Long-Term Quantification in Ancient Mediterranean History

Brussels, Royal Library of Belgium, October 15th and 16th 2009

ABSTRACTS
François de Callatay (Bibliothèque royale de Belgique/Université Libre de Bruxelles), Towards a sociology of the uses of quantification in Greco-Roman history?

Greco-Roman history is still a field of knowledge in which the use of in numbers is rather sparse, although not so sparse as portrayed by Moses I. Finley in the 1970’s and the 1980’s. For people of my generation, it may seem that a simple line divides modernists, who are comfortable tackling historical issues by using quantitative arguments, and primitivists, who prefer traditional model-based approaches. There are, in addition, several other characteristics which distinguish the two groups. First, primitivists, such as Hasebroek, or substantivists, like Polanyi and Finley, specialized in early historical periods for which, indeed, we do have very few numbers; while the advocates of modernism, such as Meyer, Wilcken or Rostovtzeff, deal with Hellenistic and Roman times which are far richer in opportunities for quantitative analysis. Second, primitivists/substantivists were chiefly trained as philologists and very much confined their analyses to literary evidence, while modernists were better versed in the epigraphic and material evidence. In other words, the old antiquarian debate is still alive, with the modernists in the role of the antiquarians. Third, primitivists favor a linear representation of time, with differentiated phases (or Stufen), making comparisons between them irrelevant (eg. Bücher and Finley), while what modernists have in mind is a stable time, with no qualitative difference between yesterday and today. Fourth, I tentatively suggest (perhaps at the risk of political incorrectness) that political leanings may also differentiate the two groups. For example, French historians who followed the Finleyan school were more likely to be leftists or socialists compared to those in the modernist group. Finally, I believe that the third and fourth of these distinguishing characteristics may be linked. The primitivists, with their linear view of time, are constantly striving for change, and are likely to be frustrated by the conditions of their society or their personal lives. For the modernist, a non-linear view of time allows them to avoid these frustrations, and to be satisfied with their lot. By describing the characteristics of these two schools we are, in Weberian taxonomy, building two Idealtypen or models. This paper offers a tentative exploration, both historical and sociological, of the use of numbers in the study of ancient Greco-Roman history.
According to Finley, markets and economic motivations played little, if any, role in ancient economies. Status and civic ideology governed the allocation of scarce resources. Hence, the application of economic theory to the ancient economy was at best a futile exercise and at worst a source of grave misunderstandings. Temin’s seminal and continued contributions to the field lead to the opposite conclusion and, as in the myth of Sisyphus, the boulder seems again to be at the bottom of the hill! My feeling is that the Gordian knot remains the same now as over the past decades: should cliometrics be used in the social sciences/humanities in general, and ancient history especially?
Neville S. Morley (Bristol University), *Orders of magnitude, margins of error*

The aim of this paper is to consider theoretical and methodological issues in the use of quantification, and arguments based on statistical analysis, under conditions of inadequate data - conditions which apply to virtually all aspects and periods of classical antiquity. It will explore the different ways in which historians seek to compensate for and rectify the inadequacies of their data, and the consequences of different approaches for the plausibility of their interpretations. Taking as its key example the development of urbanization under the Roman Empire, it will also discuss the rhetorical functions of quantification, and its role in debates about the disciplinary identity of the history of pre-modern societies.
Gerassimos George Aperghis (University College London), *Creating a long-term computer model for an ancient economy*

There is generally very little quantitative data for ancient economies in the sources, particularly for the long term. What little there is, however, can be usefully treated by a computer model to generate considerably more useful information. A general model has been developed which consists of parameters and relationships expressed in simple modules of different types and a network of linkages between the modules. For example, a parameter may be externally input into a module and a second parameter then calculated, which in turn becomes the input of other modules, e.g. population calculation to food consumption and tax calculations. A module may have ‘depth’ by being repeated for different occurrences, e.g. provinces of an empire, with different data and the ability to automatically compute a total. External module input will also usually have a ‘time’ element that expresses how it is to change within a generally designated time period. The modules, linkages and time elements making up the model are specified by the historian interactively. Data is entered and desired results obtained in a computer-aided dialogue, which can be indefinitely repeated as the data is modified. As an example, a model has been created for the economy of the Seleukid empire (312-64 BC), which can now be extended to the earlier Achaemenid and later Parthian periods.
Robert J. van der Spek (Vrije Universiteit Amsterdam), *On the efficiency of markets for agricultural products in pre-industrial societies: the case of Babylonia c. 400 – c. 60 BC.*

