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ECONOMIC RATIONALISM IN FOURTH-CENTURY BCE ATHENS

By PAUL CHRISTESEN

A significant trend in economic history in the past decade has been a growing emphasis on the importance of value systems. As Douglass North and others have pointed out, the incentives embedded in value systems play a critical role in structuring economic activity.¹ This in turn brings economic rationalism to the fore since economic analysis tends to take account of value systems through varying definitions of economic rationalism; different definitions of economic rationalism contain different assumptions, either implicit or explicit, about values. Recent scholarship in ancient economic history has devoted only intermittent attention to the question of rationalism. Simplistic views about value systems, which came into being as a result of the primitivist-modernist schism in the early part of the twentieth century, have yet to receive sufficient critical re-examination. These views, particularly that espoused by Max Weber, and later forcefully re-stated by Moses Finley, continue to exert a subtle but important influence. Weber and Finley rejected income-maximizing *homo economicus* and sought to replace him with status-maximizing *homo politicus*, at least within the bounds of pre-modern Europe. A re-examination of economic rationalism in classical antiquity is therefore a matter of some importance.

After a review of the relevant terminology and scholarship, evidence for the existence of income-maximizing economic rationalism in fourth-century Athens is presented. This evidence is important because credible documentation of the operation of this form of economic rationalism in ancient Greece has heretofore been lacking. In the absence of such documentation, Weber and Finley's views on rationalism have remained largely unchallenged despite the widely shared

¹ On the importance of value systems in economics, see A. Denzau and D. North, 'Shared Mental Models: Ideologies and Institutions', *Kyklos* 47 (1994), 3–31 and D. North, 'Economic Performance Through Time', *American Economic Review* 84 (1994), 359–68. All dates are BCE unless otherwise indicated. All translations of ancient Greek texts are my own. All currency amounts have been converted to *drachmai* for ease of comparison. I would like to thank Edward Harris, Meir Kohn, Joel Mokyr and Jeremy Rutter for their suggestions about earlier drafts of this article.

opinion that those views contain important flaws.² Future work in ancient economic history should include the development of a more nuanced understanding of economic rationalism and a greater stress on value systems. The discussion concludes with a brief consideration of how these goals might be achieved.

Terminology

While the literature on economic rationality is voluminous and complex, a classification scheme suggested by Shaun Hargreaves Heap clarifies the issues nicely.³ Hargreaves Heap divides economic rationality into three categories: instrumental, procedural, and expressive. Instrumental rationality assumes that each decision-maker possesses a well-defined set of preferences, which are consistently employed in selecting the best use of limited resources. *Homo economicus* represents a special case of instrumental rationality in which income maximization occupies a privileged place in the preference hierarchy. Procedural rationality assumes that each agent is bound by a set of widely shared norms and rules that define behaviour. Societally imposed means and ends shape decision-making, and rationality consists of becoming familiar with and employing norms and rules. *Homo politicus* represents one possible version of procedural rationality, in which social status is the defined end, and warfare, politics and agriculture the permitted means.⁴ Finally, expressive rationality assumes that individual agents are self-consciously reflexive about their preferences *and* that they are sensitive to societal norms.

Expressive rationality describes real world economic decision-making

² There is a growing body of scholarship impugning the deductions Weber, Finley *et al.* made based upon the assumption that *homo politicus* accurately described value systems in classical antiquity. See, for example, A. Bresson, *La cité marchande* (Bordeaux, 2000). The problems associated with the basis of those deductions have, however, not been addressed with the same vigour.

³ For this terminology, see S. Hargreaves Heap, *Rationality in Economics* (New York, 1989), 1–11. The definitions given by Hargreaves Heap have been slightly modified in order to make them more directly relevant to the issues discussed here.

⁴ Procedural rationality is not equivalent to Herbert Simon's bounded rationality. The latter consists of individually developed decision-making shortcuts serving as a substitute for instrumental rationality in an environment where information costs make consideration of all potential options too high. Simon's notion of 'bounded rationality' does not represent a fundamental critique of instrumental rationality because it is based on the assumption that individuals would like to employ income-maximizing instrumental rationality but are unable to do so because of cognitive limitations. On bounded rationality, see Simon's *Models of Man* (New York, 1957), 196–206.

processes much more accurately than either of the alternatives. Insofar as the evidence presented below calls into question the existence of *homo politicus*, at least in the specific context of ancient Greece, there is no need to subject this concept to substantial criticism here. The assumptions underlying *homo economicus* have been proven false on a theoretical basis by Amartya Sen (among others) and on a practical basis through the behavioural experiments conducted by Robert Frank and others. Economists are fully aware of these critiques, yet continue to make use of income-maximizing instrumental rationality.⁵ Their response is to be attributed to unsolved methodological problems. The behaviour of the expressively rational individual may respond to either individual predilections or societal expectation, and usually responds to both. This makes preferences difficult to model and to express quantitatively. Over the course of the past two decades, economists have attempted mathematically to reproduce the complexities of expressive rationality. While approaches such as game theory have shown promise, substantial problems remain.⁶ In the absence of a satisfactory resolution, *homo economicus* continues to be indispensable. This is particularly the case in positive and normative economics where the focus is on predicting or generating outcomes. Income-maximizing instrumental rationality permits economists to build and to test quantitative models. *Homo economicus* is, for their purposes, good enough.

The situation is very different for studies, such as those typically associated with economic historians and anthropologists, which focus on description rather than prediction and which are qualitative rather than quantitative. While it is in the abstract true that such studies might be purely empirical, the reality is that the need to select material for inclusion, the desire to provide causal explanations, and the paucity of information about the motivations of individual economic agents almost

⁵ For these critiques, see A. Sen, 'Rational Fools: A Critique of the Behavioural Foundations of Economic Theory', in H. Harris (ed.), *Scientific Models and Man*, (Oxford, 1979), 1–26 and R. Frank, *Choosing the Right Pond* (New York, 1984).

⁶ There does not appear to be a recent survey of the various methodologies currently under discussion. Much of the relevant work has been published in the *Journal of Economic Perspectives*. The treatment of the current status of rationality in economics found here is based in part on personal communications from Duncan Foley of the Graduate Faculty of the New School for Social Research in New York. For a representative example of the sort of work currently being done in this area, see V. M. Darley and S. A. Kauffman, 'Natural Rationality', *Sante Fe Institute Studies in the Sciences of Complexity* 27 (1997), 45–80. For a more detailed discussion of the reasons why economists have continued to use instrumental rationality, see H. Margolis, *Selfishness, Altruism, and Rationality* (Cambridge, 1982), 1–25. Friedman, following Keynes, defines positive economics as the study of what is, normative economics as prescriptive (*Essays in Positive Economics* (Chicago, 1953), 3).

inevitably bring economic rationalism into the picture.⁷ Insofar as economic historians and anthropologists are interested in achieving as high a degree of accuracy as possible, the verisimilitude of their assumptions is much more critical than in positive and normative economics. At the same time, no account, either historical or ethnographic, can hope to capture the full complexities of real-world economic activity, even in those instances where sufficient documentation is available. Some simplification is needed, but of a type that introduces minimum distortion while providing a high degree of clarity. Expressive rationality offers precisely the sort of flexible approach that serves both ends. Approaches along the lines of expressive rationality have become relatively common in economic anthropology in the last ten years, but remain rare in studies of economic activity in classical antiquity.⁸ The absence of discussion about expressive rationality among ancient economic historians is part of a larger pattern. Ancient economic historians have in recent decades paid scant attention to economic rationalism of any kind. Yet economic rationalism is implicitly a factor in much of the relevant scholarship, both past and present. In order to understand why this is the case, a brief historiographical review is necessary.

Previous Work

Ancient economic history as a discipline emerged in the early nineteenth century, when the analytical approach delineated by Adam Smith and his successors was very much in vogue. Smith *et al.* took the existence of *homo economicus* to be universal. Most early work on the economies of classical antiquity assumed implicitly or explicitly that this form of economic rationalism played a dominant role in shaping economic activity.⁹ A very different approach, closely associated with Karl

⁷ For an excellent discussion of the inherent limitations on empiricism and the role of rationalism, see L. Doyal and R. Harris, *Empiricism, Explanation, and Rationality* (London, 1986), 1–26.

⁸ See, for example, the introduction to and studies contained in J. Parry and M. Bloch (eds.), *Money and the Morality of Exchange* (Cambridge, 1989).

