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QUANTIFYING THE GRECO-ROMAN ECONOMY AND BEYOND

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LATE ROMAN DATA COLLECTION

Modern attempts to quantify aspects of life in the ancient world tend to rely mainly on the collection or creation of data from documents or artifacts. We classify and count, whether individuals in households or names or pots or shipwrecks. Most of the papers in this volume refer to investigations of this type, and so do most of my own past forays into quantification of social and economic phenomena. [1] On such studies is based the recent synthesis of the economic history of antiquity in *The Cambridge Economic History of the Greco-Roman World*. [2] This approach has been driven in large part by the fact that ancient authors do not tend to give us the kind of statistics we are accustomed to in the modern world and ardently desire for antiquity, but also by widespread and often well-founded distrust of most of the numbers preserved in ancient authors. These authors were not very interested in most of the aspects of economy, administration, and society that fascinate us, and a modern consensus has developed that even for subjects they were concerned with, like armies and battles, we do well to be wary of the numbers they give us. [3]

Underlying this pessimism about numbers in the ancient authors, I believe, is a widespread and more far-reaching scepticism about the extent to which the ancients themselves ever engaged in such quantification or were interested in and maintained statistics. Probably all of the contributors to this volume have more than once read A.H.M. Jones's famous words on this subject in his inaugural lecture in London:

[1] *E.g*. Bagnall 1982 and 1992.

[2] Scheidel, Morris & Saller 2007.

[3] See, *e.g*., Bowman and Wilson 2009, 10: 'We have had sufficient warning of the dangers of using statistical evidence from ancient literary sources, where figures are notoriously unreliable and modern scholars often seem inclined to trust figures they can find which suit their prejudices and reject those which do not'. Their introductory chapter in that volume is a good example of the focus on analytic data.

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> The chief problem of ancient economic history is one that I hesitate to confess before a mixed audience – an audience, that is to say, containing modern historians and perhaps even economists – lest ancient history should be brought into disrepute. However, it is unlikely that I shall long be able to conceal the ignominious truth, that there are no ancient statistics. The causes of this lack are so many and various that it is hard to know where to begin. The least among them is that ancient governments were not statistically minded. For even if they did not as a rule keep records of births and deaths or imports and exports, the more efficient of them carefully audited the accounts of their public revenue and expenditure, and maintained registers of their citizens, or at least of those liable to military service, and carried out assessments of property for purposes of taxation. [4]

Of course ancient governments all had records, and Jones surely understates the degree to which this was true. Indeed, he remarks that we would be satisfied if we even had 'the merest fraction of the statistical material compiled by ancient governments.' After lamenting the lack of that material, because of the fact that the relevant records on perishable materials have duly perished, Jones passes on to talk about the literary sources. But at least he raised the question. It is striking to note that the index to *The Cambridge Economic History of the Greco-Roman World* does not contain the words 'data', 'number', or 'statistics', nor do the volume's editors in their introduction deal with epistemological questions. They do, however, note that generalizations spanning the 1,500 year period from the early Iron Age to the later Roman Empire are of doubful value and need to be replaced by more fine-grained analysis.

Certainly all functional ancient governments collected information from which one could compile statistics, if one were so minded. Greek cities wanted to know who was and was not a citizen, there were records of landed property already in classical times, [5] and any state interested in taxation had to have quantitative information: Governments were obviously interested in knowing how much revenue they could hope to collect and had in fact collected. There is plenty of evidence for processes by which administrations collected data connected with taxation and, in some periods, with liturgical service. These included, in the Roman period, the censuses of people, animals, and property. [6] The records connected with these activities show that at every level officials computed numbers of people in various categories and other figures necessary to know the amounts to be collected, against which actual collections would be compared. Similarly, the reports of actual tax

[4] Jones 1948, 1.

[5] Faraguna 2000.

[6] On the census of individuals in Roman Egypt, the best attested of these, see Bagnall & Frier 1994/2006. The Ptolemaic census is less well documented, but better understood now than it once was: Clarysse and Thompson 2006.

collections or compulsory service performed provide ample quantitative data. This much is not in doubt.

What I am interested in here, however, is not so much whether there was ancient data collection as whether it is accurate to characterize ancient governments in a blanket fashion as 'not statistically minded'. This matters for two reasons. The first is that it affects how we think about the numbers in ancient sources, whether literary or documentary: Is it plausible that someone actually had this information? The second is that our concept of the relationship of a government to the economy is necessarily affected by the extent to which it was interested in quantifying economic functions.

