The 'Many Faces' of the Roman Economy: Modern Preconceptions and Some Considerations on Capital, Technology, and Labour

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Introduction

In 1981 an important collection of essays edited by Andrea Giardina and Aldo Schiavone was published by Laterza, the three-volume work titled '*Società romana e produzione schiavistica*', which had resulted from a series of seminars organized in Pisa under the auspices of the 'Istituto Gramsci'. The unifying perspective of the volumes, as hinted by the title and declared in the preface to the volume, was Marxist thought,[1] even though some of the chapters were not, in fact, 'Marxist' in their approach. In the case of a pre-industrial society like the one of ancient Rome, which relied heavily on slavery, talking of a 'slave mode of production' had obvious appeal when thinking about developing suitable theoretical models for the study of the Roman economy and society.

As discussed below, this approach has in some cases resulted in a selective interpretation of the ancient historiographical and archaeological records, projecting onto the primary data a set of preconceived ideas. For the ancient economic historian, a move from Marxist thought to other theoretical frameworks has led to a different outlook on the nature of the ancient economy.[2] In more recent years, we have seen Douglass North's ideas and New Institutional Economics (NIE) become central to studies of the ancient economy[3]; Human Capital Theory and Behavioural Economics

[1] In the preface to *Società romana e produzione schiavistica*, the edited volume *Analisi marxista e società antiche*, published in Rome in 1978, is cited as a basis; many of the authors of the two volumes are the same.

[2] Morley (2004) for a discussion of the use of theoretical models on the part of ancient historians.

[3] For example, see Scheidel et al. (2007) and the aims of the international research network 'Structural Determinants of Economic Performance in the Roman World' (http://www.sdep.ugent.be). Lo Cascio (2006, 221) has argued that the theoretical framework developed by North allows for

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M. Frangipane et al. (eds.), *Ancient Economies in Comparative Perspective*,
Frontiers in Economic History, https://doi.org/10.1007/978-3-031-08763-9_10

are the latest arrival to the investigative 'portfolio' of the ancient economic historian.[4] The re-interpretations of familiar material along the lines offered by these theoretical frameworks are pushing our knowledge forward.[5]

The 'many faces' alluded to in the title of this chapter encapsulate the different opinions ancient economic historians have expressed in the past, and still currently do, on the nature of the ancient economy: from primitivists to modernists, from believers in an 'integrated or semi-integrated market economy' to those stressing that the limited technological advances of antiquity posed a clear barrier to economic development, from those emphasising the structure and performance of the market economy to those stressing the peculiarity of some mechanisms of classical societies (e.g. euergetism), which in effect provided goods and services outside the market-place.[6] Often, specific material evidence from the past, i.e. archaeological evidence, has been interpreted on the basis of such theoretical tenets. It is in turn not surprising that the on-going re-evaluation of the Roman economy has sprung out of the wealth of archaeological data that has become available in recent decades.[7]

This chapter offers some considerations on three crucial areas for any economy—technological innovation, use of labour, and investment—to show how moving away from a preconceived idea of the Roman economy as being little sophisticated has allowed, for instance, the recognition that slave labour did not completely hamper the practical application of technological innovations or that the mechanisms of trade were very complex and involved different actors, both individuals and in some case the state/state institutions (e.g. the army).[8]

Theoretical Frameworks and Historical Reconstructions: The Case of the 'Villa Schiavistica'

An apt example of projecting onto the primary data a set of preconceived ideas concerns the use of slave labour and the evolution of Rome's agrarian exploitation, linked to the socio-political changes occurring in the capital from about the second century BCE to the end of the Republic. The traditional historiographical narrative

a better insight into the performance of the Roman empire as 'a unified political organization'. Verboven (2015) for a discussion of NIE and other theoretical models and their application to ancient economic history. Hobson (2014) for a historiography of the study of the Roman economy and a short critique of NIE.

[4] See Verboven (2015, 41–47).

[5] For example, see the Doctoral Dissertation competed in 2016 at the University of Reading by Mick Stringer: it investigated economic rationalisms in the works of the Latin agronomists using the principles of bounded rationality.

[6] The Primitivist/Modernist debate followed Finley's seminal book on the ancient economy in the early 1970s (see 1999 edition). Finley (1965), Greene (2003), Tchernia (2011), and Temin (2013).

[7] A primary example being the Oxford Roman Economy Project, see Bowman and Wilson (2009), the first volume produced by the project.