⁹ On the work of Smith and his intellectual descendants, see R. H. Campbell and A. S. Skinner, 'Introduction to Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations*', (Indianapolis, 1981), 1–66, S. Gordon, *The History and Philosophy of the Social Sciences* (London, 1991), 111–210, and H. Landreth and D. C. Colander, *History of Economic Theory*, 2nd ed. (Boston, 1989), 42–235. *Wealth of Nations* is a complex text with many nuances that cannot be addressed here. In addition, Smith's specifically economic work needs to be read alongside his *Theory of Moral*

Bücher and Max Weber, developed in Germany in the latter half of the nineteenth century. Bücher and Weber argued that the particular form of instrumental rationality assumed by Smith to be universal was a historically recent phenomenon. This is the source of Weber's famous distinction between *homo economicus* and *homo politicus*.¹⁰ Bücher and Weber's articulation of procedural rationality, as re-stated and enlarged upon by Moses Finley, remains in many ways the standard description of economic rationalism in the ancient world.¹¹

More recent scholarship dealing directly with the question of economic rationalism in the ancient world has tended to focus on behaviour without explicitly treating the value system shaping that behaviour. The scholars involved in this research have for the most part examined economic rationalism in the context of Roman estate management. In an article from 1983 on economic rationality in Columella's hypothetical vineyard in particular and in the Roman economy in general, Andrea Carradini argues that high transportation costs and other obstacles limited the operation of the market and thus the ability of estate owners to raise crops intended for sale.¹² When cultivating agricultural

Sentiments, where a different perspective on human nature is proposed. Ancient economic history is something of a special case in that the prevailing methodologies and views in the field respond more to the ideas Smith articulated in *Wealth of Nations* and nineteenth-century elaborations of those ideas than the concepts found in *Theory of Moral Sentiments* or twentieth-century work on economic rationality. (For modern-day economists, income-maximizing rationality is much more closely associated with the work of Friedrich von Hayek and Milton Friedman than that of Smith.) Those particular facets of Smith's work that have influenced ancient Greek economic history are highlighted here. This approach tends to exaggerate the importance of income maximization in the *Wealth of Nations*. On this subject, see H. Thomson, 'The Scottish Enlightenment and Political Economy', in S. Todd Lowry (ed.), *Pre-Classical Economic Thought* (Boston, 1987), 221–55.

¹⁰ For information on Bücher's scholarship, see M. M. Austin and P. Vidal-Naquet, *Economic and Social History of Ancient Greece*, translated by M. M. Austin (Berkeley, 1977 (1973)), 1–8, W. Nippel, 'Max Weber's *The City* Revisited', in K. Raafaub, J. Emlen and A. Molho (eds.), *City-States in Classical Antiquity and Medieval Italy* (Ann Arbor, 1991), 19–30 and E. Will, 'Trois quarts de siècle de recherches sur l'économie Grecque antique', *Annales économiques, sociétés, civilisations* 9 (1954), 7–22. For information on Weber's scholarship, see C. Antoni, *From History to Sociology: The Transition in German Historical Thinking*, translated by Hayden White (Detroit, 1959 (1940)), 119–84, H. Bruhns, 'La cité antique de Max Weber', *Opus* 6/7 (1987/88), 29–42 and T. Parsons, 'Introduction to Max Weber's *The Theory of Social and Economic Organization*', (New York, 1947), 3–86.

¹¹ For Finley's (re-)statement of procedural rationality, see *The Ancient Economy*, updated 2nd ed. (Berkeley, 1999), 95–122 and *passim*. For a discussion of the continuing influence of earlier scholarship, see Austin and Vidal-Naquet (n. 10) and S. C. Humphreys, *Anthropology and the Greeks* (London, 1978), 136–58. For general background information on the last quarter century of literature on the ancient Greek economy, see I. Morris, 'The Athenian Economy Twenty Years After *The Ancient Economy*', *CP* 89 (1994), 351–66 and Foreword to updated 2nd edition of Finley's *Ancient Economy*, ix–xxxvi.

¹² 'Columella's Vineyard and the Rationality of the Roman Economy', *Opus* 2 (1983), 177–204. In an article that appeared just after Carradini's ('The Price of Agricultural Land in Roman Italy and the Problem of Economic Rationalism', *Opus* 4 (1985), 77–109), P. W. de Neeve pursued

products that were marketable, estate owners sought to maximize profits through raising productivity and cutting costs. Since market prices existed for such products, rough calculations of profitability could be and were carried out. At the same time, much if not most of the production on estates was intended for internal consumption. Because this category of crops was not regularly marketed, profitability was impossible to establish, which in turn sharply circumscribed the importance of income-maximizing rationality.

Dominic Rathbone proposes a less qualified definition of economic rationalism in his examination of the Heroninos archive, a collection of records from a very large estate owned by one Appianus in third-century AD Egypt. In the minute calculations of production expenses found in those records, Rathbone believes that there is evidence of economic rationalism driven by the desire for profit maximization.¹³ There is, however, a problem with this conclusion. As Dennis Kehoe points out in his review of Rathbone's work, the relatively small size of the commercial sector and the extent of their fortunes left very wealthy Romans such as Appianus no choice but to put the majority of their wealth into land. Investment in land was therefore not a matter of rational choice, though neither was it irrational. There was no choice at all involved. Within the parameters imposed by the structure of the Roman economy, estate owners such as Appianus sought to maximize profits. But this does not mean that Appianus could be accurately described as *homo economicus* since there had been no weighing of alternative investments.¹⁴

The most recent work to address economic rationalism in the ancient economy can be found in an article by Peter Temin that seeks to prove that the early Roman empire was 'an enormous conglomeration of

many of the same issues as Carradini. Based on his examination of land prices, de Neeve explicitly agreed with Carradini's conclusions about rationality. Economic rationalism is also touched on, though no firm conclusions are reached, in N. Morley's *Metropolis and Hinterland: The City of Rome and the Italian Economy, 200 B.C.-A.D. 200* (New York, 1996), 15, 58–9, 71–7, 90–5. Robin Osborne, 'Pride, Prejudice, Sense and Sensibility', in John Rich and Andrew Wallace-Hadrill (eds.), *City and Country in the Ancient World* (London, 1991), 119–45, has argued for the importance of income maximization in the context of estate management in Athens, but in so doing does not directly address the question of rationalism and does not consider the economy as a whole. In this respect his work is much like that of Carradini and de Neeve.

¹³ *Economic Rationalism and Rural Society in Third-Century A.D. Egypt: The Heroninos Archive and the Appianus Estate* (Cambridge, 1991). This conclusion is most clearly stated on 401.

¹⁴ For Kehoe's review, see *JRA* 6 (1993), 476–84. Kehoe calls this circumscribed rationality 'bounded rationality', giving the term a slightly different meaning from Simon. This conclusion is buttressed by Kehoe's own, quite extensive work on Roman estate management, including 'Allocation of Risk and Investment on the Estates of Pliny the Younger', *Chiron* 18 (1988), 15–42 and *Investment, Profit, and Tenancy* (Ann Arbor, 1997), 18–20 and 218.

interdependent markets'.¹⁵ Temin applies a tripartite system of behavioural classification to Rome. This system categorizes behaviour under three headings: instrumental, customary, and command. Instrumental behaviour is rational in that 'a person or firm in the instrumental mode acts consistently in the sense that no sequence of his actions leads to an outcome that is in conflict with an outcome reached by a different chain'. *Homo economicus* and the profit-maximizing firm are given as specific examples. Customary behaviour reproduces patterns of activity created by habit or custom, while command behaviour 'consists of either issuing or following orders to perform or to refrain from performing a specific action'.¹⁶ Temin argues that the interaction of personal autonomy and pace of external change affect what kind of behaviour will be exhibited. He matches his tripartite division with Polanyi's reciprocity, redistribution, and market exchange, and argues that instrumental behaviour is employed in market exchange, customary behaviour in reciprocal exchanges, and command behaviour in redistribution.¹⁷

There are a number of difficulties with the model as employed and in its application to the study of the effect of value systems on economic activity. In regard to the former, Temin himself recognizes that the mode of behaviour applied in specific types of situations varies on an individual and cultural basis. Furthermore, individuals are habitually driven by a range of motivations even within the bounds of a single exchange. It is, therefore, far from clear that the match between behavioural modes and types of exchange is a particularly good one.¹⁸ In regard to the study of the value systems and economic activity, the model is problematic in that it takes the degree of personal

¹⁵ 'A Market Economy in the Early Roman Empire', *JRS* 91 (2001), 169–93. The quote refers to Finley's assertion (in the *Ancient Economy*, 22) that markets of the kind familiar from modern industrialized economies were entirely lacking in the ancient world. Temin's arguments to the contrary are provocative, but cannot be examined here. Ian Morris has recently written a lengthy review of how the issue of economic gain is treated in various disciplines and has analyzed the Solonian land crisis using a neoclassical economic model in which income-maximization is taken to be the goal of the individuals involved (though Morris does not explicitly state this to be the case). This article ('Hard Surfaces', in P. Cartledge, E. Cohen and L. Foxhall (eds.), *Money, Labour and Land: Approaches to the Economies of Ancient Greece* (London, 2002), 8–43) does not, however, make any attempt to discuss value systems.

