SHAPING CULTURAL LANDSCAPES

sidestonepress

SHAPING CULTURAL LANDSCAPES

Connecting Agriculture, Crafts, Construction, Transport, and Resilience Strategies

ANN BRYSBAERT, IRENE VIKATOU & JARI PAKKANEN (EDS)

Published by Sidestone Press, Leiden
www.sidestone.com

Lay-out & cover design: Sidestone Press

Photograph back cover: A. Brysbaert (View of the ancient vertical quarry face at Pendeli, Attica, Greece)
Photograph frontcover: Stock photo by Karsten Wentink (Northwest view of Tiryns citadel, Argolid, Greece)

ISBN 978-94-6426-095-3 (softcover)
ISBN 978-94-6426-096-0 (hardcover)
ISBN 978-94-6426-097-7 (PDF e-book)

Contents

Did ancient building contractors work for free? Stone supply in fourth-century BCE Epidauros, Greece

Jean Vanden Broeck-Parant

1. Introduction

Profit is the difference between what is earned and what is paid in production and selling costs. That some individuals were able to make profit in antiquity has never really been in doubt, or a matter of debate among scholars. Indeed, there is plenty of literary evidence showing that in various activities of production and trade, people did look for profit (e.g., Xen. *Por*. 4.5-6; *Lac*. 7.1-3; Arist. *Eth. Nic*. 8.9.4-6 [1160a]; *Pol*. 1.1257b 23-25; Pl. *Ap*. 30b). Not even Finley, a substantivist, would have denied this (Finley 1973: 21). What has been debated, rather, is whether there was a widespread desire to *maximize* profit (if at all), notably by means of capital investment and innovation. Today, the ability and desire of individuals in ancient Greece to seek and maximize profits is no longer in question. This shift can be explained in great part by the new attention paid to archaeological data and quantitative approaches, which have considerably changed our understanding of various aspects of production and trade (de Callataÿ 2014; Raepsaet 2014). However, with regard to the issue of profitability, there is one sector of the ancient Greek economy that has been left somewhat behind, namely, the production and trade of building stone and, in particular, of limestone (for the profitability of Roman marble quarries as an industry, see recently Long 2017).

With her seminal book *The Greek Temple Builders at Epidauros* (Burford 1969), Alison Burford is still, to this day, one of the only scholars who have addressed frontally the question of the profit made by the entrepreneurs who produced and transported materials for Greek construction projects. She did so on the basis of the corpus of Epidaurian building accounts, dating from the Late Classical and Early Hellenistic period (early 4th-early 3rd century BCE). These accounts contain invaluable information about the construction of various buildings, including financial details such as contract prices. In this respect, they represent an ideal source material to study the revenues of the entrepreneurs involved in construction programmes. Burford acknowledged the influence of Finley on her work; in fact, the study of this corpus was suggested to her by him (Burford 1969: 10). Burford's view on the contractors' profits is best summarized by a quote from herself: 'Both the nature of the work and the evidence of the accounts suggest that contractors for temple building were not all motivated solely or even primarily by expectations of profit from their contract; this is not to say that *no* contractors, either entrepreneurs or professional craftsmen, ever considered the possibility of positive material benefit from contracts for public works, but simply that the evidence shows that in many cases where big profits might have been expected such a thing was hopeless' (Burford 1969: 149).

Jean Vanden Broeck-Parant
F.R.S-FNRS, Université libre de Bruxelles

In: Brysbaert, A., Vikatou, I. and Pakkanen, J. (eds) 2022. *Shaping Cultural Landscapes. Connecting Agriculture, Crafts, Construction, Transport, and Resilience Strategies*. Leiden: Sidestone Press, pp. 285-298.

The statement is quite nuanced, but Burford's opinion is clear: contractors could have made some profit, but they may as well have not. The implication of such a view is that contractors (or, at least, some of them) might have provided their services 'free of charge' or at a loss.

In this paper I want to address the issue of the profit made by contractors involved in monumental construction from a different perspective. I will do so by comparing contract prices found in the Epidaurian building accounts with labour cost estimations based on the architectural remains and reconstructions of the monuments. Labour cost estimations have been used sporadically since the middle of the 20th century, notably by Stanier (1953) and Burford herself (1969) but have regained interest since the publication of the study of the Baths of Caracalla by DeLaine (1997), as one of the new ways to approach the ancient economy. The method consists in measuring the quantity (volume, weight, units) of materials used in monumental constructions, and then, in estimating the amount of human or animal energy necessary to extract, transport and set into place those materials. The estimation of the amount of energy needed is obtained by measuring rates observed in 'ethnographic' contexts to perform these actions on similar materials, and is usually expressed in person-days or, in the case of oxen-pulled materials, in yoke-days. Labour cost estimations are not and should not be a goal in themselves. Instead, they are a tool that helps us compare processes that would not otherwise be comparable. In this sense, the figures do not claim to be more than estimates, and truthfulness is more important than accuracy.

In the context of Late Classical-Early Hellenistic Greece, labour cost estimations can be converted into financial costs since we have a relatively accurate idea of the average daily wage at the time. In turn, these financial costs can be compared with contract prices, which can give a better idea of the margin (that is, the profit) made by the contractors. Russell (2020: 258) applied this principle to the production of marble sculpture in the Roman period and roughly estimated that a carver probably made a profit of around 10-20% of the price of the statue that he had been commissioned to make. I will take the temple of Asklepios (early 4th century BCE) as a case study, as it presents two important qualities for labour cost estimations: its architectural features can be measured quite accurately, and contract prices are recorded for its construction. More specifically, I will focus on the quarrying and the transporting of the blocks of the interior part of the temple (the pronaos and the cella), which is referred to in the building inscription as the *sekos*; what this word exactly entailed from an architectural perspective will be discussed below. Before doing so, I want to address Burford's arguments for the supposed 'unselfishness' of (some of) the entrepreneurs involved in the Epidaurian building programmes. I follow her line of argumentation closely, as she paved the way for a reflexion on this topic.

2. Burford's line of thought

Burford was cautious not to make monolithic statements about the status and motives of the entrepreneurs involved in construction programmes, as she acknowledged that there must have been a variety of situations. Yet her analysis insists, in various places, on the 'landowning status' of the entrepreneurs and the 'diplomatic flair' necessary for 'organizing the resources of others'. These features can hardly be disputed, but in a Finleyan perspective, they are characteristics of wealthy individuals more interested in status than in money-making. This view underlines her idea that profit was not a prime motivation for the entrepreneurs to take up contracts. On the same line, the entrepreneurs, Burford argued, were bonded to the city by an obligation of the sort that was induced by liturgies (Burford 1969: 149). However, this comparison does not seem appropriate, since a significant number, if not most of the contractors working at Epidauros, were foreigners (mostly from Argos, Corinth, and Athens). In fact, if we understand liturgies as civic duties in the context of the construction of the temple of Asklepios at Epidauros, guarantorship would better qualify as a liturgy. This is supported by the fact that the guarantors were all recruited among the wealthy Epidaurian citizens, and they could hardly hope for any material benefits.