One way of approaching this issue is to ask what a government did with the information it collected. In the Roman context, one obvious question is how far up the administrative ladder statistics traveled. Although we naturally lack any reports that a province would have sent to Rome containing the data generated at a local level concerning population, property, taxes, and the like, provinces were certainly not self-contained units from the point of view of taxation. There can hardly be doubt that the Roman administration of Egypt reported to the imperial capital how many people had been registered and how much poll-tax they had paid. For this reason, even those of us who think that Josephus's figure for the population of Egypt under Roman rule is too high have to admit that someone in Rome knew what figure had been reported from Alexandria, and Josephus could perfectly well have found out by asking the right person. [7] Naturally, the reporting flaws that affect every census, and particularly those in pre-modern societies, will mean that the figures were imperfect. I am not sure they were much worse than recent American censuses, however. At any rate, I am sure that any of the authors represented in this volume would cheerfully kill to get access to the data available to any Roman emperor.

The figures derivable from data collected by the Roman government were of at least two kinds: directly collected information and indirectly collected or analysed numbers. The first of these would include population and tax revenues, as well as the number of soldiers in the army, various categories of government expenditure, and other financial information. The second would include, for example, the volume of commerce crossing provincial boundaries or entering and departing the empire. The government may not have kept direct records of this commerce, but applying the customs rates to the amount of duties collected at various locations would enable one to know these flows fairly accurately. Both categories of figures would be directly useful to the government in planning its income and expenditure.

The more professionalized Roman government of late antiquity has had both its

[7] See Bagnall & Frier 1994/2006, 52-57; Tacoma 2006, 22-28.

detractors and its admirers. On the whole, recent work has tended to recognize that the shift from a more amateurish method of administration to one with a larger cadre of full-time professional bureaucrats led to a higher level of predictability in government processes and greater regularity and accessibility of services. [8] Bureaucracies tend to collect information. One might therefore expect that the later empire would have collected more information than the earlier, and that the continuity of such collection would have increased. The government will therefore at least have had the possibility of generating true series of commensurate data, in the sense that we use the term today.

There are certainly signs that at least the later Roman empire did collect statistics not transparently connected with taxation. To explore this question, I will return today to a subject discussed in the past both by me and by Elio Lo Cascio, the price declarations by guilds and the related official documents from the fourth- and fifth-century papyri, to try to determine the chain of data collection, its origins, its purposes, and – although here we enter the realm of pure speculation – the degree to which we can generalize from this process. [9]

It is unusual for us to be able to follow any single information-gathering activity of an ancient government in as much detail and for as many steps as we can with the late antique Roman effort to collect data about prices of precious metals and staple goods. That is one reason why the Oxyrhynchite documents for this process are so valuable.

The first step in this process was the monthly declaration that each guild involved in sales had to submit to the *logistes*, the *curator civitatis*. We have more than forty of these from Oxyrhynchos. As we shall see, it must be entirely a matter of the archaeology of papyrological survival that we do not have such declarations from other provenances. They follow a standardized format, although one that underwent changes over time, readily recognizable and undoubtedly imposed through local scribal training. Here is an example, a declaration of the price of salt from the year 319, *P.Oxy.* LIV 3750:

> In the consulship of our masters Constantinus Augustus for the 5th time and Licinius Crassus for the 1st time.
>
> To Valerius Ammonianus alias Gerontius, administering the office of curator of the Oxyrhynchite, from the guild of the salt-merchants, through me Aurelius Paesis son of Saprion. In accordance with orders, at my own risk I declare the price entered

[8] *E.g.*, Kelly 2004.

[9] Bagnall 1994; Lo Cascio 2009, 235-258: 'Prezzi in oro e prezzi in unità di conto tra il III e IV sec. d.C.'.

below for the goods which I handle, and I swear the divine oath that I have been deceitful in nothing. As follows:

Salt: 1 artaba: 250 denarii.

The aforesaid consulship, Phamenoth 30.

I, Aurelius Paesis, presented this, making my declaration as aforesaid. I, Aurelius Horion, wrote on his behalf as he is illiterate.

The bulk of the declaration was drawn up in one hand, which left blanks for the name of the individual submitting the document on behalf of the guild of salt-merchants and the number of denarii charged for an artaba of salt. These blank forms – we do not know who made them [10] – were filled in by a second hand, which then signed the declaration on behalf of the salt-merchant, who is stated to be illiterate. The declaration is submitted on the last day of the month of Phamenoth, the seventh month of the Egyptian year.

It is a plausible assumption that the price given represents the price in force at the end of the month, but it is not stated whether this price was in force throughout the month as well and whether prices varied from time to time during the month. Nor is it explicitly indicated if it is a price paid by the salt-merchant or charged by him to customers. We would perhaps readily assume that the latter is the case, but in fact the reverse seems to be more likely, because in some cases the declarations concern the raw materials acquired by the merchants and used in making their wares.