¹⁶ Peter Temin, 'Modes of Behavior', *Journal of Economic Behavior and Organization* 1 (1980), 175–95 at 175 and 176, respectively.

¹⁷ Temin also uses the existence of variable prices as a test for the existence of the market. For Polanyi's categories, see *Trade and Market in the Early Empires* (Glencoe, Ill., 1957), 250–6. The best single source on Polanyi's work is Humphreys (n. 11), 31–75.

¹⁸ The disjunction between value systems and modes of exchange has been thoroughly treated by economic anthropologists. See, for example, P. Bourdieu, *Outline of a Theory of Practice*, translated by R. Nice (Cambridge, 1977 (1972)), 171–83 and *passim*.

autonomy as a variable that exists without explanation. Temin's model, therefore, is less helpful than it might be in the study of economic rationalism in the ancient world.¹⁹

The treatment of economic rationalism in the other relevant scholarship of recent vintage – that of Carradini *et al.* – is not problematic methodologically, but it is incomplete in two important ways.²⁰ First, limits on the operation of Smithian economic rationalism are proposed, but those limits exist outside the volition of the individual. This precludes the need to take value systems into account. Important questions about economic rationalism in the ancient world are therefore left unasked. Second, this body of scholarship considers economic rationalism solely within the context of Roman estate management. While this was undoubtedly a critical form of economic activity in the ancient world, there is a lack of variety both in temporal and in organizational terms. More importantly, the structural limitations that compelled individuals such as Appianus to concentrate on agriculture are difficult to separate from behavioural restrictions imposed by adherence to societal norms. It would be instructive to examine a situation in which individuals were given the option to select from among a range of different economic activities, not all of which were contained within the sphere of the procedurally rational.

Fourth-century Athens represents just such a situation. The non-agricultural sector of the economy offered a variety of investment opportunities. The wealth at the disposal of élites was limited enough to permit individuals to choose among those opportunities. The availability of a large body of literary, epigraphic, and archaeological evidence makes it possible to study those choices in some detail. The following discussion begins by examining the process of silver-mining in

¹⁹ It should be noted that this does not invalidate Temin's model in a general sense. Models should be constructed with a specific problem-solving purpose in mind. Temin's model is not suitable to issues under discussion here.

²⁰ In this body of scholarship, economic rationalism is discussed almost exclusively in terms of the presence or absence of instrumental, income-maximizing rationality. The one exception can be found in Carradini's astute observation that Finley and others take *homo economicus* and *homo politicus* as descriptive terms rather than analytical assumptions. Two explicitly unrealistic concepts thus come to stand for the realities of modern and ancient economic activity. The stark contrast that results is, inevitably, misleading. Carradini seems to be suggesting something along the lines of expressive rationality, but does not pursue this line of thought. This scholarship does not otherwise explicitly address economic rationalism in larger terms.

Many of the numerous recent studies of ancient Greek agriculture have (largely implicitly) employed the assumption that farming regimes were driven by a maximizing impulse of one kind or another. These studies do not, however, directly address the question of economic rationality. Paul Cartledge points this out in passing in a review article, 'The Economy (Economies) of Ancient Greece', *Dialogos* 5 (1998), 4–24.

the Laurium region of southern Attica. This leads to the conclusion that the individuals running these mines were driven by income-maximizing instrumental rationality. Investment in silver mining is then contextualized within the economy of fourth-century Attica as a whole. The available information suggests that income-maximizing rationalism played an important role not only in shaping activity *within* specific spheres such as silver mining, but also in choices *among* various investment opportunities. The conclusion to be drawn is not that fourth-century Athenians were motivated solely by a drive to achieve income maximization. Rather, the point is that expressive rationality should be the base assumption in ancient economic history.

Silver Mining

The extant evidence pertaining to silver-mining in Attica is unusually rich. Extensive archaeological remains are supplemented by inscriptions stretching from roughly 367 to the end of the fourth century which record the leasing of mineral rights by the Athenian state. There are, in addition, detailed surveys of the mining region due to the fact that the discarded ore and slag heaps generated by ancient exploitation of the mines were re-worked during the nineteenth and twentieth centuries AD. Finally, there are cost estimates in the painstaking work of Constantin Conophagos.²¹

²¹ On Attic silver mining in general, see C. Conophagos, *Le Laurium antique* (Athens, 1980), J. K. Cunningham, 'The Silver of Laurion', *G&R* 14 (1967), 145–56, M. Faraguna, 'Atene nell'età di Alessandro: Problemi politici, economici, finanziari', *Atti Della Accademia Nazionale Dei Lincei* 2 (1992), 167–447, J. Ellis-Jones, 'The Laurion Silver Mines', *G&R* 29 (1982), 169–83, N. Gale and Z. Stos-Gale, 'Lead and Silver in the Ancient Aegean', *Scientific American* 244 (1981), 176–92 and 'Cycladic Lead and Silver Metallurgy', *ABSA* 76 (1981), 169–224, G. Heinrich, 'Das Erzgebirge von Laureion und seine Silberbergwerke', in H. Kalcyk, B. Gullath and A. Graeber (eds.), *Studien zur alten Geschichte*, 3 vols. (Rome, 1986), II: 399–411, R. J. Hopper, 'The Laurion Mines: A Reconsideration', *ABSA* 63 (1968), 293–326 and *Trade and Industry in Classical Greece* (London, 1979), 164–89, S. Isager and M. H. Hansen, *Aspects of Athenian Society in the Fourth Century B.C.*, translated by J. Hsiang (Odense, 1975 (1972)), 42–50 and H. Kalcyk, *Untersuchungen zum attischen Silberbergbau* (Frankfurt, 1982).

On the mining leases, see M. Crosby, 'The Leases of the Laureion Mines', *Hesperia* 19 (1950), 189–312 and 'More Fragments of Mining Leases from the Athenian Agora', *Hesperia* 26 (1957), 1–23, and M. Langdon, 'The *Poletai* Records', *Athenian Agora* XIX (1991), 55–143, as well as G. G. Aperghis, 'A Reassessment of the Laurion Mining Lease Records', *BICS* 42 (1997/98), 1–20, R. J. Hopper, 'The Attic Silver Mines in the Fourth Century B.C.', *ABSA* 48 (1953), 200–54, K. Shipton, 'The Prices of the Athenian Silver Mines', *ZPE* 120 (1998), 57–63 and D. Vanhove, 'Aristote et les mines du Laurion', *AC* 65 (1996), 243–9.

A mining engineer who worked in the Laurium region, Conophagos retired to become a university instructor. After his move into academia, Conophagos collected a mass of precious information from the archives of the companies that had operated in the Laurium region during the nineteenth and twentieth centuries. He built a working beneficiation installation as well as a smelter and excavated

The argentiferous ore in the Laurium region consists of cerusite (PbCO_3) and galena (PbS). The silver is contained in the lead compounds so that the mining process consisted of extracting and refining lead ores. (About 2 kilograms of silver were present in each metric ton of lead.) While cerusite and galena in their pure state have lead contents of 77.5% and 86.6% respectively (and correspondingly high silver content), the ore found in Attica contained a large percentage of elements not of interest to the ancients such as silicates and zinc. As a result the typical ore had a total lead content of about 20%.²²

The extraction process began with the cutting of a narrow gallery. When the miner located a vein containing lead-bearing ore, the gallery was enlarged and the sortation process begun. The lead content of the ore could be easily judged because the weight of the ore was affected by the presence of this very heavy element. Miners left any ore containing less than approximately 7% lead in the gallery. The rest was carried to the surface where it was sorted again. Pieces of ore containing more than about 30% lead were sent directly to the smelting furnace while those with lead contents between 7% and 30% were sent to a workshop for beneficiation (enrichment).²³

Figures 1–2 show a plan of an installation used to beneficiate ore and a reconstruction of such an installation in use. As the pieces of ore arrived, they were ground up and milled until reduced to grains about 1mm in diameter. The grains were then poured into wooden sluices stretching from the reservoir (a) to a channel (d). These sluices were located under plugged holes in the reservoir wall. When those plugs were removed, the water in the reservoir ran over the ore in the sluices. The heaviest grains

mining sites in the Laurium region. On the importance of Conophagos' work, see E. Photos-Jones and J. Ellis-Jones, 'The Building and Industrial Remains at Agrileza, Laurion (Fourth Century BC) and Their Contribution to the Workings at the Site', *ABSA* 89 (1994), 307–58.