Two specific arguments are presented by Burford to claim that entrepreneurs could not hope to make profit and, therefore, were not necessarily interested in making any. The first argument is that some contractors were fined enormous amounts for delays or defaulting works. In the Thymele accounts, the entrepreneur Megakleidas received 1,040 drachmae in fines out of a contract price of 1,775 drachmae (*IG* IV^2 103 = Prignitz 2014, inscr.2, lines 198-199, 230-231), and Molossos, another entrepreneur, paid a huge fine of 4,320 drachmae (lines 207-208), which must have, according to Burford (1969: 152), 'cancelled out a large part of his contract price too', even though the contract price is not known in the latter case. Megakleidas, she says, 'lost over sixty per cent of his contract price in a fine for delay, which rather suggests that he took the job on for its interest, not as a business proposition' (Burford 1969: 149). This amounts to saying that Megakleidas expected to be fined when he took on the contract and that he did not care too much about it, which is purely conjectural (Schaps 1996: 86, n. 32 has a similar reservation). All that can be safely deduced from Megakleidas' and Molossos' cases, in fact, is that fines could be quite substantial, but nothing excludes *a priori* that the entrepreneurs could have spread these costs over several projects. The same Molossos, for example, was paid the considerable sum of two talents (12,000 drachmae) for supplying sima[1] blocks to Delphi in 341 BCE (*CID* II 32,

1 The sima is the outer edge of the roof, acting as a gutter. It is usually decorated with mouldings and paintings.

Table 1. Figures of quantities, prices and costs for the quarrying and transport of stone for the *sekos* of the temple of Asklepios at Epidauros. All figures are estimates, except the prices in italics, which are directly deduced from *IG* IV² 102 = Prignitz 2014, inscr. 1.

FIGURES OF STONE QUARRYING AND TRANSPORT FOR THE SEKOS OF THE TEMPLE OF ASKLEPIOS AT EPIDAUROS
Quantity of stone
Volume of stone extracted: 271.2 m^3
Volume of stone in building: 244.1 m^3
Weight of the stone transported: 488.2 T
Prices and costs of quarrying
Total contract price for quarrying: 8800 dr.
Price for quarrying per m^3: 32.5 dr.
Total cost for quarrying: 1084.4 person-days = 1084.4 dr.
Cost for quarrying per m^3: 4 person-days = 4 dr.
Prices and costs of transport
Total contract price for transport (including land and sea transport): 3400 dr.
Price for transport per T: 7 dr.
Total costs for transporting the stone on land:
From the quarries to the harbour of Kenchreai: 162.75 yoke-days = 325.5 dr.
From the harbour of Epidauros to the sanctuary of Asklepios: 488.2 yoke-days = 976.4 dr.
Total: 651 yoke-days = 1302 dr.
Cost for transporting on land per T: 1 yoke-day = 2 dr.
Total price for sea transport: 1547 dr.?
Price for sea transport per T: 3.2 dr.?

lines 10-11). Arguably, such large contracts, if taken up by Molossos on a regular basis, would have easily absorbed fines of several thousands of drachmae.

Burford's second argument, which is more assumptive, is that an interest for the cult of Asklepios could have prompted entrepreneurs to take up contracts. This may well be true, but religious interest is not incompatible with business and profit making. Furthermore, the evidence that she invoked is quite meagre; it is the case of Hermon of Thespiae, who 'took out' (ἀφεῖλε) six drachmae of the 220 that he was supposed to receive for supplying reed for the temple of Apollo at Delphi (*CID* II 56 A, l. 10-20). This discount was interpreted by Bourguet (1905: 156) and then Bousquet (1989: 105) as an 'offering' to Apollo. However, it is also possible that Hermon made this cut in order to be more competitive and to increase his chances of winning the contract, as was already suggested by Feyel (2006: 486-489) who sees further possible examples of discounts in the prices of Delian contracts. The *naopoioi*[2] eventually withheld a tenth of 214 drachmae (not 220), presumably because Hermon's delivery was late. Knowing that, another possibility is that he made a discount with the idea that it could grant him the leniency of the *naopoioi* and that he could avoid a 22-drachma penalty. The interpretation as an 'offering' is, therefore, far from obvious. Perhaps more importantly, a discount on a salary is, in fact, in contradiction with the very principle of an offering, which is to *give* something to a deity.

The question of the profitability of building contracts, therefore, remains open. Labour cost estimations, I argue, provide a new angle to explore this issue, by comparing those costs with the prices of the contract to which they pertain.

3. A case study: the sekos of the Temple of Asklepios at Epidauros

The Temple of Asklepios at Epidauros was built in the first half of the 4th century BCE. It is traditionally dated around 370, although Prignitz (2014: 248-249) has recently suggested a much earlier dating around 400-390 BCE. While the remains of the temple are rather scarce, its construction is well known thanks to an inscribed stele recording the building expenses (*IG* IV² 102 = Prignitz 2014, inscr. 1). The inscription is almost completely preserved, allowing us to know the duration of the works (about five years), the overall cost of the temple (around 23 talents), and a number of details about the construction process. Large chunks of the works were let out as single contracts, some of which comprised not just one, but two or three steps of the construction, such as quarrying, transporting and placing the blocks. Usually, a single entrepreneur took up a whole contract and was, therefore, in charge of a significant portion of the temple. The text of the inscription rarely specifies what the total price of each contract corresponded to, or how it was calculated. Therefore, it is impossible, on the sole basis of the text, to determine individual costs included in the contract prices, let alone whether the contractors were making any profit. Labour cost estimations arguably provide a way to measure the actual costs of specific tasks, as opposed to contract prices, which can comprise a whole range of costs in addition to the ones pertaining specifically to the said tasks. Since we have a pretty good idea of the average daily wage at the time of the construction of the temple of Asklepios, it is possible to convert labour costs into financial costs and, in turn, to compare those costs with the contract prices. Table 1 shows a summary of the price and cost estimations discussed in this paper.

The *sekos* of the temple, which comprises the pronaos and the cella, is a good case study for the estimation of labour costs of quarrying and transporting stone. It combines three important qualities. First, we know relatively well what the '*sekos*' of the inscription corresponded to in reality, an issue often encountered when attempting to match the inscriptions with the physical remains. Second, despite the poor state of preservation of the building, it is possible to reconstruct the architecture of the *sekos* with relative accuracy, and therefore, to estimate the total volume of stone that was needed. Finally, the quarrying and transporting of the stone blocks for the *sekos* were the objects of separate contracts that allow us to easily determine the total price of this specific operation.

2 The *naopoioi* were an international board of officials in charge of the construction of the temple of Apollo at Delphi.

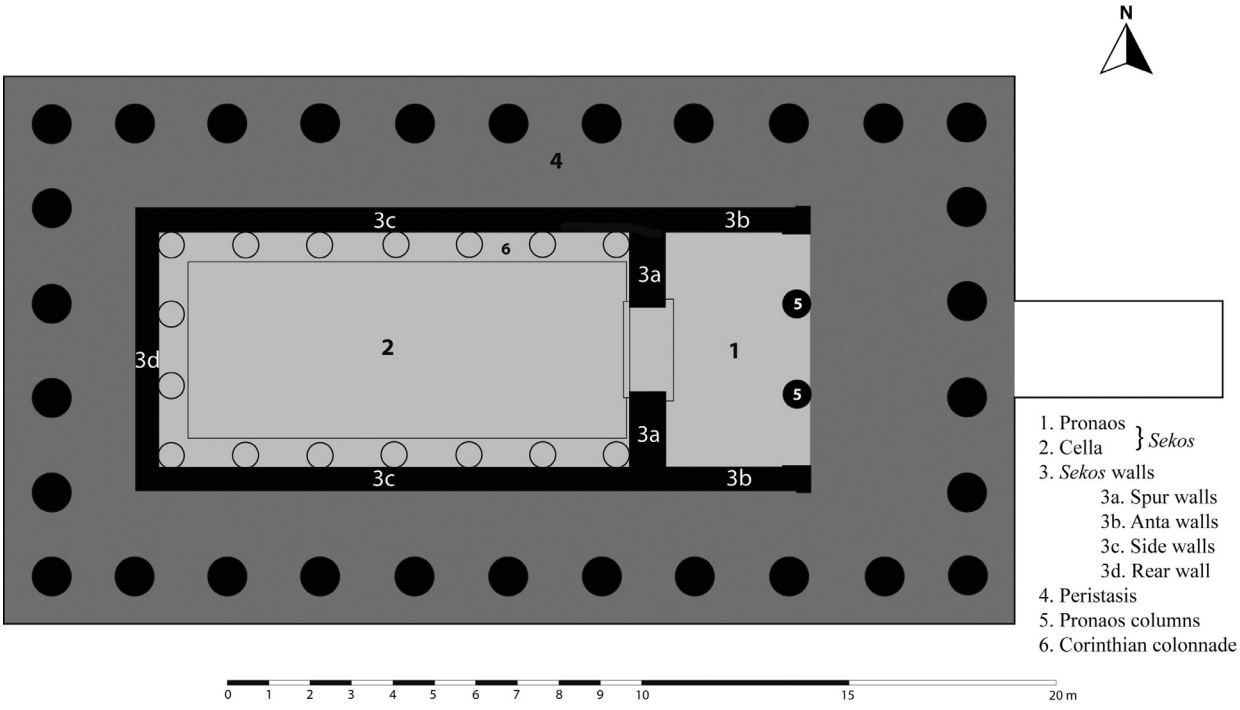

Figure 1. Plan of the temple of Asklepios, with the architectural elements mentioned in the text. After Roux 1961: pl. 28.

