

Commentary

Peter Acton

My comments on the papers in this volume reflect my limited expertise in archaeology and my strong interest in economic interpretations of the production of artifacts and monuments. Such questions as I raise about the analyses are intended to suggest alternative interpretations rather than problems with the findings themselves. In particular I have tried to propose hypotheses and further research that might make the lines of enquiry put forward in the papers still more revelatory about ancient society.

Comparing the Labor Investment and Production of Early and Late Bronze Age Ceramic Roofing Tiles in Mainland Greece. Kyle Jazwa

Jazwa's paper on early and late Bronze Age ceramic roofing tiles provides an excellent example of how understanding the way a product was manufactured can provide important insights into expenditure choices and labor conditions in an ancient society. By reverse engineering tiles to see how they were made, he has been able to estimate relative resource consumption and skill levels for different roofing options.

He draws two important conclusions: first, through comparing the finished tiles, he shows that the level of skill required to make Early Bronze Age (EH) ones was very limited and they could probably have been made in any household, whereas the higher skills required for Late Bronze Age (LH) tiles suggest they would have been made by an experienced potter. Second, that the resources required to roof one's house with LH tiles suggest it was a luxury and an example of conspicuous consumption.

On the first point, he is almost certainly correct in saying that the tiles were made by the household in which they were to be used. He notes that the technology is very similar to brick-making of the period. Even in classical Athens, there is no evidence of a specialized home building trade and it is logical to conclude that the labor involved in constructing a house was provided by the site owner's family and slaves, ideally helped by friendly neighbours who had done it before. It is likely the same arrangements prevailed in the Early Bronze Age and covered roofing as well as walls.

A little more questionable is Jazwa's inference that LH tile makers were generalist potters who made many other items as well as tiles. This might well be the case, as the detritus of later pottery kilns shows a wide variety of decorative and utility items, and Jazwa posits that there would not have been enough demand for roofing in a small community to permit specialisation. On the other hand his analysis shows that the forming and firing required to tile the roof of a reasonable sized house might occupy a potter and his kiln for an entire growing season. Allowing for accidents, dilapidation and some population growth, it might not have needed a very large community to generate enough demand to keep one or more specialist potters busy, though there

might have been limited benefit from specialisation. In terms of pottery economics, this does not affect Jazwa's conclusion. He infers correctly that, if tiles had to compete with alternatives for a generalist potter's efforts, the cost of tiles would not have been less than the potter could have made by working on other products. If the potter was a specialist, he would still have demanded a price-point that would bring in the same income as he could make with other products. From the point of view of social history, though, the development of specialisation within an industry is informative about social workings and relationships, and it will be interesting to see if future kiln discoveries throw more light on the specialist/generalist question.

Jazwa's second point is well supported by his energetic analysis that shows that both EH and LH tiles consumed far more resources than the more primitive flat clay or thatched roofs, and that LH consumed considerably more than EH. His view that this cost, together with the visibility of the projects, shows that LH tiled roofs were an example of conspicuous consumption is plausible – even probable – but would be best supported by any data that can be accessed or estimated about the relative wealth of the sites in question, the distribution of that wealth within the community, and expenditure on other costly items. All of these are hard to know or infer, but to the extent new information can be adduced that touches on these points, Jazwa's cost-based analysis will provide a robust foundation for understanding LH roofing tile customer dynamics.

Crossing Thresholds and Building States: Labor Investment, Tomb Construction, and Early State Formation in the Bronze Age Argolid. Rodney D. Fitzsimons

It is always reassuring to see scholars of the ancient world give economics some prominence in their explanation of events. Fitzsimons bases his analysis on the premise that control of what might be considered a polity's most important resource, non-specialized labor, is a powerful indicator of social organisation – an important truth but one that does not seem to have been pursued very much by others. His own pursuit is another confirmation of the benefits that can accrue to archaeological interpretation from adopting techniques from other disciplines, in this case architectural energetics and network theory.