²² For the geological background, see Conophagos (n. 21), 155–66 and Photos-Jones and Ellis-Jones (n. 21). For the extraction process, see Conophagos, 123–37, 167–212 and Cunningham (n. 21). For beneficiation, see Conophagos, 125–37, 213–73, 375–96, H. Mussche and C. Conophagos, 'Ore Washing Establishments and Furnaces at Megala Pevka and Demoliaki', in *Thorikos 1969*, edited by H. Mussche and J. Bingen (Brussels, 1973), 61–72 and Photo-Jones and Ellis-Jones (n. 21). For the smelting process, see Conophagos, 125–37, 274–304. For the cupellation process, Conophagos, 125–37, 305–40, Gale and Stos-Gale 'Lead and Silver in the Ancient Aegean' (n. 21) and R. J. Forbes, *Studies in Ancient Technology*, 9 vols. (Leiden, 1955–1964), VIII: 172–7, 226–38.

²³ A number of such workshops located in southern Attica have been excavated. The best published is the complex at Agrileza, on which see J. Ellis-Jones, 'Laurion: Agrileza, 1977–1983: Excavations at a Silver Mine Site', *AR* 31 (1984/5), 100–23 and 'The Planning and Construction of Attic Ergasteria', in A. Hoffman *et al.* (eds.), *Bautechnik der Antike*, (Mainz am Rhein, 1991), 107–15. For a careful analysis of the mining resources around Agrileza, see H. Kalcyk, 'Nape: Ein Beitrag zur Topographie des antiken Laureion', in H. Kalcyk, B. Gullath and A. Graeber (eds.), *Studien zur alten Geschichte*, 3 vols. (Rome, 1986), II: 465–8.

(containing the most lead) remained in the sluice while the rest were carried with the water into the channel (d). The installation was slightly inclined so that the water ran around the edge in a counterclockwise fashion. As it passed over two deep basins (e), the heavier grains settled out of the water and collected in the bottom of the basins. The contents of the sluice as well as the first two basins (e) were placed on the flat surface in the middle (c) to dry.

This process was extremely effective. The ore dried on surface c contained about 50% lead while the dross, which was removed from the final basin (f) and disposed of, contained only 7% lead. The enriched grains of ore were consolidated into bricks and sent to a smelting furnace. These bricks (along with the high grade chunks of ore sent directly from the mine) were placed in the furnace together with alternating layers of charcoal. When the charcoal was lit, the ore liquefied and dripped into a trough at the bottom of the furnace. The lead (with the silver completely dissolved in it) and the remaining impurities (gangue) were easily separated by skimming because the liquid lead was three times heavier than the gangue. The molten lead was poured into moulds and sent to a cupellation furnace.

The cupellation process removed the silver from the lead. In order to do so, it was necessary to re-melt the lead and direct a strong current of air over the surface of the crucible (cupel) in which the silver-bearing lead was melted. This produced an oxidizing environment in which the lead was converted to lead monoxide while the silver, much less prone to react with oxygen, separated out and sank to the bottom of the crucible. The lead oxide (litharge) was removed by skimming or by forced crystallization induced through the insertion of cool iron bars. The silver was then removed.

The issue of interest here is the beneficiation stage. From a strictly metallurgical perspective, this stage was completely unnecessary. It was entirely possible to smelt all the ore (not just the high-grade ore containing more than 30% lead) without prior enrichment.²⁴ Yet there

²⁴ Recent work by Evangelos Kakavoyannis has shown that the earliest beneficiation workshops in the Laurium region were built at the end of the sixth century. All the silver ore mined in Laurium prior to that time was not enriched prior to smelting. For this information, see Kakavoyannis, 'The Silver Ore-Processing Workshops in the Laurium Region', *ABSA* 96 (2001), 365–80. The addition of the beneficiation stage fundamentally changed the economics of silver mining in Attica by making it possible for the first time to process at a profit relatively low-grade ore. The windfall from silver-mining that funded Athens' first large fleet of triremes in the early part of the fifth century ([Arist.] *Ath.* 22.7) may well have had as much to do with the construction of the earliest beneficiation installations as with the location of new veins of ore.

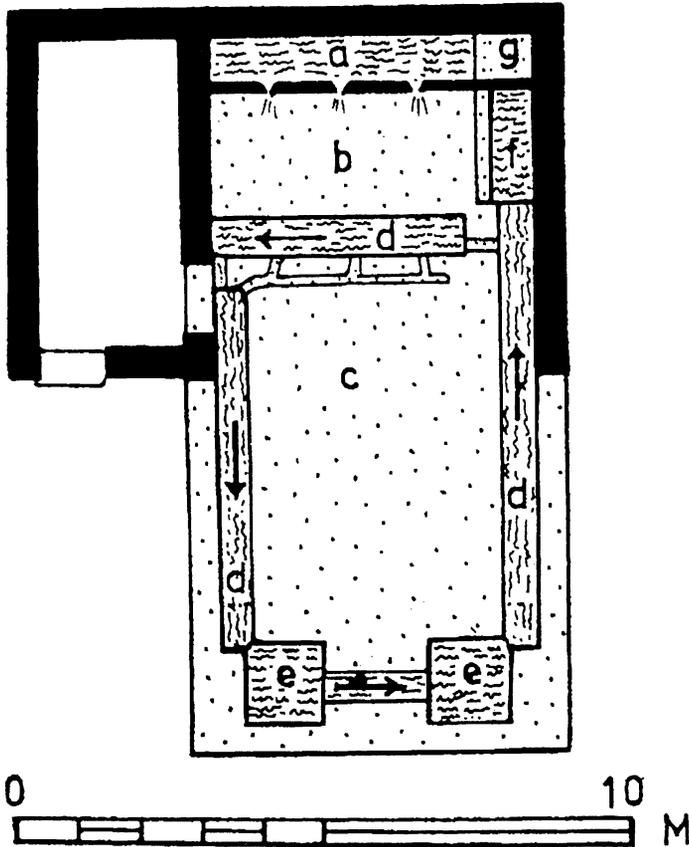


Figure 1. Drawn from J. Ellis-Jones, 'Laurion: Agrileza, 1977–1983: Excavations at a Silver-Mine Site', *Archaeological Reports* 31 (1984): 106–23. Reproduced with permission of the British School at Athens and Prof. J. Ellis-Jones.

are thirty preserved beneficiation installations in the Laurium region, and the mining leases mention eighty-three others. Furthermore, these installations represented considerable investments due to the costs of construction and of purchasing the slaves necessary for operation (about 15 per workshop).²⁵ Why did they exist?

²⁵ Some sense of the expenses involved can be obtained from SEG xxxii.236, D. xxxvii (4, 12–13) and J. Ellis-Jones and S. D. Lambert, 'Two Security Horoi from Southern Attica', *ZPE* 125 (1999), 131–6, which gives the text of two *horoi* found at a washery at Agrileza in southern Attica. These sources indicate that beneficiation workshops were valued well in excess of 6,000 *drachmai*.

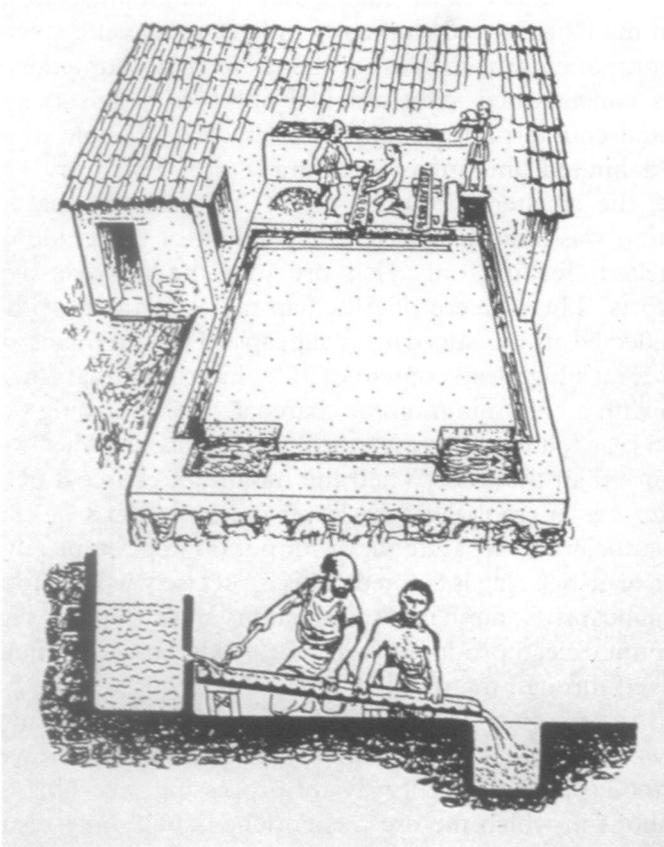


Figure 2. Drawn from J. Ellis-Jones, 'Laurion: Agrileza, 1977–1983: Excavations at a Silver-Mine Site', *Archaeological Reports* 31 (1984): 106–23. Reproduced with permission of the British School at Athens and Prof. J. Ellis-Jones.