The accounts of the temple record that Euterpidas of Corinth took up the quarrying and transporting of half of the *sekos* for 6,167 drachmae (Prignitz 2014, inscr. 1, lines 12-14); that Archikles of Corinth took up the quarrying of half of the *sekos* for 4,400 drachmae (lines 14-16) or perhaps a bit more (some letters are missing); and that Lykios of Corinth took up the transport of half of the *sekos* for 1,700 drachmae (lines 16-18) or perhaps a bit more (here too, some letters are missing). From these prices it is clear that the total prices for quarrying and transporting the blocks of the *sekos* were, respectively, about 8,800 drachmae and 3,400 drachmae. It could have been slightly more but, in any case, the difference would be negligible for our calculation.

In order to estimate the labour cost that corresponded to these prices, one needs, first, to assess the total volume of stone of the *sekos*, which implies to determine what the word *sekos* exactly stands for from an architectural perspective (see Figures 1 and 2). It certainly included the side and rear walls, the anta walls of the pronaos, and the spur walls separating the cella from the pronaos. Roux did not find any fragment of the crowning of the walls, but the inscription refers to a ὑποδόκιον, possibly a course of stone blocks supporting the beams, as the name indicates (Roux 1961: 115; Prignitz 2014, inscr. 1, lines 57-58; 230-231). One of the passages mentioning the ὑποδόκιον also mentions a κυμάτιον, which Prignitz (2014: 53) interprets as a decorative course below the ὑποδόκιον. In any event, the reconstruction of the upper parts of the walls remains conjectural. A generous estimation of their total volume, based on Roux's drawings, amounts to 60.9 m^3. The ceiling itself was made of wood (Roux 1961: 123) and must be, therefore, excluded from our calculation.

Should the two front columns of the pronaos be included in our contract? Baunack (1890: 69-70) suggested that they could have been the object of a separate contract mentioned on lines 18-19. These lines are very badly preserved; the only letters that make sense on line 19 inform us that two individuals were paid 230 drachmae and 300 drachmae (or more) respectively, for jobs that had been already completed when the account was written (this is evident from the fact that their names are in the dative form; see Thür 2015). Baunack's suggestion finds support in the fact that the second craftsman, Kallidikos, appears elsewhere for 'stone quarrying' ('λατομία', line 296). However, he was most likely an Epidaurian, since no ethnic is mentioned, which means that the stone he quarried probably came from the Epidauria. Since the local limestone was unlikely to be finer than the Corinthian limestone, one would have to assume that the pronaos columns, which were probably the object of particular care, were made of a coarser stone than the one used for the rest of the *sekos*. In any case, it is possible that Kallidikos performed a job other than stone quarrying mentioned on lines 18-19. Therefore, I chose to include the two front columns in my estimation of the total volume of the *sekos*. Future works will have to take into account that the lines 18-19 could have referred to the quarrying of stone for some element of the temple. At this stage, it is impossible to tell.

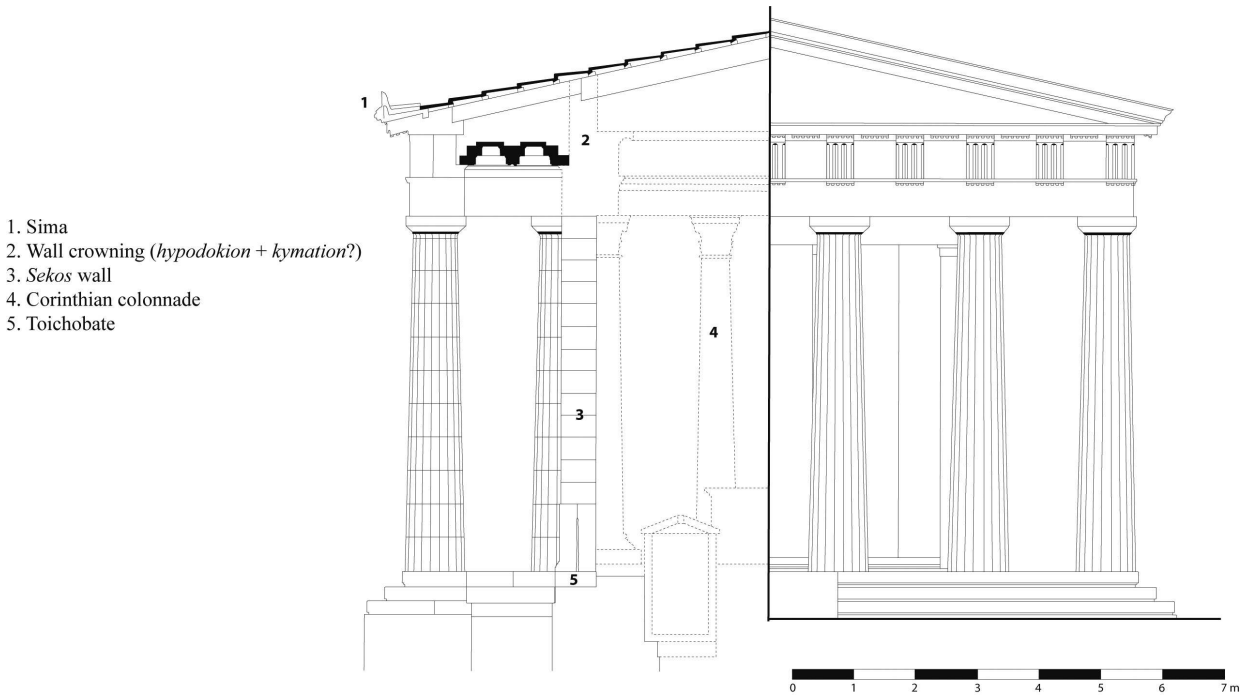

Figure 2. Section (left) and facade (right) of the temple of Asklepios seen from the front, with the architectural elements mentioned in the text. After Roux 1961: 125 fig. 28.

The foundations of the *sekos* were part of a different contract that was taken up by Antimachos of Argos (lines 9-10), so they should be excluded. So was the paving of the temple (lines 38-40), which must have included the *sekos* since no distinction is made in the inscription between the different paved areas. What is more, the pavement was made of a finer limestone than the one used for the elevation. I include the toichobate[3] course in my estimation, since it makes more sense for it to have been included in the quarrying of the *sekos* than in the quarrying of the foundations or of the peristasis[4]. In any case, it represents a relatively small percentage of the total volume of the *sekos* and its absence would not significantly change the results of the estimation. A more problematic issue is the supposed interior colonnade of the *sekos* running along the side and rear walls. Roux (1961: 112-114) could not find any fragment belonging to this colonnade but he nonetheless hypothesized its existence on the grounds that several wall blocks show a recess comparable to the ones that can be observed in the Tholos at Delphi, where there was an interior colonnade. Furthermore, the contractor Marsyas is said to have polished the columns 'τᾶν ἔχθοι καὶ τᾶν ἔνδοι', the ones outside and the ones inside (lines 66-67), where the 'inside' columns could refer to an interior colonnade. I chose to include this hypothetical, yet plausible, interior colonnade in the contracts for quarrying of the *sekos*. The columns appear on Roux's drawing of the plan of the temple, but he does not discuss their number (16 columns appear in his drawing) and diameter (about 0.65 m). My estimation of the volume of the colonnade is based on this drawing. I assume that the height is the same as that of the *sekos* walls (about 5.7 m), as restored by Roux (1961: 125, fig. 28). The total volume of the supposed interior colonnade is about 30 m^3, which represents about 17% of the total amount of stone that was quarried for the *sekos*.