The next stage in the process is visible in a papyrus of ca. 327, *P.Oxy.* LIV 3765, in which, as the editor put it, 'we have the beginning of a roll of declarations ... and that it was prefaced either by a summary of the items and prices declared the previous month or (if prices were inserted) by the items and current prices extracted from the declarations that immediately followed'. I quote the text of column iv.

Females likewise: at 1st tooth-change	200 talents	
at 2nd tooth-change	150 tal.	
full-grown	100 tal.	
Bull, full-grown	230 tal.	
inferior	200 tal.	
Veal	1 pound	... denarii (?)
Cow, full-grown	100 tal.	
inferior (?)	[...] tal.	

[10] Lo Cascio 2009, 259, describes them 'quasi che si tratti da dichiarazioni effettuate utilizzando un modulo già preparato nell'ufficio del λογιστής e poi riempito dall'interessato.' It is unlikely that a government office would provide the blanks free of charge; the cost of such preparation, whether official or private, certainly fell on the submitting guild.

That is, the first six columns of the papyrus are a listing of goods, not fully preserved, with the price for each, a summary of the information that occupied many glued-together sheets with declarations that made up the rest of the roll. No statement appears on the papyrus to identify who made this summary list of prices, but it is difficult to escape the likelihood that it was someone in the office of the *logistes*, the official to whom the declarations were submitted each month. Whoever it was, the local administration thus prepared each month a summary of the voluminous documentation submitted to it.

The third stage came when a summary encompassing more than one month was prepared. The surviving example, *P.Oxy.* LIV 3773, which dates to ca. 340, includes gold, silver, and five important commodities (wheat, barley, wine, vegetable seed, and lentils) for a period of fifteen months, starting in Thoth of one year and continuing to Hathyr of the following year. I quote the first two monthly entries in column ii.

Tybi.		
1 solidus		1,033 talents, 500 denarii
Uncoined silver	1 pound	1,033 tal.
Wheat	1 artaba	45 tal.
Barley	1 art.	20 tal.
Lentils	1 art.	25 tal.
Vegetable seed	1 art.	50 tal.
Wine	1 sextarius [11]	1 tal.
Mecheir.		
1 solidus		233 tal., 500 den.
Uncoined silver	1 pound	1,166 tal., 1,000 den.
Wheat	1 artaba	46 tal., 1,000 den.
Barley	1 art.	20 tal.
Lentils	1 art.	2 tal.
Vegetable seed	1 art.	45 tal.
Wine	1 sextarius	1 tal.

We do not know if similar tables were prepared for all types of goods or only for these bellwether index items. That would be interesting to know. This table still concerns, as far as we can see, only a single city, which is presumed to be Oxyrhynchos, although there is no explicit indication in the surviving parts of the papyrus.

There is nothing said in any of this to suggest that the price was fixed by the state, that is, that this declaration in some sense represents compliance with a descendant of Diocletian's Edict of Maximum Prices. The official orders with which Aurelius Paesis was complying were to declare the price. Whether the informa-

[11] The papyrus mistakenly gives 'artaba' instead of 'sextarius' here.

tion gathered in the earliest years of the existence of these declarations served in any way to help the state try to set prices has been debated. In the most recent detailed discussion of the subject, Elio Lo Cascio has argued that such a role down to 324 is possible, although there is no direct evidence. [12] After that point it seems most unlikely that the declarations are connected to any such generalized attempts at state control of prices. Lo Cascio has noted that the rapid changes in price connected (in my view, at any rate) with the changes in the composition and denomination of the copper coinage during the fourth century caused the state to need good information in order to set the prices at which it purchased goods (especially if by requisition) and at which goods and money were interchangeable in the taxation process. After the stabilization of the currency in the last quarter of the fourth century, however, those motives would no longer have been operative.

Lo Cascio has suggested in a more recent paper, not yet published, [13] another reason for which the Roman state might wish to know prices. That is the general regulation of markets. In this paper, he has amply documented his view that the Roman concept of a just price meant a fair market price under the prevailing circumstances. It was not an abstract notion of justice that was at stake, but one closely linked to a market system in which monopolistic practices and price-fixing were to be actively prevented by state action. In Lo Cascio's view, the Romans put a positive valuation on the market-making activity of middlemen and did not see them as parasites.

This is an attractive suggestion. But if it is true, it points to a use for statistics of a kind rather different from the more basic purposes that are usually supposed to have been involved in the government's collection of information about population or taxes. It reflects, in fact, a move to using data to influence the making of policy and in the operation of regulatory activity by the state.

The process of aggregation of data was not limited to the level of a single city or nome. It has been shown by Lo Cascio that the aggregation of monthly data into *quadrimenstrui breves* at a higher than local level is found at Trinitapolis in Apulia. [14] In another papyrus, *P.Oxy.* LI 3628-3633, from the fifth century but an unknown year, we find that for a limited set of commodities, overlapping with that just mentioned but not identical with it, these prices were compiled for six of the nine cities in the province of Arcadia, and no doubt for all nine, for four-month periods of an indiction, i.e., Thoth through Choiak, Tybi through Pharmouthi, and Pachon through Mesore. The goods in question are gold, silver (worked and un-

[12] Lo Cascio 2009: 270-2.