The answer is that the beneficiation process substantially increased the profits derived from silver mining. Conophagos' calculations demonstrate that the gross profits of silver mining in Attica in the fourth century were about 70dr per ton of ore.²⁶ Expenses (in cases where ore was beneficiated) ran about 38dr per ton, leaving a net of 32dr per ton. Conophagos shows that if Athenian mine operators had not beneficiated the less-rich ore, costs would have soared to 61dr per ton. The reason for this 23dr per ton difference lay in the costs of smelting and cupellation. Even though crushing and concentrating entailed a certain

²⁶ On this subject, see Conophagos (n. 21), 213–73, 341–59.

amount of expense as well as small losses of lead and silver, both were more than made up by reduced costs in later processing stages.

A key component was the cost of the charcoal consumed in smelting. Ore in its concentrated state weighed about 80% less than its non-concentrated counterpart. Beneficiation made it possible to smelt and cupellate a limited amount of high-grade ore. For every kilo of ore processed, the smelter consumed about 200g of charcoal.²⁷ As fuel consumption was almost entirely independent of the grade of the ore being smelted, feeding only rich ore into the furnace significantly reduced costs. The concern of Athenian mine operators with charcoal costs is reflected in the surviving slagheaps. These remains of ancient smelting reveal a high lead content of 10%, indicating that smelters were being run with a bare minimum of charcoal. The reasoning behind this conclusion is as follows. Silver is much more easily chemically separated from the ore than the lead. When the minimum charcoal necessary to liquefy the ores is employed, the lower concentrations of carbon-rich gases are sufficient to separate the silver but do not completely treat the lead, and a lead-rich slag is created. This is precisely what is found in the ancient slagheaps. Conophagos' calculations show that the slight losses in the amount of lead produced were of considerably less value than the money saved through the reduction of charcoal costs.²⁸

Even in the absence of the evidence provided by the ancient slag heaps, it would be clear that Athenian mine operators were very much aware of the costs of different ways of processing ore. This is because the workshops in which the ore was enriched could only result from a careful cost analysis. This is a point that merits emphasis. Simply put, the numerous workshops in the Laurium region, the existence of which is documented both archaeologically and epigraphically, are without doubt the product of rational analysis employed in pursuit of income maximization. Their presence indicates that Athenians weighed different approaches to conducting the mining of silver and were willing to invest time, energy, and money and to utilize relatively advanced technology in order to achieve higher rates of return on their investment. Stronger evidence for the operation of rational decision-making in the

²⁷ Charcoal consists of processed wood. Depending on the nature of the wood used and the quality of the finished product, five to ten grams of wood were needed to produce a single gram of charcoal. Every kilogram of ore therefore required the processing of at least an equal amount of wood. On the production of charcoal and the reasons for its importance in metalworking, see D. S. Olson, 'Firewood and Charcoal in Classical Athens', *Hesperia* 40 (1991), 411–20. On charcoal prices in antiquity, see G. Glotz, 'Le prix des denrées à Delos', *JRS* 11 (1913), 16–29.

²⁸ On this subject, see Conophagos (n. 21), 274–304.

pursuit of income maximization would be difficult to imagine. But this evidence proves the importance of income maximization only within the sphere of silver mining. It does not prove that Athenians chose to invest money in the silver mines after a careful evaluation of the risk and return associated with alternative forms of investment. To consider this question, other categories of evidence must be examined. Before doing so, however, one further observation about silver mining is apposite.

Income maximization in silver mining presents an immediate contrast with the same approach applied to land-ownership, in that it involved voluntary deviance from the procedurally rational norms postulated by Weber and Finley. Very wealthy Romans were compelled to put the bulk of their assets into land. No such compulsion drove investors into the Attic silver mines.²⁹ The identity of those active in the silver-mining business is an important question in this regard, since non-citizens, especially non-Greeks, must have been less bound by societal norms and less concerned with local sanctions that helped buttress those norms. To begin with, there is good anecdotal evidence that, at any given time, some of the wealthiest citizens in Athens were active in silver mining.³⁰ In this particular case, it is possible to go beyond anecdotes because the Athenian state maintained control over sub-surface mineral rights. The mine-leasing inscriptions provide the names of more than three hundred individuals who owned land in the mining area or who purchased mining rights.

Kirsty Shipton has studied the socio-economic background of these individuals in great detail. She finds that at least 12% and perhaps as much as 20% of the men who purchased mining leases were part of the wealthy élite among the Athenian citizen body.³¹ This is roughly double their actual numbers in the citizen body as a whole. Shipton performs a similar analysis for individuals found in fourth-century leases of public land in Attica and finds the proportion of wealthy élite citizens to be much smaller than in the mine leases. While it is necessary to be cautious

²⁹ This is apparent for a number of reasons, not the least of which is the geographic bias noted by Osborne. If wealthy Athenians had no other place to invest, no geographic bias should have arisen. The relatively small size of family fortunes in Attica is also relevant in this regard.

³⁰ The relevant passages include *Plu. Nic. iv 2, Hyp. iv 35 and Dem. xlii 20.*

³¹ *Leasing and Lending: The Cash Economy in Fourth-Century BC Athens* (London, 2000). For a brief summary of this study, see K. Shipton, 'Money and the Élite in Classical Athens', in A. Meadows and K. Shipton (eds.), *Money and Its Uses in the Ancient Greek World* (Oxford, 2001), 129–44. See also S. Ito, 'Pheidippos, An Athenian Miner: A Note on the *Poletai-Inscriptions*', in H. Kalcyk, B. Gullath and A. Graeber (eds.), *Studien zur alten Geschichte*, 3 vols. (Rome, 1986), II: 454–61. Shipton defines the wealthy élite as those who are known to have performed the most expensive liturgies (funding triremes and dramatic choruses).

about concluding that élites preferred investments in the silver mines to investments in land, there is every indication that they certainly did not avoid placing their money in the mining business and were not troubled by having their names listed in public inscriptions that identified them as active in this sphere of economic activity. It is also of interest to note that there was, as Robin Osborne has observed, 'a geographical bias . . . to the group of men who exploited the silver mines. A stake in the Laurion mines was clearly attractive to that part of the Athenian propertied class that had reasonably easy access to south Attika'.³² Osborne argues, with good reason, that this bias came about because of a desire to keep a close eye on one's investments. It is not, therefore, a question of absentee owners, but of regular, personal involvement.

Investment Practice in Fourth-Century Athens

The instrumentally rational investor seeking income maximization demands a rate of return that is commensurate with risk. When, for example, given the choice between two investments with the same yield but differing risks, the economically rational individual selects the safer of the two.³³ The result is that, in an environment dominated by rational investors, there will be a correlation between risk and return. The presence of such a correlation is, therefore, a strong test for the presence of income-maximizing instrumental rationality. The obvious question is whether such a correlation existed in fourth-century Athens. It might seem that the optimum arrangement would be to provide a quantitative comparison of risk and return for various kinds of economic activity. This is, however, not possible, and even if it were, it would not be useful.

Returns can be calculated with a high degree of precision. Risk, however, is very difficult to quantify. Consider the simple case of a loan extended to a single debtor against the security of a piece of farmland. There is a finite possibility that the creditor will not receive the entirety of the principal and the interest due to him. But how can that possibility

³² *Demos, The Discovery of Classical Attika* (Cambridge, 1985), 124.