The former approach demonstrates beyond doubt that different periods of tomb construction show very significant increases (multifold) in the amount of labor required, from cists through shaft graves to tholos tombs and ultimately to the huge engineering feats of the Mycenaean state. He calculates the minimum labor simultaneously required from the size of the largest block that needed to be transported, which makes perfect sense. On the other hand, I would encourage Fitzsimons to put more emphasis on the fact that the values he generates represent the minimum, number employed on the project, thereby avoiding assumptions of that assumes consecutive working and that of

all laborers were being interchangeable, moving from one task to the next. This might not have been the case; Adam Smith would have pointed out that, provided there was a single point of authority in overall charge of the project, they wouldn't have taken long to figure out that, even for the most basic tasks, higher productivity can be achieved by specialisation. Laborers might have been working on different tasks in parallel, the total numbers employed might have been higher and time to completion shorter.

If this was, in fact, the case, it only reinforces Fitzsimons' findings from his second approach. Network theory provides an experimentally supported way of calculating the degree of social complexity in a society based on the number of individuals being co-ordinated in some manner. If the numbers turn out to have been higher than otherwise thought at a point in time, then the complexity was greater. Interestingly this process feeds back into Fitzsimons' observation about grave groupings that suggests the existence of elites within elites and the emergence of new ones, and it would be interesting to see if this element of network theory can explain some of the chronology of these changes in social hierarchy.

The development of social complexity in early societies is one of the most important questions in ancient history and Fitzsimons has produced a powerful methodology for identifying inflection points. May it continue to be developed.

Relations among Workshops and Craftsmen in Protoattic Vase-painting: Limits and Perspectives in Quantifying the Production. Giulia Rocco

Making sense of the scale of operations, the activities of particular workshops and the relationships between potters and painters, never simple in any period, appears especially difficult in Protoattic pottery. Rocco's painstaking analysis of commonalities of shapes among the output of various ergasteria sheds new and important light on the subject. I am far from qualified to critique Rocco's analysis of shapes, but her approach reflects some important truths about the industry and leads to some interesting questions about the relative status of potters and painters in different eras.

She rightly distinguishes between the output of potter-painters and that of master potters working with specialist painters, and notes that some small pieces appear to have been painted by apprentices while others might be "the hasty executions of an expert painter". She sensibly protests at identifications of individuals that imply impossibly lengthy careers and attributes commonalities over periods greater than 20–30 years to further generations educated in the same long-standing workshop traditions. She analyses collaborative work on commissions to establish that the best painters were mobile in Protoattic times just as they were in the classical period.

Her potter-centric approach also offers an intriguing take on hierarchies within the industry. By her account, master potters engaged the best painters to decorate their best works – a reversal of the usual assumptions about painter-potter relationships later on. If

she is correct, it suggests that the scarce skill and the one most in demand in the marketplace was vase formation and that those who possessed this skill in a high degree could get the best painters to work for them. This also implies (although Rocco does not say so) that the real value of a special piece would have been captured by the potter while painters would have been obliged to accept the potter's terms of payment, perhaps even in a bidding competition. In later periods it is generally thought that the proven mobility of painters indicates that the best painters captured the value of their work, using whatever potter they were comfortable working with (or who offered the best terms subject to quality standards), if they didn't make the pot themselves. If this temporal reversal is correct it can only mean that between 700 and, say, 400 BC skill in painting became more valued than skill in forming, or, to put it another way, sophistication in painting developed much faster than in forming. There would not have been a simple point-in-time transition and there would have been a period – possibly of several decades – when the relative claim to value would have been unclear and might even have differed between different workshop groups or for different types of vases at the same time.

Whether or not this speculation has substance does not affect the importance of Rocco's shape-based analysis, but I very much hope that she will pursue this line of thinking and see if it is possible to identify inflection points (such as the transition from Black to Red Figure or a change in the expectations of those commissioning large and complex ritual vessels) in which the skills of the painter came to outweigh those of the potter.

Social Network Analysis and Connoisseurship in the Study of Athenian Potters' Communities. Eleni Hasaki and Diane Harris Cline

This paper is another demonstration of how the complexities and uncertainties inherent in interpreting archaeological discoveries can be illuminated by adopting techniques from other disciplines. The application of Social Network Analysis (SNA) to relationships identified in the Beazley corpus provides a novel and dynamic view of relationships and interactions in the Athenian Kerameikos. The paper refers to an enormous advance in this respect between Boardman's 1974 work and Osborne's of 2004, which used the same data and a slightly more sophisticated version of Boardman's basic approach. SNA is an order of magnitude more powerful. As the authors recognize, using Beazley's unverified classifications as they have is fraught with methodological problems that Beazley himself did not help to resolve, but the approach will certainly be robust when applied to alternative identifications of commonalities in output.