[13] In *Law and Transaction Costs in the Ancient Economy*, ed. U. Yiftach-Firanko, D. P. Kehoe, and D. M. Ratzan, University of Michigan Press, forthcoming.

[14] Lo Cascio 2009, 264.

worked), wheat, barley, lentils, chaff, wine, meat, salt, and radish oil. Here is the opening of the papyrus and a sample set of entries:

> Schedule of purchasable goods on sale in the market place, for each city in accordance with the schedules submitted by the tabularii of each city for the 9th indiction, viz.:
> For the Cynopolite for the months of Thoth, Phaophi, Hathyr, Choiak, as follows:

Gold, per 1 solidus	4,000 myriads of denarii
Silver, per 1 pound	5 solidi
Unworked silver, per 1 pound	4 ¾ solidi
Wheat, per 1 solidus	13 artabas
Barley, per 1 solidus	14 artabas
Lentils, per 1 solidus	10 artabas
Chaff, per 1 pound	1 ½ myr. den.
Wine, per 8 sextarii	165 myr. den.
Meat, per 1 pound	24 myr. den.
Salt, per 1 artaba	150 myr. den.
Radish oil, per 1 sextarius	80 myr. den.

This stage thus included gathering the material assembled in the third phase for individual cities and aggregating it for all of the cities of a province. The fineness of resolution provided by monthly figures, however, is replaced with somewhat coarser information comparable to our quarterly reports. We do not know if the prices given are closing or average prices. That they vary from city to city as well as from quadrimester to quadrimester helps to confirm our impression all through the sequence of documents that the prices have not been fixed by the state. Compliance, once again, is with reporting requirements, not fixed prices.

It would be perverse to think that the process of abstracting and consolidating data stopped at this point. Undoubtedly the data from the Egyptian provinces were collected in Alexandria and put into a similar analytic framework; it is equally likely that they were then passed on to the capital and the central administration of the empire.

The lack of an absolute date for the highest-level summary in *P.Oxy.* LI 3628-3633 is deeply regrettable, but my instincts, based on the handwriting, are for the second half of the fifth century, which would mean that the various parts of the process are attested over something like a century and a half; this was not a short-lived experiment. The text on the back of this roll, *P.Oxy.* LI 3636, is surely of the later fifth century. Moreover, such a date means that we cannot invoke the monetary depreciation and price rises of the fourth century, with their concomitant need for accurate current price information to guide government purchasing and similar activities, as an explanation for the continued collection of information in the fifth century. Of course bureaucratic inertia could be at stake, but after 75-100 years past the point when inflation was a serious concern, that explanation becomes less credible.

I do not mean to suggest that idle curiosity lay behind this data collection. But it is a taste of the practices of the late antique administration that suggests an appetite for information on the basis of which the government could behave less passively than the Roman government is often thought to have done. The price data in the Oxyrhynchos papyri are in fact surprising in many ways, suggesting the presence of large price anomalies between places separated from one another by no great distance and linked by that rapid and cheap highway, the Nile. It is hard to imagine that a skilled arbitrageur could not have profited from these data, and we have evidence as early as the third century BC for attempts by individuals in one region to acquire goods more cheaply in other parts of Egypt, based on the sharing of price information. [15]

Is this a unique case, or if the spades of Grenfell and Hunt's workmen had hit a different couple of baskets might we have similar information for some other aspect of life? There are probably not a lot of areas with the same scope for information gathering, but there is no reason to think that there were none. A straightforward reading of the evidence seems to me to support the idea of an administrative apparatus that saw information as vital to its ability to govern the empire effectively, and that cared about such governance.

These considerations could give birth to a variety of further reflections about governments and the economy in antiquity, but for the moment I want to focus in conclusion on just two points: First, whatever the problems of statistics in ancient authors, we should not dismiss them on the basis of an a priori belief that such data could not have been available. Each figure needs a careful examination to see what data-collection process it might have rested on and whether the results could reasonably have been known to the author. This may seem obvious, but I think that is not an approach as widely employed as it ought to be. Second, it suggests that we might try harder in looking for aggregate numbers preserved in the documentary sources and seeing how far we can understand exactly what they refer to, what process they may have derived from, and how we can use them. The fragmentary condition of many papyri makes this a difficult piece of advice to follow, but I think it is essential if we are to be able to build any kind of model of an ancient economy.

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[15] *P.Cair.Zen.* V 59823, concerning wax; translation in Bagnall & Derow 2004, 161.

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