³³ The economically rational investor may not demand a precisely risk-balanced return for a particular asset class if the returns associated with that asset class are negatively correlated with the other components of his portfolio in such a way that overall portfolio risk is lessened by its presence. The considerable inefficiencies in the extant markets and the complexity of the calculations made this a factor of minimal importance in determining risk-balanced returns in fourth-century Athens.

be calculated? The number of potentially relevant factors is large, and each of those factors resists quantification. The debtor might refuse to pay any of the principal or interest. Or he might pay some portion of the principal or interest. The debtor might leave the legal jurisdiction in which the loan was contracted. The debtor might die and leave an estate with few assets. Even the existence of substantial collateral does not greatly simplify matters since there are problems in valuing the collateral before the loan is made, in ensuring that the asset offered as security has not been used as collateral against a prior loan, in monitoring downward changes in the value of the collateral, and in preventing the debtor from disposing of the collateral. The list could be extended further, but the partial catalogue given here is sufficient to make the difficulties obvious.

Even if it were possible to produce meaningful figures about the risk associated with specific categories of investment in fourth-century Athens, they would not be decisive. It would stretch the boundaries of the imagination to believe that fourth-century Athenians produced quantitative risk assessments. It is much more likely that, if the risk-return balance was in fact an important consideration, that balance emerged as the result of experience rather than abstract calculation. The level of return demanded by investors would be gradually adjusted based on past transactions. While no two transactions are ever completely commensurable, any individual transaction could be classified within a loosely defined, limited number of categories and evaluated on that basis. All this goes to say that fourth-century Athenians *could* have acted rationally in the Smithian sense, not that they necessarily did. In order to conclude that fourth-century Athenians did in fact employ income-maximizing instrumental rationality, it is necessary to demonstrate both that there was a conscious awareness of risk and that there was a coherent response to that awareness in the form of a risk-reward balance.

The following discussion is divided into three parts. The first consists of a brief overview of the different types of investment available to fourth-century Athenians. In the second part, specific cases suggesting that Athenian investors were aware of and responded to risk are examined. The final section provides a description of the risk and return associated with each type of investment, qualitative for the former and quantitative for the latter, and finds a strong correlation between the two.

Xenophon and Aeschines nicely summarize the investment options available.³⁴

There was at one point in time a beautiful woman named Theodotê in the *polis* (Athens). She was the sort to have sex with anyone who might persuade her. One of the men who happened to be present mentioned her, saying that the beauty of this woman was greater than words could tell. . . . “It is necessary that we go see her,” said Socrates, “since that which is greater than words cannot be understood by hearing about it”. . . . Thus they went off to Theodotê’s house. . . . Socrates observed that both she herself (Theodotê) and her mother, who was also present, were sumptuously dressed and that she was attended by numerous female servants who were lovely and were not neglected and that her house was expensively furnished. “Tell me, Theodotê,” he said, “do you own a farm?” “Not me, at any rate,” she said. “Perhaps a house that produces an income?” “No house either,” she said. “Some craftsmen, then?” he said. “No craftsmen either,” she said. “Then how,” he said, “do you get hold of the necessities of life?” “If someone,” she said, “develops an affection for me and wishes to do me a good turn, I by this means find my livelihood.” (X. *Mem.* iii xi 1–4)

But someone might say that, after he had sold his family home, he bought another somewhere else in the city, and that in place of the grazing land and the farmland at Alopecê and the slave-craftsmen and the rest of the property [which he sold off], he invested in the silver mines, just as his father had done in the past. But no, there is nothing left, not a house, not an apartment house (*sunoiikia*), no farmland, no slaves, no loans, nor anything else from which men who are not evil-doers earn their living.

(Aeschin. i 105)

As these passages indicate, a range of investment options was available in Athens during the period in question. These can be divided into five distinct categories: ownership of real property (agricultural land, single family houses, apartment buildings, commercial structures), loans on land and domestic commerce, maritime lending, silver mining, and ownership of slaves.³⁵

³⁴ The following discussion of investment behaviour draws on L. Casson, ‘The Athenian Upper Class and New Comedy’, *TAPA* 106 (1976), 29–59, A. Karayiannis, ‘Entrepreneurship in Classical Greek Literature’, *South African Journal of Economics* 60 (1992), 67–93, P. V. Stanley, ‘The Value of *Ergasteria* in Athens’, *MBAH* 9 (1990), 1–13, W. Thompson, ‘The Athenian Investor’, *RSC* 26 (1978), 403–23 and ‘The Athenian Entrepreneur’, *AC* 51 (1983), 53–85. For a different, strongly primitivist, interpretation, see P. Millett, *Lending and Borrowing in Ancient Athens* (Cambridge, 1991), 160–78. Millett argues that, ‘there was . . . only the crudest conception of relative rates of profitability in Athens’ (95).

³⁵ It should be emphasized that the investors behaving rationally in the sense intended by Smith did not necessarily invest all of their resources in any one of these categories. The optimum arrangement in most cases is to spread one’s resources out over a number of different types of investment with varying levels of risk-balanced reward. Diversification serves a number of goals, including assuring desired levels of liquidity, generating necessary cash income, and making it possible to equalize risk-adjusted returns at the margin. The last of these is particularly important because maximizing risk-balanced return requires locating the best possible investment for every dollar (or *drachma*) available to the investor. The strongest possible test for income-maximizing rationality would involve demonstrating that Athenians invested their funds in such a way that risk-balanced return could

The available evidence contains numerous attempts to control risk. An explicit discussion of the importance of risk can be found in the Demosthenic speech *For Phormio* (xxxvi 11), in which the division of assets between Apollodoros and Pasicles, two sons of the wealthy banker Pasion, is discussed:

They immediately . . . divided the bank and the shield workshop. Apollodoros, given the choice, chose the shield workshop rather than the bank. But if Apollodoros had any of his own capital invested in this bank, why would he have chosen the workshop rather than the bank? For the revenue from the workshop was not larger, but in fact less. The income from the workshop was 6000 *drachmai* a year, while the bank produced 10000 *drachmai* a year. . . . Apollodoros was wise to choose the workshop, since that is an enterprise that does not involve risk (*ktêm' akindunon estin*), but the bank is a business producing risk-laden revenues from other people's money.

Other important examples pertain to the leasing of real property. Preserved leases for agricultural land commonly prescribe a cultivation regime, specify amounts of fertilizer to be applied, require maintenance of assets such as vines, trees and buildings, and forbid the cutting of timber and the removal of topsoil.³⁶ Lenders extending credit showed a similar desire to limit their chances of taking a loss. Loans made for non-maritime purposes were normally contracted only in cases where the borrower could provide substantial collateral. While the advantages of requiring collateral are obvious, sale of the asset or its use as security against a prior or subsequent loan could seriously undermine those advantages. Athenian creditors were aware of these potential problems and took steps to prevent them from occurring. One solution was to insist on the placement of *horoi* on land or buildings used as collateral. A more aggressive measure was *prasis epi lysei*, in which the title to the collateral was officially transferred to the creditor. The borrower remained in physical (although not legal) possession of the pledged

not have been improved by modifying the relative weighting of the components of an individual's portfolio. The available evidence will not support such a test.

This is not a difficulty of great significance. Simon's insights about bounded rationality make it clear that even in the comparatively information-rich environment of the present day, income-maximizing investors and profit-maximizing firms regularly deploy their resources in ways that are less than optimal. Insofar as perfect rationality is an unrealizable ideal, its presence in fourth-century Athens would be considerably more surprising than its absence. That said, it is not without interest to consider what is known about the investment practice of Athenians who had significant amounts of wealth at their disposal. The relevant evidence is reviewed in great detail in J. Kron, 'Landed and Commercial Wealth in Classical Athens 500–300 B.C.' (Ph.D. dissertation, University of Toronto, 1996). Kron finds that, though the evidence is too sparse to permit definitive conclusions, it does indicate that wealthy Athenians tended to invest their money in an eclectic mix of assets.