Under this title a research project is being carried out at the Vrije Universiteit in Amsterdam by two PhD students (ancient historians/assyriologists) and a postdoctoral researcher (economic historian) under the direction of professor J.L. van Zanden (economic historian, Utrecht) and myself. For this research we utilize a unique dataset of several thousand prices in the huge corpus of Babylonian cuneiform documents known as “the Astronomical Diaries”. These diaries contain meticulous daily reports of astral phenomena, the weather, the level of the Euphrates river, local history concerning political events, famines, plagues, good and bad harvests, and, last but not least, a detailed record of the monthly, and sometimes daily, prices of raw foodstuffs: barley, dates, cuscuta, cress, sesame, and wool. A preliminary publication of the dataset (still a work in progress) can be found here: [http://www.iisg.nl/hpw/babylon.php](http://www.iisg.nl/hpw/babylon.php). Thanks to the extent of the data, it is possible to subject it to various kinds of statistical analysis. It is our purpose to test theories concerning the measure of volatility of prices relative to the functioning of the market, as suggested by the study of K.G. Persson. For the first time it is possible to compare a dataset of prices from antiquity with prices from early modern history, to compare deviation from the mean and average prices in different societies (taking into account exogenous shocks like warfare, plagues, and the river level) and to study the interdependence and relative importance of the main constituents of the diet (in Babylonia, these were barley and dates, with harvests in Spring and Autumn, respectively).
Alain Bresson (University of Chicago), *Grain, market and agricultural production in Greece: ancient and modern data*

It is now ever more recognized that market and market institutions were fundamental in explaining the development of the ancient Greek economy. This is of course true of the internal market. The *polis* organization, boosted by the invention of coinage, allowed a division of labor that enhanced productivity. But division of labor was of also the rule on the international market. Long distance trade allowed the population of Aegean Greece to be fed with grain produced in regions of comparatively high productivity (Sicily, Cyrene, Egypt, Pontus). Conversely, Aegean Greece specialized in the production of wine and oil, but also handicraft products like textiles, weapons, perfumes, luxury objects and ceramics. To illustrate the result of this division of labor, we could say that slaves of the Laurion silver mines, or female slaves, or manumitted weavers of Athens were fed with comparatively low-cost imported food. Now is it possible to get a better view of the grain market in ancient Greece? The attention devoted to grain should not conceal the fact that products other than grain were also traded. But grain was the basic food of the population, and in ancient Greece, grain was traded *en masse*. This trade had nothing in common with the trade in luxury objects, which were destined for a small, aristocratic minority of the population. Imported grain was a continuing necessity in order to feed the population of the Aegean. A city like Athens in the second half of the fourth century had to import between 66% and 75% of its grain every year.