Overall, the volume of stone used for the construction of the *sekos* was about 244.1 m^3. However, this figure does not exactly account for the volume of stone that was extracted. One needs to take into account the material that was 'lost' in digging the excavation trenches and in scantling the blocks, which could have amounted between 7 and 11% according to Bessac (1996: 311); he suggests an approximate 10% for labour cost estimations. Adding another 1% accounting for the surface material that was removed in order to access the exploitable stone, we get a figure of 271.2 m^3. Even taking into account the hypothetical interior colonnade and the 'lost' material, it is still significantly less than what Stanier had estimated for the front and for the back and side walls of the cella alone, 345m^3 (Stanier 1953: 74; the same figure is used by Burford 1969: 248). This discrepancy comes in large part from

3 The toichobate is a row of blocks integrated to the crepis (the substruction courses of a temple), which supports a wall.

4 The peristasis is a four-sided colonnaded porch around the cella of a temple.

the fact that Stanier based his estimation on the figures given by Dinsmoor and Cavvadias (1891), where the walls appeared to be much thicker than they actually were: 1.55 m for the rear wall and 1.48 m for the side walls. This is almost three times the measurements given by Roux.

4. The costs of quarrying

No experimental work has been done so far that could help us determine the time needed for extracting the specific limestone used in the temple of Asklepios or, more generally, the oolitic limestone that is found abundantly in the Corinthia. Hayward (2013: 68) estimated that it would take about 25 hours for quarrying 1.4 m^3 of Corinthian oolitic limestone, on the basis, first, of an experiment by Kozelj (1988: 36-39), who extracted a Thasian marble block of 0.125 m^3 in 22.5 hours, and, second, the assumption (originally collected by Stanier 1953 from Oxonian stonemasons and then repeated by Burford 1969), that marble takes about five times longer to quarry than softer stones. Hayward does not specify how many workmen are implied in his figure; it must be two, for a simple arithmetic calculation based on Stanier's ratio and Kozelj's experiment gives not 25, but 50 hours, for quarrying 1.4 m^3 of Corinthian oolitic limestone. Therefore, it must have taken one person about 36 hours for extracting one cubic metre. This is slightly more than what Bessac estimated for quarrying the same amount of stone in the Pielles quarry, in southeastern France (31 hours and 10 minutes), in the context of a quarry with Hellenistic traditions and techniques. The stone from les Pielles is 'slightly firmer' than the local oolitic strain, and it is surprising that it would take longer to quarry the soft Corinthian limestone. This tends to confirm Bessac's (1996: 309, n. 1) friendly criticism of Kozelj's experiment, namely that the productivity can vary dramatically between a one-off experiment and a professional, routine activity. Strict comparisons, however, are deceptive and can also be misleading. Therefore, I follow Hayward's estimation, in lack of more accurate estimations.

The average length of a working day in antiquity cannot be ascertained. It must have depended on the various activities; some being more wearing than others. The maximum limit, of course, must have been determined by the available daylight. In Athens, the time of daylight ranges from about nine hours and 30 minutes per day in the winter to about 14 hours and 45 minutes in the summer. Some, like Bessac (1996: 309), have proposed an average of 10 hours of work per day, others, eight hours (Hayward 2013: 68, n. 24). There is little doubt that there must have been important variations according to the place and time. Here I take an average of nine hours of effective work per day. Therefore, it must have taken roughly two days (18 hours) for a team of two quarrymen – or 4 person-days – to extract 1 m^3 of Corinthian oolitic limestone. This is significantly less than Burford's figure, who estimated that it took 6.5 person-days for extracting 1 m^3 of limestone (Burford 1969: 248).

In the Erechtheion accounts, the daily wages of workmen comprised between five obols and one drachma (or six obols), and that of the architect is one drachma (Randall 1953). These are Attic drachmae, not Aiginetan as in Epidauros. However, the architect of the temple of Asklepios, Theodotos, also had a salary corresponding to one drachma a day (Prignitz 2014, inscr. 1, lines 7, 29-30, 52), and I assume that the ratio between his salary and the wages of the skilled workers was the same as in the Erechtheion accounts. Since 1 m^3 of stone required two skilled quarrymen to work for two days, it can be estimated that its extraction cost four (Aiginetan) drachmae. This cost can be compared to the cost of limestone blocks from the Akte Peninsula mentioned in an Eleusinian inscription dating from 329/8 BCE (*IG* II^2 1672, lines 131-132). Pakkanen (2013: 64-65) calculated that the price of 1 m^3 was about 4.9 (Attic) drachmae and suggested, on the basis of ethnographic comparisons, that this price only accounted for the actual labour costs of quarrying. At that time, the daily wage of the workers was two drachmae, as attested in the same inscription, meaning that the extraction required 2.5 person-days, to be compared with the 4 person-days required for extracting one cubic metre of Corinthian oolitic limestone. This comparison, combined with Bessac's criticism mentioned above, suggests that the estimation of 4 person-days is perhaps too generous. In any case, a lower estimate would only reinforce the discrepancy between the actual quarrying costs and the contract price for quarrying. Indeed, according to my estimation, the price of 1 m^3 of stone (32.4 drachmae) was about eight times higher than its actual quarrying cost (4 drachmae).

How can we explain this difference? The stone itself, as a material, probably did not cost anything, contrary to gold or silver, for example. The question of the intrinsic value of stone has been a long-lasting debate which has still not reached a consensus. However, it might be, as Carusi called it, a 'false problem', since stone, she writes, 'does not exist in the abstract without quarrying' (Carusi 2019: 67). The Eleusinian inscription *IG* IV^2 1672, as Ampolo (1982: 255 n. 31) has shown, seems to point in that direction, since the price (τιμή) of the stone corresponds exactly to the cost of its extraction (τομή).

There were, of course, a lot of costs for a contractor in addition to the extraction of a block. The exploitation of the quarries was probably subjected to a fee, in one form or another. Little is known about the ownership of the quarries in Greece, and in the Corinthia specifically there is a complete dearth of evidence. A column drum found in a quarry bears the two-letter mark ΔA which, according to Lolos (2002), is the abbreviation of δαμόσιον. In fact, ΔA could equally have been the abbreviation of a name, as was noted by Sève (*BE* 2003: 575, n. 92). Even if the two letters did

refer to the 'public' or 'state' sphere, it would not necessarily mean that the quarry itself was state-owned. Since then, new inscriptions have been discovered on quarry faces near Kenchreai, the eastern harbour of Corinth, but they date from the 1st or 2nd century CE and do not inform us on the ownership of the quarries (Hayward and Pitt 2017). Therefore, one must, as is often the case, turn to the Attic sources. They are not abundant and might not be completely relevant to the exploitation of quarries in the Corinthia, but they can at least give us an idea about the different regimes that could have existed. There is evidence in Attica of quarries owned by gods and administrated by the city or the demes. For example, an Eleusinian inscription bearing two decrees dealing with the quarry of Herakles in Akris attests that this quarry was leased out, at the deme level, to the highest bidder (*SEG* 28, 103). The existence of privately owned quarries in Attica is debated. Recent scholarship, however, has demonstrated the high probability that private quarries existed alongside public quarries, and that the state received taxes on the exploitation of such quarries (Flament 2015 and Carusi 2019, with earlier bibliography). The Attic evidence is scarce but tends to suggest that whatever regime they were subjected to, the contractors had to pay for the right to exploit quarries. Unfortunately, it is impossible, in the state of our documentation, to measure the weight of these financial burdens. All we can say is that it did not apparently deter entrepreneurs from investing in quarries.