³⁶ On this subject, see R. Osborne, *Classical Landscape with Figures* (London, 1987), 36–44.

property and recovered title upon the repayment of the principal and interest.³⁷

Maritime loans were among the most complex forms of business transaction that took place in fourth-century Athens.³⁸ This type of loan was usually made to borrowers engaged in seaborne commerce for a specific voyage with either cargo or ship offered as security. While loans made for the purpose of domestic commerce were normally contracted orally (though in the presence of witnesses), maritime loans typically involved a written contract. The sole surviving complete example of such a contract comes from the Demosthenic corpus (xxxv 10–13). The text is as follows:

The Agreement:

Androclès [of the *deme*] of Sphettos and Nausicratès of Carystus lent 3000 *drachmai* of silver to Artemo and Apollodôros, both of Phaselis, for the purposes of a commercial voyage from Athens to Mendê or Sciônê, and from there to Bosporos, or if they should wish, to the western part of the Bosporos as far as Borysthenês, and [from there] then back to Athens, at the rate of 225 *drachmai* per 1000, but if they should sail from Pontos to Hieron (the entrance to the Thracian Bosporos) after the rising of Arctouros (the middle of September) the rate shall be 300 *drachmai* per 1000. They made this loan on the security of 3000 jars of Mendian wine, which will be transported, from Mendê or Sciônê in a 20-oared ship that Hyblésios owns. And they will bring back to Athens all the goods taken as return cargo in the Pontos on the same vessel. And if the goods are delivered safely to Athens, the borrowers will repay [to the lenders] the money owed according to the agreement in 20 days from the time when they arrive at Athens, in full except for deductions arising from the jettison of cargo made in accordance with a vote of the other passengers on the ship and monies paid to hostile forces. All the remainder shall be paid in full. And they will provide for the lenders unobstructed title until they have repaid the money they owe according to the agreement. And if they have not paid in the time agreed upon, it will be permitted for the lenders to pledge the goods given in security and to sell those goods at prevailing prices. And if the proceeds of the sale should be less than that which is owed to the lenders in accordance with the agreement, let it be permitted for the lenders to exact from Artemo and Apollodôros the remaining amount from all their goods both at land and on sea wherever those goods might be found, just as if a trial had been held, judgment had been rendered and payment due not

³⁷ The *horoî* indicated that the asset had been pledged as security and thus implicitly warned potential buyers or creditors. For *prasis epi lysei*, see E. Harris, 'When is a Sale Not a Sale? The Riddle of Athenian Terminology for Real Security Revisited', *CQ* 38 (1988), 351–81.

³⁸ The discussion here generally follows E. Cohen, *Athenian Economy and Society: A Banking Perspective* (Princeton, 1992), 121–89, though see also G. M. Calhoun, 'Risks in Sea Loans in Ancient Athens', *Journal of Economic and Business History* 2 (1929/30), 561–85, G. E. M. de Ste. Croix, 'Ancient Greek and Roman Maritime Loans', in H. Edey and B. S. Yamey (eds.), *Debts, Credits, Finance and Profits*, (London, 1974), 41–59, E. Harris, 'The Liability of Business Partners in Athenian Law', *CQ* 39 (1988), 339–43 and P. Millett, 'Maritime Loans and the Structure of Credit in Fourth-Century Athens', in K. Hopkins, P. Garnsey and C. R. Whittaker (eds.), *Trade in the Ancient Economy* (Berkeley, 1983), 36–52, 186–9.

rendered. Let it be possible to proceed in this fashion against either one individually or both of them . . .

The number of provisions built into this agreement to protect the creditors is striking. Two in particular call for specific comment. The first is the clause permitting the creditors to seize the cargo in case of default and to lay claim to the private possessions of the borrowers. The mobility of individuals contracting maritime loans limited the effectiveness of legal remedies. The creditors seek to avoid the difficulties and costs of litigation by insisting that in case of default they may proceed as if a trial had already been held and a verdict in their favour returned. In addition, the creditors can seize the possessions of either of the borrowers or both. Because Athenian law did not grant business partnerships a fictive legal identity, questions of responsibility for debts contracted by more than one individual were complicated.

The second provision to be considered is the increase in the interest due if the voyage takes place after the middle of September. Maritime loans were unique in that the borrower was released from obligation to repay either principal or interest if the underlying security (cargo and/or ship) were lost at sea. Transactions of this sort thus incorporated both a loan and insurance. Creditors had good reason to be concerned about the timing of a voyage since weather conditions change substantially over the course of the year in the Mediterranean. The beginning of inclement autumn weather increased the risks associated with sailing, and Androclês and Nausicratês built an appropriate adjustment into the contract.

The combination of a loan and insurance raised the number of factors affecting risk in maritime loans. If return was to be adjusted to risk, creditors required information about the factors affecting the probability of loss such as destination, time of sailing, competence of captain, soundness of ship, etc. Professional lenders were in a much better position than the average individual to acquire information of this sort. As a result these loans were frequently 'syndicated' by professional bankers in the sense that bankers would combine money from several different investors to build a pool of funds. The bankers would vet potential borrowers and set rates. Syndication of loans also had the important advantage of spreading the risk of loss of each ship over several investors and spreading several investors' funds over several ships.

The evidence just considered strongly suggests that Athenian investors were very much aware of risk. It also suggests that this awareness

generated an instrumentally rational response in the form of a risk-reward balance. A description of the risk and return associated with each type of investment will make it possible to explore the latter point in greater detail. The first step is to consider what is known about the returns associated with each form of investment. This can be summarized as follows:

<u>Form of Investment</u>	<u>Approximate Annual Return</u>
Real Property	8% ³⁹
Loans, Land/Domestic Commerce	10–18% ⁴⁰
Ownership of Slaves	15–25% ⁴¹
Maritime Lending	25–50%
Silver Mining	too variable to state a meaningful average

Does the hierarchy of returns correlate with what is known about risk? This question can be best answered by examining each category of investment in turn.

Real property is the obvious starting point. It need hardly be said that the risks involved in this type of investment were relatively minimal. The owner could profit either by making direct use of the property or by leasing it. The latter arrangement entailed a certain amount of risk in regard to decrease in value of the asset during the time it was let, but the precautions found in the extant lease documents indicate that owners took active steps to minimize this risk. For reasons that need not be repeated, loans on land and domestic commerce entailed more risk than ownership of real property. Cash vanishes more readily than land or buildings. Loans of this type generated higher returns than those associated with ownership of real property but with larger attendant risks.

Ownership of slaves represented an investment in human capital. Individuals who purchased slaves as an investment typically had three options available to them. They could lease the slaves to others, they could directly employ them in a revenue-generating capacity, or they

³⁹ This is attested in both the literary and epigraphic sources. See Is. xi 42 and IG ii-iii².2496. For an exceptionally lucid summary of the evidence pertaining to the leasing of land in ancient Greece, see R. Osborne, 'Social and Economic Implications of the Leasing of Land and Property in Classical and Hellenistic Greece', *Chiron* 18 (1988), 279–323.

⁴⁰ The examples of this type of loan catalogued in Millett (n. 34, 103–5) show rates of 10–18%. The Athenian law code assumed that where interest was due on unpaid obligations it would be charged at 12%.

⁴¹ In calculating the returns that might be expected from investments of this sort, assumptions must be made about the initial cost of the slaves, the cost of their maintenance and their useful lifetime. On this point, see Casson (n. 34), R. Osborne, 'The Economics and Politics of Slavery at Athens', in A. Powell (ed.), *The Greek World* (London, 1995), 27–43 and Thompson (both works cited in n. 34).

could permit the slave or slaves to establish their own business on the condition that the slave make payments to the owner.⁴² All these options involved considerable risk. Slaves could die prematurely or escape. Lessees could be difficult to find. Demand for the items produced by slaves could suddenly dry up, leaving the owner with hungry mouths and unproductive hands. Even in the best of circumstances the value of individual slaves depreciated over time, and aged and infirm slaves represented a potentially serious financial burden.

The preceding discussion of maritime loans has already made clear the substantial risks involved in extending a combination of loan and insurance to highly mobile merchants. The practice of securing these loans on the value of ship and/or cargo diminished the protection offered to the creditor by collateral. The events narrated in Demosthenes xxxii, where the borrowers seek to perpetrate fraud on a variety of fronts, give some indication of the problems that creditors had to confront. Finally, silver mining represented the speculative venture *par excellence* in fourth-century Athens. The high costs of sinking shafts and difficulty in locating silver-bearing ore were compensated by a potentially spectacular return. Unfortunately complete loss was another, quite likely, outcome.⁴³

A qualitative assessment of risk indicates that there was in fact a strong correlation between risk and reward in fourth-century Athens. This pattern could only come into being as the result of a widespread pattern of economic decision-making in which investors assessed the relative merits of various alternatives open to them and demanded a return commensurate with the anticipated risks. The 'widespread' aspect of this conclusion requires particular emphasis. The correlation discussed above could not have arisen from the actions of a few scattered individuals. It could only have come into being in an economic environment populated by investors employing instrumental rationality with income maximization as a dominant preference.⁴⁴

⁴² For examples of individuals exercising these options, see Aeschin. i 97, Dem. xxvii 9–10 and Xen. *Vect.* iv 14–15. Slaves working under the last of these three conditions were called *choris oikountes*. On this subject, see E. Cohen, *The Athenian Nation* (Princeton, 2000), 130–54 and E. Perotti, 'Les esclaves *choris oikountes*', *Annales Littéraires de l'Université de Besançon* 163 (1974), 47–56.