But how can we prove this? Fortuitously, we have a set of literary texts and inscriptions from the second half of the fourth century which allows us to quantify both the local production of Attica and the imports. Among these data, the most famous is a 329/8 BCE Eleusis inscription, which gives us the amount of grain production in Attica and in its dependent territories. However, there has been a huge debate over these ancient data. Are they reliable? And even if they are, how can we estimate the value of this production for a single year? To evaluate the figures provided by the Eleusis inscription, there exists a document of central importance which has thus far been neglected. For the beginning of the 20th century, we have a series of statistics for agricultural production in the several regions of modern Greece and, incidentally, only for one year, of Attica. These figures are sufficient to allow us to make an estimate of the value of the amounts in the inscription of 329/8. Far from being a year of exceptionally low production, 329/8 appears to have been an average or good year.
With this approach to the Eleusis inscription, we can disprove the contention that Athens was self-sufficient. But beyond the case of Athens, the modern Greek statistics are of extraordinary value because, for a period of c. twenty years, they provide us detailed statistics on the grain, wine, oil, vegetable production of the several regions of Greece. We can thus correlate the modern figures with ancient data, for instance on the high grain productivity of Thessaly, or the very low one in most islands. It thus becomes absolutely clear that, just like in modern times, most ancient Greek communities were forced to trade: the local grain production was inevitably so low, but conversely the wine or oil production potentially so high, that it becomes clear that the life of these communities was simply unthinkable without trade. This is all the more true since we know that in many cases population density was higher in antiquity than it was at the beginning of the 20th century.

Inevitably, this methodology will raise objections. Is it sound to use modern data to estimate ancient production? Should we accept that data on modern Greek agriculture can provide us with a precise picture of ancient Greek agriculture? To the second question, the answer should certainly be no: we know for sure that there has been a considerable evolution over time and that for instance islands like Lesbos or Thasos that produced mainly wine in Antiquity are now covered with olive trees. Many other examples could be provided of this variability of production, even in modern times. And yet there is every reason to answer yes to the first question. It is sound to use modern agricultural data (prior the introduction of fertilizers and mechanization) to evaluate ancient production not because production choices, techniques or even climate would have been the same, but because basic environmental factors such as available agricultural land, land productivity and comparative rainfall differences have remained unchanged.

This paper will provide analyses of three test cases. Beyond these test cases, a systematic data base, allowing the correlation of ancient and modern economic data, should be developed, and this could lead to surprising results in our reading of ancient data.
Josiah Ober (Stanford University), *Explaining performance in the polis system*

Thanks to some recent quantitative projects (e.g. Morris 2005, Kron 2005, Hansen 2006), it is now tolerably clear that in the half-millennium ca. 800-300 B.C., the world of the Greek poleis experienced not only demographic growth, but also sustained growth in per capita consumption. The Greek world was also unusual in being a long-lived and influential civilization organized not as an empire, but as a city-state culture in which competition among many culturally-similar states was constant, and political authority remained highly dispersed. Finally, the Greek world was historically remarkable for its capacity to develop new institutions of great interest to modernity, including egalitarian social relations and republican/democratic forms of state government. At Stanford (in collaboration with other centers), we are assembling several data-bases intended to allow us to better understand how the polis system worked by looking at the distribution and circulation of people, goods, and institutions within the polis system.

-Polis database: derived from Hansen and Nielsen IACP (2004). Codes 1035 poleis according to variables derived from IACP indices, including geographic coordinates, size (area), and institutions. Future work on this data base should focus on a subset of relatively well documented poleis, in order to code institutional features by date.

-Coin hoard database: derived from Thompson, Mørkholm and Kraay IGCH (1973). Codes coins of 80 leading poleis found in ca. 850 archaic/classical hoards, by date of hoard. This is only a proto-type of what we hope will be a much more complete and accurate coin hoard database centered at the ANS.

-Culture-leader database: derived from OCD3 (1999). Codes ca 2600 relatively well known individuals, according to birthplace, workplaces, occupations, and date (all Greco-Roman antiquity). This is a proto-type of what we hope will one day be a more comprehensive data-base, derived from the New Pauly and other sources for ancient biography.
Didier Viviers (Université Libre de Bruxelles), *Demography and ancient towns: questions and difficulties*

Among the subjects in Ancient History for which quantification represents a real difficulty, is demography, especially urban demography. Estimating the size of urban populations in antiquity is dependent on a number of general historical concepts. M. Hansen (2006) recently posed the question of whether the majority of ancient Greeks lived in urban or rural areas. But the answer to this question depends, of course, on the definition of urban. After a brief summary of the principal methods of estimating the urban populations in antiquity, this paper will discuss a well-documented case study; that of the Syrian city of Apamea-on-the-Orontes. This example shows the necessity of a "convergence of evidence", as well as the risks of methods which do not adequately account for differences among human settlements in estimating their populations. Thus, because of the difficulties in quantification, the exploration of population density in ancient settlements leads to questions regarding the nature of urban communities.