In addition to these 'exploitation fees', stone quarrying, especially for monumental buildings, incurred a series of costs related either to the additional tasks required when extracting a block or, more generally, to the logistics of a quarrying site. First, stripping was necessary to access the stone bed. Then, a quarry face had to be opened. These preliminary steps generated a considerable amount of waste that had to be discarded. The quarrying operations themselves generated more waste in the form of stone chips and dust which also had to be regularly removed. These tasks which did not pertain directly to the extraction of stone blocks were probably performed by day labourers. A block, once extracted, needed more or less extensive scantling. It was then moved to a storage platform or directly to the loading area, which also required some handling. Possibly, an individual (or more) was assigned to the loading of the blocks on the carts. According to Kozelj (1988, 31), the 'basic' arrangement of a quarry also included, in addition to the infrastructure that we already mentioned, hoisting machines, a small sanctuary, a guard tower, accommodation for the workers, and a workshop for repairing the tools. This equipment needed maintenance, which generated further expenses. It is, however, difficult to determine the extent of these facilities, or whether they existed at all in the quarries that produced the stone for the temple of Asklepios, as we do not have the slightest idea as to how the production was organized. If the production was relatively constant in time and space, it would make sense that the quarrymen and their family had settled in nearby villages. In such case, on-site accommodation would not have been necessary. The guard tower was likely a recurring feature of large-scale quarrying sites, but it is doubtful that it would have been necessary on smaller sites. As for the sacred areas, they did not necessarily take the form of imposing structures and could have consisted of small shrines (Kokkorou-Alewras et al. 2010: 66-67). There was, in any case, a need for metal workers and equipment for the maintenance of the tools. *Ostraka* of the Mons Claudianus in the Eastern Desert of Egypt, which date from the early 2nd century CE, provide lists of workers employed on the quarry site. For four stoneworkers, about one metal worker was required, a high ratio related to the exceptional hardness of the granodiorite that was extracted here. Russell (2019) gives the approximate ratio of 1:12 for the Dokimeion quarries, where softer marble was excavated, and it is likely that this ratio was even lower in the Corinthian limestone quarries.

We still know too little about the organization of stone exploitation in the Corinthia (despite the enormous progress made thanks to the work of Hayward 1996; 2013) or in Greece in general at that period, to draw realistic assumptions about the costs incurred by the running of a quarry, notably in terms of its infrastructure and the wages paid. However, the evidence does exist, in direct or indirect forms. The ancient quarries themselves arguably provide the best source material if one interprets them in light of the ancient texts but also, more importantly perhaps, the ethnographic surveys play a major role. Such work, which combines all the various sources that we possess, remains to be done, especially for Classical and Hellenistic Greece.

5. Land and sea transport: costs and price parallels

The total price for the transport of the stone blocks of the temple of Asklepios, as we have seen, was about 3,400 drachmae. This comprised at least sea transport from Kenchreai to the harbour of Epidauros, roughly 43 km by sea, and land transport from the harbour of Epidauros to the sanctuary of Asklepios. The easiest route, especially for heavy transport, must have been the one corresponding to the modern national road EO70 that goes from the modern town of Epidauros towards Nauplion. The ancient road thus probably went along the north side of the Myrona and Profitis Ilias mountains, and then went south after the latter, to the sanctuary (see Figure 1). Following this route, the distance from the harbour to the sanctuary was about 11.3 km, on a relatively flat terrain.

As for the land transport from the quarry to the port of Kenchreai, there are two issues. The first problem is that we do not know exactly where the stone of the *sekos* was

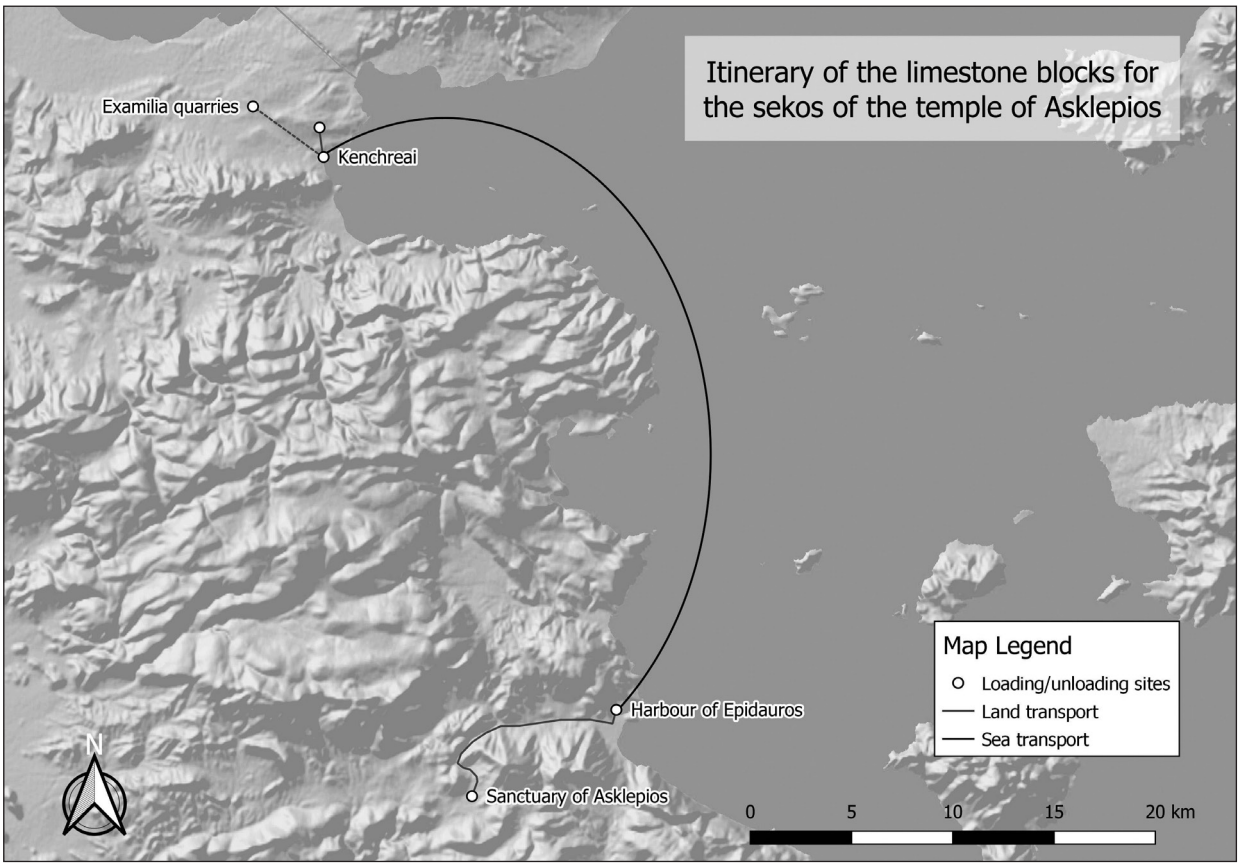

Figure 3. Map with the itinerary of the limestone blocks for the *sekos* of the temple of Asklepios.

quarried, or whether it was quarried in only one place. The exact provenance is difficult to establish because of the rather uniform appearance, at a macroscopic level, of most of the oolitic limestone of the Corinthia. According to Hayward (1996: 219), extensive quarries situated about 1.5-2 km away from Kenchreai must be considered as 'strong candidates' for the supply of oolitic limestone to Epidauros. The Examilia quarries could also have provided the limestone of the temple of Asklepios but are a bit more distant (about 4.5 km). This dilemma can only be solved by high-accuracy provenance determination of the stone used in the temple of Asklepios, which remains to be done. Arguably, however, a two-kilometre difference did not have a big impact on the transport costs. The second issue is that it is not certain whether the land transport from the quarry site to the harbour was comprised in the 'quarry contract' or in the 'transport contract'. After all, the contract titles as they appear in the inscription are rather concise and vague; furthermore, it would have made sense for the contractor in charge of the quarrying to arrange the transport of the blocks out of the quarry, as the logistics of the two were intrinsically linked – one thinks, for example, of storage and space management within the quarry site. I follow here the most straightforward interpretation, which is that the transport from the quarry to Kenchreai was comprised in the 'transport contract'.

