Adroher Auroux and M. Abelleira Durán (chapt. 8).

Chapters 5 and 6 raise interesting issues that go far beyond the methods of quantifying ceramic material. First, D. Daems proposes various mathematical formulae that allow one to measure social complexity dynamics in past societies. Then the impressive chapter by I. Romanowska looks at agent-based modeling and explains how computer simulations may help to overcome the main drawbacks with respect to archaeological material — i.e., the incompatibility of data-sets and the incompleteness of the data. We may note that agent-based modeling has already provided very interesting results for the nature of the Roman economy.[3]

E. García Vargas and A. M. Sáez Romero (chapt. 9) attempt to quantify the scale of fish-sauce production in the vicinity of the Bay of Cádiz between the Late Archaic and Early Imperial periods; they include 3D reconstructions of surviving kilns. J. Remesal-Rodríguez (chapt. 10) uses social network analyses to approach epigraphic evidence that comes in the form of stamps and *tituli picti* on Baetican Dr. 20 amphoras. Next, amphora stamps are utilized as evidence for identifying communication networks. Statistical methods, such as null-hypothesis significance testing (NHST), the Jaccard index and the multi-response permutation procedure are applied in order to compare collections of stamps in different Roman provinces and to identify the commercial routes that were used to export Baetican olive oil. The Jaccard index is a tool also used in the following chapter, which aims to link inscriptions on amphora fragments that formed Monte Testaccio, the mountain of discards.

Chapters 13 and 14 are concerned with quantifying workshops in the Guadalquivir valley that produced Dr. 20 amphoras, and with measuring their capacities (3D reconstructions are supplied). Then D. J. Martín-Arroyo Sánchez presents the quantitative problems regarding Cretan amphoras (AC2) found at Pompeii.

Finally, K. Verboven looks at the use of cliometrics in the ancient economy. He begins with a critical account of different ways of estimating Roman GDP, emphasizing how imperfect GDP is as a proxy for real economic performance. He then mentions other methods, such as the Gini index and the Social Development Index, which are also not free from flaws. He concludes by emphasizing that, in order to measure economic performance, it is necessary to gather indicators from anthropometrics, urbanism, economic complexity, and the energetic threshold of a society.[4] Economic complexity may be approached using the Hausman and Hidalgo index,[5] which could be particularly interesting for archaeologists since it concentrates on diversity rather than the scale of production.

Most chapters in the book are written in Spanish, but Italian and French also appear; three chapters are in English. This should not pose a problem for many Anglophone readers and many others in Europe, but the book could have reached a broader audience if chapters had been accompanied by comprehensive summaries in English. A certain lack of care may be detected regarding some of the finer details: spelling errors and inconsistencies in bibliographic references are not uncommon. The quality of certain illustrations leaves something to be desired; in one case the same illustration appears in different chapters. Finally, it appears that little effort was made to organize the chapters, which are presented

3 T. Brughmans and J. Poblome, "Roman bazaar or market economy. Explaining tableware distributions in the Roman East through computational modeling," *Antiquity* 90 (2016) 393-408.

4 In other words, the energy needed for the physiological and reproductive requirements of the society, as well as the energy needed for the interaction with the environment necessary to procure it.

5 The Economic Complexity Index (ECI), developed by C. Hidalgo (MIT Media Lab) and R. Hausman (Harvard University's Kennedy School of Government), measures the productive capability of a country by considering a number of items that are produced within it and a number of countries where a particular item is produced. For example, countries displaying high economic complexity export many products of low ubiquity that are produced by highly diversified countries. Contrarily, countries with low ECI export only a few goods that are commonly available and produced by non-highly-diversified countries.

seemingly in no particular order. This sometimes makes it difficult for the reader to discern the book's thread.

Notwithstanding minor shortcomings, the book is a fine collection of scientific writings which should be read by all those engaged in the fields of ceramology, ancient production, consumption and trade, as well as by a broader range of students and scholars interested in ancient economic history. First, it identifies appropriate methods for registering archaeological material. Second, it presents different approaches to the data registered and to quantification methods, explaining the ways in which the approach chosen may affect the results. Third, it demonstrates and clarifies the most useful statistical and computational tools for testing hypotheses about the nature of the ancient economy by way of archaeological materials. A regression analysis is the main matter of substance that would have been welcome since it would have complemented the statistical methods.[6] Is it, finally, possible to quantify the ancient economy? Yes, it is — and this book provides some fine examples of how this can be achieved.

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6 This method has been used by P. Temin to analyze wheat prices: *The Roman market economy* (Princeton, NJ 2013).