⁴³ For losses associated with investments in the silver mines, see Dem. xlii 20 and Hyp. iv 35.

⁴⁴ Michele Faraguna (n. 21) has persuasively argued that Lycurgan Athens implemented a carefully designed program to make the most of all of Attica's economic resources, the *polis*-level equivalent of individual income-maximization. J. K. Davies, 'Temples, Credit, and the Circulation of Money', in A. Meadows and K. Shipton (eds.), *Money and Its Uses in the Ancient Greek World*, (Oxford, 2001), 117–28, cites interesting evidence for productive investment of public funds. Paul Cartledge, 'The Political Economy of Greek Slavery', in P. Cartledge, E. Cohen and L. Foxhall (eds.), *Money, Labour and Land: Approaches to the Economies of Ancient Greece* (London, 2002), 156–66, argues (albeit very briefly) that income-maximizing investment was too risky for the

Conclusion

It seems clear that Smithian rationalism played a role in shaping economic activity in fourth-century Athens. This is not, however, tantamount to stating that income maximization was the only or even the most important force structuring economic activity in Athens. The evidence suggests that fourth-century Athenians were responsive to the sort of concerns associated with *homo economicus*, not that they were sensitive only to those concerns. There were, for example, other significant economic considerations beside risk and reward. Wealthy individuals needed to generate cash to pay taxes and to fund large expenses such as dowries.⁴⁵ Another matter of some importance was the desire for liquidity and the concomitant ability to meet unexpected financial demands. Most of the investments available in fourth-century Athens were by nature illiquid, and this must have led some individuals to keep a larger percentage of their assets in cash than would otherwise have been the case. In addition, the evidence presented above pertains only to investment and ignores non-investment spending of all kinds including procedurally rational forms of expenditure such as voluntary participation in the liturgy system.

The influence of motivations other than income-maximization is evident even in silver-mining. After he finishes outlining the difference between natural and unnatural forms of acquisition (*oikonomia* and *chrêmatistikê*), Aristotle touches upon an intermediate type:

And there is a third form of acquisition that lies somewhere between the other two (*oikonomia* and *chrêmatistikê*) because it possesses elements both of that form of acquisition which is in accordance with nature and that form of acquisition which concerns itself with exchange. For it involves things that come from the earth and those non-self-reproducing but still useful things that come from the earth. It embraces things such as the cutting of timber and all sorts of mining. (Pol.1258b28–32)

Mining, like agriculture, was a form of economic activity that involved producing a tangible item that came from the earth. As such, it had a special attraction that went beyond the profits to be made.

The co-existence of a number of different economic motivations is

average individual in ancient Greece and was therefore largely restricted to the élite. While there is no doubt some element of truth in this assertion, the evidence indicates that this particular form of rationality was less circumscribed than Cartledge supposes.

⁴⁵ On this point see Osborne, 'Pride, Prejudice, Sense and Sensibility' (n. 12). The importance of dowry payments in influencing borrowing patterns is highlighted in M. I. Finley, *Studies in Land and Credit in Ancient Athens, 500–200 B.C.* (New Brunswick, N.J., 1952), 79–87.

even clearer in regard to real property. Ownership of real property was procedurally rational in that agriculture was one of the normatively positive forms of acquisition. It could also be at the same time instrumentally rational. In an (almost certainly fictional) exchange found in Xenophon's *Oeconomicus*, one of Socrates' young protégés asks him for advice on the proper means of acquisition. Socrates recommends agriculture and warfare. When Critoboulos asks about how to be a successful farmer, Socrates chooses to recount a past conversation with Ischomachos, a wealthy landowner who describes his farm management technique in some detail. It is in many ways a canonical statement of one of the central tenets of procedural rationality. Yet as Ischomachos brings his discourse to a close he and Socrates engage in the following dialogue (Ischomachos is speaking):

"For a man who is capable of seeing to all the necessary details and of consistently applying himself, farming provides the most rapid profits. My father taught me this and himself showed it to be true. He would never allow me to purchase farmland that was carefully tended. Instead he urged me to buy land that was, either because of the neglect or incapacity of the owners, idle and uncultivated. He said that on the one hand land which was carefully tended came at a high cost and did not permit of much improvement and that on the other hand, in his opinion, land which could not be improved did not provide much in the way of pleasure to its owner. He thought that land and livestock had to be continually improving in order to provide the owner with the greatest satisfaction. No greater improvement is possible than in cases where land is put to good use after being idle. Be assured, Socrates," he said, "that we have on many occasions already greatly multiplied the original value of a piece of land. . . . My father was, Socrates," he said, "in my opinion at least, by nature the person who was the most enamoured of agriculture of all the Athenians." And I, upon hearing this, asked him, "Did your father, Ischomachos, keep all the farms which he tended or did he sell them off if he could get a very good price for them?" "He sold them off, by Zeus," said Ischomachos, "but, because of his fondness for work, he immediately bought an idle farm in its place." "What you are saying, Ischomachos," I said, "is that in fact your father was by nature enamoured of agriculture no less than merchants are enamoured of grain. Because of their great affection for grain, merchants sail wherever they hear it is plentiful, crossing the Aegean and Black and Sicilian Seas. They then lay hands on as much grain as they can and carry it over the sea, loading it onto the ship on which they themselves sail. And whenever they are in need of money, they do not dispose of the grain in just any random place, but they go wherever they hear that grain is particularly valued and people prize it most highly and hand it over to those men. Your father's love of agriculture seems to be more or less of the same sort." In response to these things Ischomachos said, "You are, on the one hand, Socrates, joking. But I on the other hand think that men who build houses and sell them off once completed and then build other houses are none the less enamoured of building houses." "Yes, by Zeus, Ischomachos," I said, "I swear that I put trust in what you say and that all men naturally feel affection toward those things which they think will bring them profit." (XX 22–29)

Ischomachos was a true gentleman with a deep belief in the inherent virtues of agriculture. He was also intensely interested in making a profit. To use the vocabulary suggested above, Ischomachos was expressively rational.⁴⁶ In this respect he was no different from most fourth-century Athenians. Any complete examination of the values and motivations that shaped economic activity in fourth-century Athens would need to take into account a wide range of factors, among which Smithian economic rationalism must be included. While the evidence presented here can speak directly only to the situation in Athens, there is no reason to think that this situation was exceptional.

Expressive rationality as an analytic concept offers significant advantages to ancient economic historians, not least because it responds to their need for verisimilitude. Much of the recent work in ancient economic history can be seen as a search for a way to make expressive rationality a functional concept for the study of economic activity in the Greco-Roman world, though the relevant scholarship does not, of course, address the issues in these terms.⁴⁷ The immediate challenge is to locate an approach for modelling value systems that is simple enough to produce coherent accounts, yet nuanced enough to simplify without introducing untoward distortion. Precisely this problem has occupied the attention of both economic anthropologists and economic sociologists for much of the last decade, and the body of scholarship that has resulted is rich and largely untapped by ancient economic historians.⁴⁸ This is a subject that I hope to address in future publications.

⁴⁶ For further exploration of Ischomachos' approach to economic activity, as recorded by Xenophon, see M. Faraguna, 'Alle origini dell'Oikonomia: Dall'anonimo di Giamblico ad Aristotele', *Atti Della Accademia Nazionale Dei Lincei* V (1994), 551–89 at 565–7 and E. Harris, 'Workshop, Marketplace and Household', in L. Foxhall, P. Cartledge and E. Cohen (eds.), *Money, Labour and Land in Ancient Greece* (London, 2002), 67–99 at 84.

⁴⁷ See, for example, the articles collected in D. J. Mattingly and J. Salmon (eds.), *Economies Beyond Agriculture in the Classical World* (London, 2001).

⁴⁸ In economic anthropology the most relevant work is Parry and Bloch's concept of long-term and short-term transactional orders. On this subject see J. Parry and M. Bloch, 'Introduction', in *Money and the Morality of Exchange* (n. 8). Parry and Bloch's work has been sparingly used by ancient economic historians. For economic sociology the most relevant work may be William Sewell's notion of 'thin coherence'. On this point, see Sewell's 'The Concept(s) of Culture' in V. Bonnell and L. Hunt (eds.), *Beyond the Cultural Turn* (Berkeley, 1999), 35–61. 'Thin coherence' has not, at least to this author's knowledge, as yet been applied to the ancient world.