The volume of transported stone was not equal to the volume extracted. As we have seen, an average of 10% of the extracted stone was 'lost' in scantling works in the quarry. The objective of this operation was, precisely, to reduce the transportation costs. Of course, some finishing work on the construction site would have further reduced the total volume of the blocks, but only by a negligible degree. Therefore, the figure used in the following calculation is that of the estimated total volume of the *sekos*, i.e., 244.1 m^3. The main variable to take into account in our case is not the volume, but the weight. Indeed, the blocks used for the construction of the *sekos* were of a medium size and could be fitted easily on a small cart. The standard elevation blocks, for example, measured 0.565 × 0.355 × 1.132 m (Roux 1961). According to Hayward, the density of the Corinthian oolitic limestone is approximately 1.9-2.1 tonnes per cubic metre (Hayward 2013). Taking the average of 2 tonnes per cubic metre, we get a total weight, for the *sekos* of the temple, of 488.2 tonnes. This is considerably less than the 948 tonnes estimated by Stanier. In addition to the difference in volume estimates, this huge discrepancy is also due to the fact that Stanier assumed a density of about 2.7 tonnes per cubic metre, which is closer to the average density

of marble stones. As a result, the transport price per ton was about 7 drachmae.

Let us now see how this price compares with the figures that we obtain with labour cost estimations. I will start with the cost of land transport, which lends itself more easily to labour cost estimations than sea transport. The most common means of heavy transportation in ancient Greece was a wagon with two or four wheels pulled by oxen. For large blocks of several tonnes, special platforms or reinforced wagons would have been needed, as well as several pairs of oxen. However, the blocks of the *sekos*, the weight of which was comprised (roughly) between 400 kg and a ton each, could have been easily transported by a pair of oxen, which could pull a charge of a tonne in normal conditions. That carts could transport a charge of a ton or more is evidenced by the Epidaurian accounts themselves, as Burford has shown (1969: 187-188) and was confirmed by Raepsaet on the basis of ethnographic sources (Raepsaet 2019: 81-82). The distance from the harbour of Epidauros to the sanctuary, as we have seen, is about 11.3 km. I assume that the road was relatively flat, as it is today, and that it was made of battered earth. The average slope between the departure and arrival points is of less than 3%. In these conditions, which can be considered 'normal', a pair of oxen pulls, on average, a weight of one ton, at a speed of about 2.5 km per hour (Raepsaet 1984). On the basis of these factors, it can be estimated that it took about four hours and a half for a pair of oxen carrying about one ton of material to get to the sanctuary. We also know from ethnographic sources that a pair of oxen can work about six hours a day when subjected to an intense effort (Raepsaet 2019: 52). Considering that some time must have been needed for loading and unloading the blocks (see Brysbaert 2015: 96-97 for the loading and unloading of blocks in a prehistoric context), and that the pairs of oxen had to make the return travel (with an empty wagon), it is unlikely that a carriage could have made more than one delivery per day. Therefore, we must consider that, on average, one pair of oxen could deliver one ton of stone at the sanctuary per day.

The oxen were probably hired, along with carts, from local peasants. Costs for hiring pairs of oxen for one day are found in the Eleusinian inscription from around 330 BCE which contains accounts of the construction of the Porch of the Telesterion and deals in particular with the transportation of column drums (*IG* II^2 1672). The situation with which the transporters of the Telesterion blocks had to deal with was significantly more complicated than that of the blocks of the temple of Asklepios: the blocks weighed about 7.5 tonnes and required a specific type of wagon, as well as up to 11 pairs of oxen pulling together over 35 km for up to three days and a half. The cost of hiring a pair of oxen was four drachmae a day, 'according to a decision of the people that Lycurgus had put to the vote', the inscription records (*IG* II^2 1673, line 65). The figure makes sense, considering that a normal daily wage at the time was two drachmae, as already mentioned; the four drachmae covered the peasant's salary as well as maintenance fees and, perhaps, a compensation for the inconvenience of the requisition. As we have seen, the daily wage in early 4th century Epidauros was not two drachmae, but one; therefore, we can reasonably assume that the hiring of a pair of oxen cost two drachmae a day at the time. The cost for transporting the blocks of the *sekos* to the sanctuary, therefore, can be estimated to 976.4 drachmae. Applying the same reasoning for the land transport from the quarry site to Kenchreai, and assuming that the latter was about 2 km away from the former, it can be estimated that a single pair of oxen was able to make three deliveries a day, for a transport cost of about 325.5 drachmae. In total, the land transport costs would have amounted to about 1,302 drachmae, or 38% of the contract price. Of course, this estimation does not take into account the loading and unloading of the blocks, which required several workers and cranes or ramps (Korres 2003: 36-37). As already mentioned, it is also possible that the transport cost from the quarry to Kenchreai (estimated at 325.5 drachmae) was included in the 'quarry contract' rather than the 'transport contract'. However, the difference would not be high enough as to change the observations made above.

Interestingly, the Thymele accounts contain a reference to a contract for transporting stones specifically from the harbour of Epidauros to the sanctuary of Asklepios: Megakleidas (an entrepreneur already mentioned above) transported 71 blocks of Pentelic marble for a total price of 1,775 drachmae, or 25 drachmae a piece (Prignitz 2014, inscr. 2, lines 198-199). There is little doubt that the price was calculated per individual block. According to Roux (1961: 175), the 71 blocks must have constituted the totality of the marble blocks necessary for the completion of the *sekos* walls of the Thymele, with the exception of the exterior orthostates. This would amount to approximately 50 tonnes, meaning a price of around 35.5 drachmae per tonne to transport the stones from the harbour to the sanctuary. The difference with the price recorded for the blocks of the *sekos* – 7 drachmae per tonne for the whole trip, including sea transport – is huge but not extremely surprising: the blocks of the Tholos were made of a heavier, but also finer, marble and, more importantly, their curved and slender shapes, which made them more susceptible to breakage, implied a completely different set of logistics.

With regard to sea transport, the actual costs are difficult to estimate because we lack sufficient direct parallels but also, more crucially, because too little is known of the infrastructure that was used, such as the types of cranes (and the number of men that were required to operate them), and the harbour facilities in place to load and unload the blocks. One might expect that Kenchreai had developed efficient infrastructure by the early 4th century, but that was not necessarily the case

at the harbour of Epidauros at the time. More importantly perhaps, we are at sea regarding the type of ships that were used and their cargo capacity. At the time of the construction of the temple of Asklepios, the cargo capacity of transport ships could already exceed 100 tonnes (see Bresson 2016: 86-87; Raepsaet and Pomey 2020: 34-37). In theory, therefore, five journeys or less would have been enough to transport the blocks of the *sekos*. In reality, smaller ships, such as those of the type of the Kızılburun wreck (late 2nd-1st century BCE; see Carlson 2009), could have been used to transport stone. The size of the ship and of the space available for cargo also determined the number of rowers on board, who probably helped with the loading and unloading of the blocks. Since too many details elude us, it is impossible, at this stage, to estimate the costs of sea transport in terms of wages.