In fact, exactly how many different hands can be identified is not very important for understanding how the Kerameikos actually worked (except in the unlikely event that a large number of relationships identified turn out to be between units that are actually the same person). What matters is the patterns of relationships. By exposing

intermediate connections between groups of craftsmen it provides a picture of how people went about their business in a much more relatable manner than traditional tendencies to isolate identifiable groups. Particular findings of interest in this respect are that some nodes of artists were central to a large number of relationships, while others were relatively isolated, connecting to just one other node, and that there was a mix of large and small “clusters”. The picture is intuitively plausible. With no advantages in cost of production or price realization to be derived from collaboration, and with all or most workshops based around a household unit, relationships were likely to have been based on family ties, friendships, common artistic interests, and energy for socializing rather than pragmatic concerns over production economics, and the result would be as shown here: somewhat random and chaotic.

The analysis also identifies a new class of player: those such as the Cactus Painter whose own output was modest but seem to have had some kind of linkage to a large number of other hands. It is fascinating to speculate how such intermediaries operated and how they made a living. Brokers of potter-painter arrangements? Resellers? Entrepreneurs? Educators?

The authors’ plan to pursue the analysis in time slices to ensure that the relationships posited were chronologically possible will be an important further step. Even if some relationships need to be redefined it might provide new insights into apprenticeships and workshop traditions over time.

Productivity of Athenian Vase-painters and Workshops. Philip Sapirstein

Sapirstein’s revision of Cook’s analysis of painter output is welcome and 8.2 pots per year for “productive painters” seems much more plausible than Cook’s figure of less than half that. His numbers are carefully calculated and his use of the data wisely discriminating, but irrespective of the accuracy of the answer, it is the variability from the norm that is of most interest.

The analysis makes clear that there were a large number of decorators, including some very good craftsmen, whose output was far less than the norm and were probably doing something else with their time than decorating vases. Sapirstein suggests various possibilities within the workshop, including but not limited to throwing pots. He might also consider the range of activities open to Athenian citizens outside the workshop. A household might choose only to operate a workshop for a few weeks a year when other activities such as managing their small farm or military service permitted. Some might be spending most of their time playing roles in the Athenian democracy. Some might simply have been quite satisfied with a modest income from a few weeks work; after all the accumulation of wealth beyond one’s basic needs was not a major objective for all Athenians. One of the great attractions of making pots to part-timers was that all resource costs (labor and materials) varied directly with output so a small occasional

producer would have the same costs as a larger full-time operation. And of course, if the small occasional producer was a good enough painter to get a premium for his work, he'd probably try.

In contrast to Stissi (see below), Sapirstein's analysis brings him to a much lower estimate than Cook of the number of people working in decorated pottery and he explains why he questions Stissi's conclusion. This debate seems likely to be productive and is not one I am in any way qualified to adjudicate, but I offer the following observations:

- Apart from the lifestyle choices mentioned above, the evidence for a reasonable number of painters not being full-time is very strong, and Sapirstein is right to question a calculation of total employment based on all identified hands being Full Time Equivalents.

- He also seems justified in questioning a calculation based on an estimate of the percentage completeness of the Beazley Archive Pottery Database, especially if it contains irrelevant material.

- It would be interesting to know to what extent Sapirstein's readiness to dismiss the possibility of there being a large number of "minor hands" takes into account likely survival bias in the archaeological record. The less distinguished a piece was, the more likely it would have been to be used in a way that might destroy it altogether.

Sapirstein rightly observes that to estimate the population engaged in making utility ware requires a different approach. A special challenge is that archaeological finds suggest that many, probably most, workshops made both decorated and utility ware – which would have been economically sensible as it would take a very long time for a painter to fill a kiln. Irrespective of what they were making, there is no reason to suspect workshops needed much more than the five people Sapirstein posits – perhaps six if they used a specialist clay-preparer and a wheel spinner.