*La démographie des villes antiques : enjeux et problèmes*

Parmi les domaines où les difficultés de la quantification en histoire ancienne se font le plus sentir, il y a bien évidemment la démographie, et sans doute plus particulièrement encore la démographie urbaine. De l’estimation des populations urbaines dans l’Antiquité dépendent bon nombre de conceptions historiques générales. Ainsi, M. Hansen (2006) s’est-il récemment interrogé, après d’autres, sur l’endroit où résidait en majorité la population des cités grecques : en ville ou à la campagne ? Mais la réponse que l’on apporte à cette question n’est pas sans lien avec la définition même de la ville, et cela tant pour le monde grec que pour le monde romain. Après avoir fait un bref tour d’horizon des principales méthodes qui permettent d’évaluer les populations urbaines dans l’Antiquité, cette communication s’appuiera sur le cas, particulièrement bien documenté, d’Apamée-sur-l’Oronte pour mettre en évidence la nécessité d’une « convergence d’indices », mais aussi les risques qui résulteraient d’un recours excessif à des paramètres constants qui ne tiendraient pas compte de la nature des établissements humains dans l’estimation de leur population. C’est ainsi, en dépit des difficultés de la quantification, la question de la densité du peuplement des villes antiques qui s’en trouve à nouveau posée et, partant, celle de la nature des communautés urbaines.
Elio Lo Cascio (Università degli studi di Roma la Sapienza) and Paolo Malanima (Università degli Studi Mediterranea di Reggio Calabria), *Per capita GDP in the Roman economy: a revision of the estimates*

Several attempts have been made recently to estimate the GDP (and more specifically per capita GDP) of the Roman Empire, after the pioneering work of Keith Hopkins (1981 and 1995/96) and Raymond Goldsmith (1984 and 1987), notwithstanding the unavoidably conjectural nature of most of the data on which the estimates are built. We will discuss in more detail these new attempts by Peter Temin (2006) and Angus Maddison (2007), looking at their internal logic, the methods they adopted in their choice and assessment of the data and in the techniques of calculation, and the final results they achieved. We will also analyze other recent attempts made by Milanovich, Lindert and Williamson (2007) and by Scheidel and Friesen (2009) to measure distribution of income and inequality in the Roman Empire. By this revision we intend to achieve what seems to us a better-founded and more realistic appraisal of the performance of the Roman economy, in comparison with other pre-modern advanced agrarian economies.
Peter Temin (Massachusetts Institute of Technology, Cambridge), *Price behavior in the Roman Empire*

Prices were stable for approximately three centuries in the late Republic and Early Roman Empire, to the extent that we know what prices were. This stability was followed by several centuries of inflation after 200 CE, in the Late Roman Empire. I explore this price behavior in three ways. I propose new indices of inflation and political instability. I discuss possible factors that can explain the change from one price regime to the other, including the Antonine Plague. And I present evidence and a possible explanation for the apparent stop-and-go process of ancient inflation.
Willem Jongman (Rijksuniversiteit Groningen), *The new economic history of the Roman Empire*

Sir Moses Finley’s ‘cultural turn’ on the ancient economy has been the dominant paradigm of the last few decades: for social and cultural reasons the ancient elite failed to develop an economic mentality and was unwilling to engage in trade and manufacturing. As a result, these sectors of the economy remained small and marginal. No system of interconnected markets developed and thus the economy did not grow. That the ancient economy did not in fact perform very well was taken for granted, and subsequent discussion remained largely limited to explanations for this elite mentality or investigations of the limits to that mentality. Equally, there was broad consensus that the ancient economy was one where modern economic theory did not apply (even Finley’s critics never opened a textbook of economic theory). Finally, there was widespread distaste for quantification, based on the one hand on Finley’s insistence that collecting accurate statistics was not part of the ancient economic mentality, and on the other hand on, I assume, a philologist’s romantic dislike for numbers.