There are, however, a number of parallels with regard to prices for sea transport, notably for Delphi at about the same period and, in the Hellenistic period, for Epidauros and Didyma, but, as we will see, none of the ratios given in these passages can be safely replicated in our case study. Loading and unloading the blocks were arguably burdensome steps: Haussoulier (1926) calculated that column drums for the Didymaion, about seven tonnes each, were loaded and unloaded at a cost of roughly 80 drachmae each (40 drachmae for each step); at a time when the daily wage was about 2 or 3 drachmae a day (Raepsaet and Pomey 2020: 45). Assuming an average daily wage of one drachma in Epidauros, and applying this rate to our case, the total cost just to load and unload the blocks would be unrealistically high (about 1,860 drachmae at the very least). For the loading and unloading operations, the size of the blocks mattered a lot. An Epidaurian inscription from about 300 BCE mentions the lifting of blocks 'from the sea', thus probably following a wreckage that happened close to the shoreline, for 5 drachmae a piece (Kritzas and Prignitz 2016). However, this rescue operation can hardly be compared with a normal (un)loading operation.

Relatively close in time to the construction of the temple of Asklepios, around 338 BCE, a series of replacement limestone blocks (angle triglyphs and *epignapheia*[5]) were shipped from the Corinthian harbour of Lechaion, on the Corinthian Gulf, to Khirra, the harbour of Delphi (*CID* II 59, lines 50-69). Hansen (in Amandry and Hansen 2010: 473, fig. 19.3) gives the measurements of these blocks, which allows estimating their volume and weight. In turn, the price per tonne for shipping can be calculated as about 41.2 drachmae. At such a rate, and even if we assume an inflation ratio, the price to transport the blocks of the *sekos* of Asklepios would have skyrocketed. This high price can be explained by the fact that these blocks were an emergency order, and that the commissioners evidently did not proceed to an auction, as was normally the case (Bommelaer 2008: 234). The risk factor may also have had an impact. Risk is, of course, extremely difficult to assess, but crossing the Gulf of Corinth is arguably riskier than following the coastline from Kenchreai to Epidauros; it could also have been a bad season for sailing when the emergency order was placed.

The Epidaurian inscription mentioned above also gives rates for the transport of blocks overseas (Kritzas and Prignitz 2016, lines 94-114, 128-138). The configuration of the stone supply resembles ours in many aspects, with small, ashlar ('four-feet') limestone blocks being shipped from Corinth across the sea to the harbour of Epidauros. The inscription does not specify where the blocks were delivered, but the mention 'across the sea' makes it likely that the land transport from the harbour of Epidauros to the sanctuary was the object of a separate contract. Lakon, the entrepreneur who took up the contract, received 9 drachmae per 'four-feet' block. Four feet makes about 1.20 m, which corresponded to one of the dimensions of the block, but the other dimensions are not specified. Kritzas and Prignitz (2016: 22-23) argue that the blocks mentioned in the inscription were probably intended for the upper parts of the Propylon of the Gymnasium, meaning that each of them would have had a volume of either about 0.28 m^3 or about 0.56 m^3. The limestone foundations of the temple of Artemis in Epidauros are paid by the tetrapodia, and standard blocks of these foundations have been measured as 1.28 x 0.78 x 0.29 m (Roux 1961, Pakkanen 2013). This gives a volume of about 0.29 m^3 per block, a figure very close to the volume of some of the blocks of the Propylon for the Gymnasium. If the four-feet blocks transported by Lakon had a volume of about 0.28 m^3, the rate would have amounted to 32.1 drachmae per cubic metre, or 16 drachmae per tonne; a volume of 0.56 m^3 per block would halve this rate, thus 8 drachmae per tonne. Applying such rates to the *sekos* of the temple of Asklepios, and taking into account the inflation, we obtain, respectively, figures of about 3,904 drachmae, which exceeds the total contract price (3,400 drachmae), and 1,547 drachmae. Even though the latter figure seems more realistic in relation to the contract price, we lack evidence that could help us to decide between the two rates, as many other factors could have influenced the prices and explain the rate difference between c. 390 and c. 300 BCE. One of these factors is the level of competition between contractors. The example from Delphi cited above gives an idea of what the prices could be when there was no auction, and the prices were fixed.

6. Conclusions

The preliminary results presented in this paper allow some comments regarding the profitability of the contracts taken up by the entrepreneurs at Epidauros. The case study of the *sekos* of the temple of Asklepios shows that the costs in wages for quarrymen represent only a small portion of the prices of quarrying contracts. This suggests

5 The word *epignapheion* is a hapax and probably refers to angle cornice blocks.

that there was room, in the contract price, for substantial profits. The exact size of these profits in proportion to the contract price, however, remains to be determined. A number of additional costs, which might have represented, together, a more substantial amount than the quarrying itself, are still largely eluding us. A better understanding of the management of quarries in the Corinthia in the 4th century BCE should help answer that question. With regard to transport, the combination of costs for hiring pairs of oxen and of a tentative shipping *price* (which may itself have included a margin!) still leave about 550 drachmae. This sum might include costs that I was not yet able to estimate precisely, such as the maintenance of the machines and wagons, or the loading and unloading of the blocks at the quarry site and at the sanctuary, but also, arguably, a margin for the entrepreneurs.

In this investigation, I have insisted on the uncertainties and issues that one is facing when attempting to estimate the costs and prices of quarrying and transporting construction stone. Small 'leaps of faith' are often required, and a substantial amount of data is still missing to obtain figures that can be firmly trusted. At the same time, I hope to have shown in this case study that labour cost estimations are a useful method to explore the question of the profits made by entrepreneurs in Classical and Hellenistic Greece, in particular in the production and trade of construction stone. However, further work is necessary, which will require the combination of various kinds of sources, each demanding specific sets of skills for approaching them. Interdisciplinarity, a trendy word in archaeology and history, is, in this case, an absolute necessity: architectural scholarship, geology (for provenance determination), experimental archaeology, ethnography, and epigraphy must work together.

Ultimately, the question of the profitability can only be useful and meaningful if it is placed in the wider context of stone production and trade as an industry, taking into account dynamics of supply and demand. Once believed to be an occasional activity in Classical Greece, the supply of construction stone for monumental buildings is now regarded as a more constant business, in the same way as other economic sectors. In this framework, the profitability (or non-profitability) of stone supply is a major factor in our understanding of the economy of monumental construction and, more generally, of the economy of the Classical poleis.

7. Acknowledgements

I am very grateful to the editors of this volume, Ann Brysbaert, Irini Vikatou and Jari Pakkanen, for their useful comments and suggestions. I also thank George Raepsaet for kindly providing me with a copy of his 2020 article, which I was not able to access at the time of the writing of the present paper.

8. Bibliography

BE = Bulletin épigraphique
CID = Corpus des inscriptions de Delphes
IG = Inscriptiones Graecae

Amandry, P. and Hansen, E. 2010. *Fouilles de Delphes II. Topographie et architecture 14. Le temple d'Apollon du IVe siècle*. Paris: De Boccard.

Ampolo, C. 1982. Le cave di pietra dell'Attica: problemi giuridici ed economici. *Opus* 1: 251-260.

Baunack, J. 1890. *Aus Epidauros. Eine epigraphische Studie*. Leipzig: S. Hirzel.

Bessac, J.C. 1996. La pierre en Gaule narbonnaise et les carrières du bois des Lens (Nîmes). Histoire, archéologie, ethnographie, et techniques. (*Journal of Roman Archaeology Supplement* 16). Ann Arbor: Journal of Roman Archaeology.

Bommelaer, J.F. 2008. Delphica 1. À nouveau les comptes de Delphes et la reconstruction du temple d'Apollon au IVe siècle av. J.-C. *Bulletin de Correspondance Hellénique* 132: 221-255.

Bourguet, E. 1905. *L'administration financière du sanctuaire pythique au IVe siècle avant J.-C*. Paris: Albert Fontemoing.