From Counting Pots to Counting People: Assessing the Scale of Athenian Pottery Production and its Impact on Workshop Staff. Vladimir Stissi

Stissi's paper provides an excellent exploration of the complexities of trying to estimate workshop scale, organisation of labor, and employment arrangements in Athenian potteries and his conclusion that there was more specialisation and casual labor than the usual static picture of small workshops with stable staffing is almost certainly correct. His estimate of annual production of pots in Athens at one to two million a year, derived from other estimates of survival rates and the incompleteness of the Beazley Archive, is necessarily tenuous but plausible. His conclusion that the number of active potters at any one time in the Kerameikos was much higher than traditionally believed is more open to challenge.

Stissi's analysis of monographs, together with Sapirstein's work which he cites and the inevitable impact of survivor bias, gives strong support to his conclusion that

there were many more “minor hands” in action than has generally been thought, but his inference about total numbers depends upon taking a view on the average annual production per active hand. He shows that the conventional estimate of 130 potters applied to a conservative calculation of the volumes he thinks were produced suggests output per person per year of 1.770 items per year “which seems on the high side.” This is debatable, as potting can be done very fast and much depends on time needed for painting. I would suggest it may in fact be very low. I have seen a potter in England make a nicely shaped vase in two and a half minutes and one in Rajasthan, using a single ball of clay and with a single hand-spin of a heavy wheel, form three ornamental vases of different shapes, each about 25 centimetres high and 15 in diameter, one with a separate lid, in just over two minutes. Of course some of the vases in the archive are much more complex and of finer finish and would have taken longer, and the larger ones were thrown in more than one part, but for the vast majority of shapes, a potting output per person of several thousand units a year might well be possible.

Similar considerations apply to decoration. Stissi recognizes that most potters spent some of their time painting, but one suspects that what most of them painted tended to be repetitive, simple and copied, taking only a short time. Highly decorated pots with novel scenes carefully planned and executed would have taken much longer – possibly a few days but nothing like the four months Cook suggested. In any event, for the best painted pots, painting was certainly the production bottleneck and probably divorced from the standard potting firing chain, not least because the best pots seem to have been fired separately to avoid the risk of other vessels exploding.

One hopes that Stissi’s admirably creative approach to estimating volumes from analysis of the Beazley Archive and monographs can be applied to estimating the relative output of products with very different forming or decorating requirements. To achieve more confident conclusions about productivity would require a careful segmentation of products according to the likely time they took to produce, distinguishing especially:

- Shapes that really do take more than a few minutes for an experienced potter
- Painting that would have taken several hours or days and a genuine master as against simple or copied decorations that could be churned out quite quickly by an experienced potter.

This is not an easy segmentation given the limitations and biases in the data we have, but perhaps further finds, together with the application of artificial intelligence in pattern recognition and manipulating big data, will make it more achievable. Stissi’s approach should underlie such developments.

The paper raises two other issues of great interest to social and economic historians. First is the question of employment arrangements. Stissi shows there was a fair amount of mobility between workshops, not only among young artisans finding their niche but also among recognized “masters”. It is interesting to speculate on the relevant economic arrangements. One would expect that the best decorators could command a premium for their work in a way that other painters could not. They needed a workshop in which

to base themselves – at least for raw materials and firing, even if they formed the pots themselves. Their presence would also have shed some lustre on the workshops they used and might well have helped the education of apprentices. Their bargaining power would have been considerable. This perhaps explains why there was considerable mobility. Perhaps they just set themselves up with whatever workshop offered the best terms season to season. Were they actually engaged in the economics of the workshop they used or did they just outsource the rest of the process to the lowest bidder offering acceptable quality standards?

A second question is around the size of average workshops in Athens. Stissi seems suspicious of the data that suggest that all or most workshops in Athens were small and, though he does not really challenge it, he does note that much larger ones have been discovered at Selinous and Corfu. I believe the reason Attic workshops were small was purely economic: there was no financial advantage and a considerable risk in getting larger. An interesting question, and one addressed in relation to Bentz's paper, is what markets Selinous served that made scale beneficial.

Production and Consumption of Ceramics at Selinous: A Quantitative Approach. Martin Bentz

Bentz's paper on discoveries at Selinous presents a fascinating challenge to those of us who like to try to explain industry structures through economics. It is pretty universally accepted now that workshops in 6th and 5th century Athens were small and largely based around households, and the reasons are not far to seek. Scale brought no cost or price advantages for utility ware and premiums for decorated pieces could be achieved in any size of workshop. Expansion therefore brought risk and no economic benefit.