[8] Tchernia (2011) for an insightful analysis of the mechanism and the actors of Roman trade.

saw in the considerable influx of booty and slaves into Italy, which followed in the second century BCE Rome's territorial expansion outside of the Italian peninsula, the cause of an important chain of events that ultimately led to the crisis of Republican institutions. According to this traditional narrative, which can be traced as far back as Max Weber and Michael Rostovtzeff, politically prominent and wealthy landlords expanded the size of their landholdings, dispossessing small and medium free farmers who had fallen on hard times due to the long period they had to spend abroad for the military campaigns.[9] The new estates, whose main cash crops were grape/wine and olives/oil, largely relied on slave labour.[10] This is the kind of villa 'pre-announced' in Cato's agricultural manual of the mid-second century BCE, and fully described in the treatises of Varro (116–27 BCE) and Columella (4–c. 70 CE). Thus, it was thought that the slave-based villa at the centre of large estates became a predominant feature of central and southern Italy, a model of agrarian exploitation later exported to provinces such as Iberia. Such large estates replaced small-sized rural settlements, which tended to disappear from the landscape. The dispossessed farmers moved to Rome, and augmented the urban population, becoming a tool in the hands of unscrupulous politicians, who sought to secure their vote in the assemblies. Since army recruitment was organized according to the census and how much land one owned and small and medium farmers were the backbone of the Roman army, this situation would have had repercussions on army recruitment too.[11] The formation of large estates in the hands of the rich to the detriment of small and medium landholdings relates to another important issue: the distribution of *ager publicus*, or public land, and its illegal occupation.[12] The view that large estates had had a negative impact on Republican Italy is present also in moralist writers such as Pliny the Elder, who famously wrote that '*latifundia* ruined Italy and are doing so now in the provinces'.[13]

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[9] Weber (1896) argued that ultimately the collapse of the Roman empire was the result of a long process which had started with the concentration of landed property in the Republic and the widespread adoption of slave gangs as agricultural manpower. Rostovtzeff (1911, 1926) emphasized the coexistence and conflict of social classes (including slaves) from the late Republic to late antiquity, stressing the incompatible interests of the classes as an impetus for change in Roman history. See also Toynbee (1965, vol.2, 296–312), Frederiksen (1981), Hopkins (1978). Rosafio (1994) offers a quick overview of the debate over slaves and tenants in the villa system.

[10] Two key passages from ancient literary works have been at the centre of this historiographical reconstruction: Plut., *Ti.Gracch* 8.7 and App. *BCiv.* 1.1.7–9. The passages report that when Tiberius Sempronius Gracchus passed through Etruria on his way to take up a military post in Hispania (in 138 or 137 BCE), he saw a territory supposedly depopulated of local farmers and free workers, with 'barbarian' slaves replacing them to till the soil or tend the flocks on the estates of the wealthy. Plutarch relates this story as coming from a pamphlet by Tiberius Gracchus' younger brother, Gaius Sempronius Gracchus (c. 154–121 BCE).

[11] This vision of rich and arrogant villa owners replacing hardy, independent farmers (i.e., old-fashioned family-based farming by citizen-soldiers) with slaves gave graphic clarity to Tiberius and Caius Gracchus' later political views when they were tribunes of the people. It offers a clear example of how to combine a simplifying social narrative with nostalgia for an agrarian past of 'simple' farmers.

[12] This issue occupied much of Rome's sociopolitical debates throughout the mid- and late-Republican periods; see Roselaar (2010).

[13] Plin., *HN* 18 .11.

This reconstructed historical scenario found confirmation in the archaeological record. The villa of Settefinestre excavated in the 1970s near Orbetello, in Tuscany, and the field survey of the surrounding territory were used to support this historical paradigm.[14] But do the archaeological remains really prove the existence of an estate run primarily with slave labour? The interpretation of the excavated remains had been informed by the existing historical reconstruction and by the works of the Latin agronomists.[15] At Settefinestre, a large, plantation-like estate, which housed many slaves (a '*villa schiavistica*') was expected, hence the various modular rooms identified around one large courtyard of the villa were interpreted as slave quarters to house 'hundreds of slaves'. However, there are other ways to interpret this layout, such as a multi-purpose complex comprising storage areas, stables for donkeys/mules *and* housing for both domestic servants and field labourers.[16]

In the last fifty years, the historical reconstruction of Rome's agrarian history in the middle and late-Republican period has been increasingly questioned. Various scholars have stressed that the diffusion of large villa estates did not necessarily mean that *everywhere* the small and medium farms disappeared; the increased number of slaves to be found in Roman society did not mean that the villa engaged in cash crop agriculture relied exclusively on slave labour; and finally, peasant farmers might actually have been more competitive on the market than previously thought because of the high productivity of Roman agriculture.[17]

Nowadays, more scholars admit that the Roman economy was highly complex and presented several mechanisms (e.g. credit-money) that were not too dissimilar from later historical periods which have always been recognized as being more 'sophisticated', e.g. the Middle Ages.[18]

Technological Innovation and Investment

Investment and practical applications of technological innovation in production facilities are cornerstones of any economy. Therefore, also in the case of the ancient Roman economy, these areas have been at the centre of attention.[19]

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[14] Carandini (1985) and Carandini and Cambi (2002).