Bousquet, J. 1989. *Corpus des inscriptions de Delphes. II. Les comptes du quatrième et du troisième siècle*. Paris: De Boccard.

Bresson, A. 2016. *The Making of the Ancient Greek Economy. Institutions, Markets, and Growth in the City-States*. Princeton: Princeton University Press.

Brysbaert, A. 2015. 'Set in stone'? Constructed symbolism viewed through an architectural energetics' lens at Bronze Age Tiryns, Greece. In: C. Bakels and H. Kamermans (eds), *Excerpta Archaeologica Leidensia*. (Analecta Praehistorica Leidensia 45). Leuven: Peeters, 91-105.

Burford, A. 1969. *Greek Temple Builders at Epidauros*. Liverpool: Liverpool University Press.

Carlson, D. N. 2009. A marble cargo of monumental proportions: the late Hellenistic shipwreck at Kızılburun, Turkey. In: P. Jockey (ed.), *Leukos lithos. Marbres et autres roches de la Méditerranée antique: études interdisciplinaires*. (ASMOSIA 8). Paris: Karthala, 475-493.

Carusi, C. 2019. The quarries of Attica revisited. In: *C.F.* Noreña and N. Papazarkadas (eds), *From Document to History. Epigraphic Insights into the Greco-Roman World*. Leiden: Brill, 56- 69.

Cavvadias, P. 1891. *Fouilles d'Épidaure 1*. Athens: S.C. Vlastos.

de Callataÿ, F. 2014. Long-term quantification in ancient history: a historical perspective. In: F. de Callataÿ (ed.), *Quantifying the Greco-Roman Economy and Beyond*. Bari: Edipuglia, 13-27.

DeLaine, J. 1997. *The Baths of Caracalla. A Study in the Design, Construction, and Economics of Large-scale Building Projects in Imperial Rome*. (Journal of Roman Archaeology Supplement 25). Portsmouth: Journal of Roman Archaeology.

Feyel, C. 2006. *Les artisans dans les sanctuaires grecs aux époques classique et hellénistique à travers la documentation financière en Grèce*. Athens: École française d'Athènes.

Finley, M.I. 1973. *The Ancient Economy*. Berkeley: University of California Press.

Flament, C. 2015. Les modalités de cession des carrières d'Héraklès *en-Akris* à Éleusis (SEG XXVIII.103). *Zeitschrift für Papyrologie und Epigraphik* 193: 141-150.

Gautier, P. et al. 2003. Bulletin épigraphique. *Revue des études grecques* 116: 559-684.

Haussoulier, B. 1926. Inscriptions de Didymes. Comptes de la construction du Didymeion IV. *Revue de philologie, de littérature et d'histoire anciennes* 50: 125-152.

Hayward, C. 1996. High-resolution provenance determination of construction-stone: a preliminary study of Corinthian oolitic limestone quarries at Examilia. *Geoarchaeology* 11: 215-234.

Hayward, C. 2013. Corinthian stone exploitation and the interpretation of inscribed building accounts. In: K. Kissas and W.D. Niemeier (eds), *The Corinthia and the Northeast Peloponnese. Topography and History from Prehistoric Times until the End of Antiquity. Proceedings of the International Conference Organized by the Directorate of Prehistoric and Classical Antiquities, the LZ' Ephorate of Prehistoric and Classical Antiquities and the German Archaeological Institute, Athens, Held at Loutraki, March 26-29, 2009*. Munich: Hirmer, 63-78.

Hayward, C. and Pitt, R.K. 2017. Inscriptions from limestone quarries at Kenchreai, Greece. *Zeitschrift für Papyrologie und Epigraphik* 204: 89-96.

Hiller von Gaertringen, F. 1929. *Inscriptiones Graecae IV. Inscriptiones Argolidis*, 2nd edition, fasc. 1, Inscriptiones Epidauri. Berlin: G. Reimer.

Johannes, K. 1913-1940. *Inscriptiones Graecae II et III : Inscriptiones Atticae Euclidis Anno Posteriores*. Parts I-III, 2nd edition. Berlin: Reimer.

Kokkorou-Alewras, G., Poupakis, E. and Eustathopoulos, A. 2010. *Αρχαία ελληνικά λατομεία. Οργάνωση χώρου και εργασίας, τεχνικές λατόμησης και λάξευσης, τρόποι μεταφοράς, κόστος, διασπορά και χρήση λίθων*. Athens: Πολιτιστικό Ίδρυμα Ομίλου Πειραιώς.

Korres, M. 2003. *From Pentelicon to the Parthenon: the Ancient Quarries and the Story of a Half-Worked Column Capital of the First Marble Parthenon*. Athens: Melissa.

Kozelj, T. 1988. Extraction of blocks in antiquity: special methods of analysis. In: N. Herz and M. Waelkens (eds), *Classical Marble: Geochemistry, Technology, Trade*. Dordrecht: Kluwer Academic Publishers, 31-39.

Kritzas, C. and Prignitz, S. 2016. A building inscription from Epidauros. *IG* IV² 1, 114, *SEG* XLI 298, *IG* IV² 1, 110. *Archaiologike Ephemeris* 155: 1-41.

Lolos, Y.A. 2002. A public column drum from a Corinthian quarry. *Hesperia* 71: 201-207.

Long, L.E. 2017. Extracting economics from Roman marble quarries. *The Economic History Review* 70: 52-78.

Pakkanen, J. 2013. Economics of shipshed complexes: Zea, a case study. In: D. Blackman, B. Rankov, K. Baika, H. Gerding, and J. Pakkanen, *Shipsheds of the Ancient Mediterranean.* Cambridge: Cambridge University Press, 55-75.

Prignitz, S. 2014. *Bauurkunden und Bauprogramm von Epidauros (400-350): Asklepiostempel, Tholos, Kultbild, Brunnenhaus*. Munich: C.H. Beck.

Raepsaet, G. 1984. Transport de tambours de colonnes du Pentélique à Éleusis au IVe siècle avant notre ère. *L'Antiquité classique* 53: 101-136.

Raepsaet, G. 2014. Économie et socio-économie de l'Antiquité, entre théories et pragmatismes. Quelques réflexions. *L'Antiquité classique* 83: 181-218.

Raepsaet, G. 2019. Énergies animales mises en œuvre: charges et poids voiturés dans le monde gréco-romain. *Ancient Society* 49: 41-102.

Raepsaet, G. and Pomey, P. 2020. Une *lithagôgia* au Didymeion de Milet vers 180 av.n.è. À propos de SEG IV.453. *Revue belge de philologie et d'histoire* 98: 19-54.

Randall, R. H. 1953. The Erechtheum workmen. *American Journal of Archaeology* 57: 199-210.

Roux, G. 1961. *L'architecture de l'Argolide aux IVe et IIIe siècles avant J.-C.* Paris: De Boccard.

Russell, B. 2019. Labour forces at Imperial quarries. In: D.M. Poljak and K. Marasović (eds), *ASMOSIA XI. Interdisciplinary Studies of Ancient Stone. Proceedings of the Eleventh International Conference of ASMOSIA, Split, 18-22 May 2015*. Split: University of Split, 733-739.

Russell, B. 2020. Roman sculptors at work: professional practitioners? In: E. Stewart, E. Harris, and D. Lewis (eds), *Skilled Labour and Professionalism in Ancient Greece and Rome*. Cambridge: Cambridge University Press, 243-266.

Schaps, D.M. 1996. Builders, contractors, and power: financing and administering building projects in ancient Greece. In: R. Katzoff, Y. Petroff, and D. Schaps (eds), *Classical Studies in Honor of David Sohlberg*. Ramat Gan: Bar-Ilan University Press, 77-89.

Stanier, R.S. 1953. The cost of the Parthenon. *Journal of Hellenic Studies* 73: 68-76.

Thür, G. 2015. Zu den älteren Bauverträgen aus Epidauros. *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte. Kanonistische Abteilung* 132: 408-420.