The pottery industry in Selinous was very different. Bentz draws particular attention to the remarkable size of the potters' quarters, the large number of kilns, the presence of some very large kilns and the pairings of them which imply, at least, co-operative working, if not common ownership.

To calculate output and local demand, Bentz uses whatever sources he can find and applies them boldly. Output calculations rest on assumptions about product mix, firing cycles, contemporaneity and seasonality. Local demand calculations start with a reasonably firm quantification of the needs of households, graves and sanctuaries. The former requires an estimate of replacement rates (a notoriously contested topic) and the items in the latter two, though generally small, were large in number, meaning errors might be significant. Nevertheless, there is no reason to think the account is more likely to err in one direction than the other and it would take inconceivably large errors to undermine Bentz's conclusion that the amount produced greatly exceeded local demand and much of it must have been aimed at another market.

We must question how this occurred. Cases of one location exporting a wide variety of pottery items, as seems to have been the case here, are thought to be extremely rare and for the very good reason that, if you had access to a reasonable clay deposit, you could make the products yourself consuming no more materials or labor than anyone else – and there would be no cartage to pay. Pottery exports we know of tended to be items of a single class, decorated vases from Attica being the most notable example. The substantial movement of amphoras in the Northern Aegean at the time was certainly due to the contents rather than the vessels. The most notable examples we have of major exporting centres in Roman times also specialized: terra sigillata from Arretium and “Samian” red terracotta ware from Graufesenque, for example.

Bentz’s important paper raises many questions. Two stand out to me. Why did whoever was buying pottery from Selinous not make their own? Despite Selinous’ scale, the nature of pottery cost structures is such that I cannot believe it would have been cheaper to bring in product from there. Was their home deficient in good clay deposits? Did they have some exchange arrangement whereby they specialized in something else that Selinous imported from them? Were defence alliances involved? Improbable as some of these ideas may seem, the answer must lie in something of that nature.

The second question involves the ownership structure of the kilns. Were they independents who found it convenient and efficient to work together or were the kilns owned by a few individuals and the rest of the workers employees? Or was it a public utility, perhaps with firemen on regular duty, that potters could choose to use when it suited them? If so, what were the governance and maintenance arrangements? Such speculations are intriguing, far though we seem from being able to answer them at present. If anything can throw more light on such matters, it will probably be Bentz’s rigorous yet creative approach to quantification.

The Economy of the Ancient Pavements. Prices and Contracts of Marble Floors and Mosaics in the Ancient Greek World. Niccolò Cecconi

Cecconi’s analysis of contractual payments for the construction of public works in Eleusis, Delos and Epidauros builds on and refines the efforts of scholars such as Feyel to establish payment values and arrangements. By focusing on marble and mosaic flooring, he is able to dig deep into the data available and identify different contract types for different locations and for different buildings within the same location, as well as what may be an important difference between marble and mosaic construction contracts.

The limited number of observations in the surviving epigraphy where both volumes and prices are given shows, as one would expect, the same price per extracted block of breccia stone in 5 contracts at Eleusis. It would be interesting to see if the cost of spotted limestone at Eleusis varied between public and private uses but this would

require estimating how many medimnoi there were per “slab” which Cecconi wisely does not attempt. One wonders if data from other sites might show some basis for one or two hypotheses to be tried. An estimate of labor time required to deliver on the extraction or cleaning contracts – and hence earnings per day per person – would be another interesting continuation of the analysis.

More important though, are Cecconi’s observations on financing. For marble flooring, financed by the sanctuary, Eleusis offered simple contracts, engaging different individuals for extraction and cleaning, while Delos’s contracts were much more complex and Epidauros did a bit of both. Presumably this variability was a pragmatic response to circumstances and it is interesting to speculate on what those circumstances might have been. Labor market variations in different trades? Different priorities or risk-preferences among the commissioners or their communities? Time constraints?

A final question raised by this intriguing piece of research is the motivation of private individuals to finance mosaic floors. For local benefactors like Alexippos and Klearetēs, was it a liturgy or a political gambit or a bit of both? And what was driving foreigners to be so kind to Delos?