I have argued elsewhere that ancient historians have been wrong to turn their back on economic theory. I also think they were wrong not to investigate empirically the actual performance of the ancient economy before they developed their explanations for its economic failure. Are we really so sure that nothing much changed between archaic Greece, Augustan Rome, and late antiquity, or even the early Middle Ages? In recent years some (mostly economists) have indeed tried to reconstruct Roman GDP and per capita incomes, and though I admire their intellectual ingenuity, I am also concerned since the underlying data really are not very good for such estimates of absolute levels of performance. Moreover, these reconstructions tend to lump data from different periods into one composite and thus necessarily static picture. However, economic growth (if there was any) is precisely a process of change over time.

As an alternative tactic, and in the footsteps of the new economic history of modern times, I have in recent years begun to construct time series of aggregate archaeological datasets. These only rarely give us absolute performance levels, but often they graphically demonstrate that there were large changes over time. Antiquity was not a world of the *longue durée*, where nothing ever changed, and where the mass of the population never escaped from a precarious life near subsistence.
Geoffrey Kron (University of Victoria, Canada), *Comparative evidence and the reconstruction of the ancient economy: Greco-Roman housing and the level and distribution of wealth and income*

In many pre- and early industrial economies, housing has generally ranked just behind food as one of the most significant charges on the income of all but the wealthiest classes in society. Moreover, even today, housing, along with real estate, constitutes the bulk of most families’ personal wealth, and the construction industry not only represents a significant segment of the economy, but also provides a valuable indicator of the pace of economic growth.

Although modern social scientists have used the evidence of housing as a useful proxy for the distribution and level of income in poorly documented societies, and archaeological evidence permits us to reconstruct housing standards for Greeks and Romans from a wide range of social classes in considerable detail, ancient economic historians have only begun to exploit this critical evidence. Ian Morris has argued for a dramatic improvement in Greek living standards between the 9th and the 4th centuries B.C. based upon the increase in the size and cost of housing. Moreover, Wolfram Hoepfner and Ernst-Ludwig Schwander have argued for the social and political significance of the striking egalitarianism in Greek housing. For Rome, Andrew Wallace-Hadrill and Paul Zanker have analyzed housing at Pompeii and Herculaneum, pointing out the existence of a large and relatively prosperous middle-income group. For the most part, however, such studies have failed to move from impressions to a full quantification of their results. Even Wallace-Hadrill’s superb study, which was based upon a carefully compiled survey in which he analyzed his sample to yield fascinating and valuable statistical evidence, left a number of possible avenues of analysis unexplored and eschewed quantitative, as opposed to impressionistic, comparisons with other cultures or historical periods.

In this paper I will examine a number of archaeological samples of Greco-Roman housing as an indicator of the housing, wealth and income distribution in a number of pre- and early industrial cultures. This housing evidence is consistent with the evidence which I have already collected for Greco-Roman mean heights and agricultural productivity, and suggests that the distribution of income in both Greek and Roman society was likely to have been significantly more egalitarian than in most pre-industrial cultures. To cite just one implication of this research, I will argue that the estimates of per capita GDP for the Roman empire proposed by Goldthwaite, Temin, Maddison, Scheidel & Friesen, and by Milanovic, Lindert, & Williamson will need to be adjusted significantly upwards.
Andrew Wilson (All Souls College, Oxford), *Quantifying Roman economic performance by means of proxies: pitfalls and potential*

With an emerging consensus among ancient economic historians that the Roman period saw some (limited) economic growth, the focus of debate has now moved to whether that growth was simply population growth, or whether there was per capita growth as well; when such growth might have occurred, and what drove it and ended it. Answers to these questions would affect to the answers we would give to the question recently posed by Peter Temin and Walter Scheidel of whether such growth was a one-off, unrepeatable effect of the integration of the Mediterranean under Rome, or a process sustained over perhaps two centuries until terminated by exogenous shocks such as the Antonine Plague.