[15] Marzano (2007, 129–148).

[16] Marzano (2007, 129–148) for a full discussion of the evidence; Marzano and Metraux (2018, 16–18). In the case of villas in northern Italy, such architectural typology is normally associated with *mansiones* offering lodging to travelers.

[17] See, e.g., Frederiksen (1970–1971) (pre-dating the excavation of Settefinestre); Bringmann (1985), Launaro (2011), Kron (2008).

[18] Harris (2006, 2019a, 2019b).

[19] For example, Greene (2000), Wilson (2002), and Harris and Iara (2011) and the conferences (and resulting volumes) organized by the Structural Determinants of Economic Performance in the Roman World network based at Gent/Brussels (http://www.rsrc.ugent.be/sdep), with the 2015 conference devoted to 'Capital, Investment, and Innovation'. The volume by Scheidel et al. (2007) comprises a chapter on 'Technology' by Helmuth Schneider (pp. 144–71).

After Moses Finley published his influential *The Ancient Economy* in 1973, one of the tenets of those who saw the ancient economy as fundamentally 'primitive' concerned the cases of technological innovations that never developed into widespread practical applications.[20] In this view, the fact that slave labour was readily available meant that wealthy landlords, who had the capital to invest in new technologies, had no immediate incentive to do so. In addition, the availability of unskilled labour in large urban centres such as Rome, would have also discouraged the adoption of inventions. The oft-quoted anecdote in this respect is the episode recounted by Suetonius in the *Life of Vespasian*: a new machine to move heavy columns is not adopted by the emperor for his building projects in the capital, because he needed to 'feed his people',[21] i.e. employ the many unskilled and poor inhabitants of the capital, who may otherwise have bred social unrest.

The water mill is a good example of how modern preconceived ideas about Roman mentality and society (the 'slave mode' of production theory) have informed incorrect reconstructions of the past.[22] Although it was known that in the Hellenistic and early Roman periods several scientists at the Museion in Alexandria researched water-powered machines, it was believed that the various mechanical principles known theoretically were not developed into utilitarian applications.

Although Vitruvius's *de Architectura* contained a description of the geared water-mill,[23] thus proving that some practical application of the theoretical principles had occurred, this invention was believed not to have had any diffusion, thus proving the ancients' fundamental reluctance to accept technological innovation. The lack of much archaeological and written evidence for the use of water mills confirmed historiographical reconstructions contrasting the economy of classical antiquity with that of the Middle Ages. On the one hand, there was a society that, because of the ready availability of slaves, had no immediate incentive to ameliorate production with the practical application of technological innovations; on the other, there was a booming, mercantile society with a highly entrepreneurial bourgeoisie.

As we shall see further on, there is now good archaeological evidence showing that, in fact, by the early first century CE,[24] the watermill had spread widely in various regions of the empire.[25] Yet, it took some time for certain beliefs to change and

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[20] Finley (1999, 146–147). An example often referred to is the invention of the steam engine by Hero of Alexandria (first century AD), which did not lead to the practical exploitation of steam power. See Hero, *Pneumatics*, II.11.

[21] Suet., *Vesp.* 18.

[22] For a discussion see Wilson (2002).

[23] Vitr., *Arch.*, X.5.1–2; the other two occurrences in early imperial literature mentioning the water mill are Strab., *Geogr.*, XII.3.30 and Antipater of Thessalonica, *Anth. Gr.*, IX.418.

[24] It is now believed that the water mill was invented in the mid-third-century BCE, was widely spread by the first century CE, and the full range of vertical wheel types were in use by the late second century: Wilson (2008, 355). The earliest archaeologically known water mill, dated to *c.* 58 CE by dendrochronology, is the Avenches mill: Wikander (2000, 394–97).

[25] The study published by Wikander in 1984 listed twenty-three known watermill sites; in 2000, he listed 56, and in 2006, this number had grown to just above 70 Bowman and Wilson(2009, 34) and Fig. 1.2; see also Wilson (2014).

allow correct interpretation of the archaeological data. Let us consider the impressive complex of Barbegal in southern France, 7 km west of Arles (ancient Arelate). It consists of a complex of sixteen watermills built along a steep hillside and powered by a branch of an aqueduct which until recently was thought to have supplied flour for the entire population of nearby Arleate. A new study has argued that in fact the mills operated only for part of the year to produce hardtack (*panicus panis*) for the ships that visited the ports of Arelate and Fossae Marianae.[26]