Increasingly, historians and archaeologists are attempting to grapple with these questions by using proxy data that may be thought to have some relation to certain sectors of the economy, or to overall performance. Richard Duncan-Jones, François de Callataÿ (*JRA* 2005), Wim Jongman (*CEHGRW*), Walter Scheidel (*JR-A* 2009), and my colleagues and I myself in the Oxford Roman Economy Project have all tried this approach in various ways. Most of the proxies used have turned out to be problematic in one or another aspect, but this does not invalidate the exercise; probing the reasons for data bias leads to a better understanding of what the evidence actually does show. This paper examines criteria for proxy construction (and presentation, to reduce the misleading effects of graphing often imprecise data). It examines a number of commonly used proxies (shipwrecks, stature, lead and copper pollution, animal bone consumption), looking at their strengths and weaknesses. It also presents some early attempts at constructing new proxies, some of which might hold greater promise but which currently either suffer from small sample sizes (fish-salting capacity, water-mills) or regionally uneven collection policies (building inscriptions), neither of which is an insuperable problem. The different pictures presented by archaeological, literary and documentary data for the same phenomena are compared, and the importance of regional disaggregation stressed. Finally, the paper tackles attempts to compare the trends suggested by several proxies.
Roger S. Bagnall (New York University), *Late Roman data collection*

Modern attempts to quantify aspects of life in the ancient world tend toward pessimism about the extent to which the ancients themselves engaged in such quantification or were interested in and maintained statistics. Taxation is the main exception: 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. There are also signs, however, that at least the later Roman empire did collect statistics not transparently connected with taxation. I will look at the price declarations by guilds and related official documents from the fourth- and fifth-century papyri to try to determine the chain of data collection, its origins, its purposes, and the degree to which we can generalize from this process.
Jean-Pierre Devroey (Université libre de Bruxelles), *Mesurer et compter dans les écrits de gestion carolingiens de part et d'autre des Alpes*

The Carolingian period saw a flowering of medieval administrative writings, before the development of rationality and economic calculation which characterizes the 'practical turn' taken during the 13th c. This paper will examine both the methods and quantitative data available from normative documents concerning the domestic economy of the great landowners, and also from two important 9th c. documents: the polyptyc of Saint-Germain-des-Prés, and the polyptyc of San Colombano di Bobbio. Measure and accountancy indeed offer two markers of the practical rationality at work during the Carolingian period.

La période carolingienne correspond à une efflorescence des écrits de gestion au Moyen Âge, avant le développement de la rationalité et du calcul économique qui caractérise le 'tournant pratique' du XIIIe siècle. La communication examinera en parallèle les méthodes et les savoirs disponibles pour apprendre à mesurer et à compter, les documents normatifs destinés à organiser l'économie domestique des grands propriétaires fonciers et les documents de la pratique, à partir de deux exemples principaux du IXe siècle, les polyptyques de Saint-Germain-des-Prés et de San Colombano di Bobbio. Mesure et comptabilité constituent des marqueurs de la rationalité pratique à l'œuvre à l'époque carolingienne.
Walter Scheidel (Stanford University), *4,000 years of wages and well-being*

Real incomes are a critical measure of human well-being. In recent years, historians have made considerable progress in the comparative study of real wages around the world. As a result, for the period from the thirteenth century CE onward, we are now in a position to compare real wages in a number of European countries as well as in Turkey, India, China, and Japan. Only small and frequently deficient samples of usable evidence have survived from earlier periods, mostly in the Near East. However, despite their various shortcomings, these sources are often sufficient to support rough estimates of real wages. In my paper, I draw on my ongoing collection and analysis of pertinent data from antiquity and the early and high Middle Ages in an attempt order to extend the chronological scope of the historical study of real incomes back to the late third millennium BCE. In some cases, this approach enables us to trace contours of change in the very long run. With only very few apparent exceptions, the available data are consistent with a Malthusian interpretation of pre-modern economic development.