Since it was believed that the watermill had not been adopted by early imperial Roman society because of the reliance on slaves, this complex was for some time dated to around the late third century CE, thus establishing a link between the appearance of such practical application of technology and the decline of slavery in ancient society.[27] But a reassessment of this complex has in fact dated it to the second century CE, when slavery was still permeating every level of Roman society.[28] Clearly, the general idea that the reliance on slave labour hampered the Romans' willingness to invest in technological innovation could no longer be sustained. Rather, at least in the case of wealthy landowners and private estates, what seems to have had a greater bearing on the decision to adopt, or not to adopt, a particular technological innovation was whether they resided on the estate: absentee landlords seem to have been more indifferent to investing in technological innovation than landlords who resided on their property.[29]

Once the practical application of water power in antiquity was not being denied a priori, more evidence has been identified or earlier, forgotten identifications have become more widely known and used by scholars in their discussion of ancient technology, economy, and organization of production.[30] At Saepinum in Italy, a stamp mill to crush bark to produce tannin for a tannery was identified and the use of stamp mills to crush ore at Roman mines is very strongly suggested by archaeological evidence.[31] Water-powered stone saws, which were used to cut marble slabs for revetment, have been identified at Ephesus (in a room on the lowest level of Terrace House 2)[32] and at Gerasa (in the cryptoportico of the Tempe of Artemis). These examples date to late antiquity,[33] but the depiction of a stone sawmill in a relief on

[26] Sellin (1983), Sürmelihindi et al. (2018).

[27] Leveau (1996, 142).

[28] Leveau (1996).

[29] Lewitt (2008).

[30] Example, see the large horizontal mills, dated to the fourth century CE, identified at Chemtou during Toutain's excavations in the 1890s (Toutain 1895 *Les cités romaines de la Tunisie: essai sur l'histoire de la colonisation romaine dans l'Afrique du Nord* page 77, note 3.) Other mills of the same type have been recognized at Testour: Wilson (1995).

[31] Wilson (1995, 2008, 356); Brun and Leguilloux (2014) for the Saepinum mill.

[32] At least five water mills were built in a row along the slope of the Bülbül Dâg Mountain; the stone sawmill of Ephesus has been dated to the sixth or early seventh century; see Ritti et al. (2007).

[33] The *terminus post quem* for the installation of the mill is the fifth century, *the ante quem* is 749 CE, when a devastating earthquake occurred; see Ritti et al. (2007).

the lid of a third-century CE sarcophagus from Ierapolis, proves that this 'invention' occurred earlier in the empire.[34]

In addition, it has become clearer how some of those very wealthy landlords, that past historiography described as resistant to innovation because of their reliance on their slaves, were in fact the ones introducing the watermill on their estates. The case of several watermills excavated in the context of large villas investigated in Gaul is exemplary.[35] These villas had estates producing wine and oil, as shown by the presence of presses and a *cella vinaria*; in fact, it is likely that these were the main cash crops of these Romano-Gaulish estates, and that grain was cultivated mainly to satisfy internal needs. One good example is the villa site of St. Martin (Taradeau), which underwent some important changes in the use of space and production facilities in the second century CE. In this period, a watermill was installed on the estate and part of the residential quarters was converted into enlarged wine-processing facilities.[36] Many more Roman villa sites than those identified to date will have had watermills in the imperial period. A mill would not necessarily have been built in proximity of the main building of the villa, but close to a river or other source of waterpower. These more peripheral areas of a villa estate are rarely investigated archaeologically, a factor to be reckoned with when considering the number of watermills known from villa sites.

The known examples of watermills in the context of rural villas in Gaul are interesting for another reason.[37] The mills do not seem to have been used to grind surplus cereals destined for the commercial market. The watermills were often located next to the kitchen and a bread oven and appear to have satisfied the internal needs of the villa estate and its inhabitants/workers; in other words, money was invested in the installation of equipment which would expedite *recurrent* tasks. Since a watermill was more efficient than a mill powered by humans or by animals (it had a higher output and, unlike humans or animals, it could operate continuously), the installation of watermills shows that there was a general interest in investing in technological advances which allowed the rationalization of the use of the available labour resources. It is not surprising that several cases of excavated watermills are on large villa sites which present signs of other investment for market-oriented production (multiple presses and larger production facilities for wine and oil). This is indicative of the presence of some kind of planning in deciding in what area to invest available resources and rationalize the use of manpower so that commercial productions would not be neglected. Large villa estates point to wealthy owners who would not only have had available capital but also better and larger social networks and connections, which had an important role in establishing commercial links; such owners may have had additional incentives in trying to increase the productivity of their estates and in using the time and manpower at their disposal more efficiently.

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[34] Ritti et al. (2007); on the dating, p. 140.

[35] Brun and Borreani (1998).

[36] Brun (2005, 45 and 43) for a plan.

[37] See also discussion in Marzano (2015).

Capital and Organization of Labour

In my recent work I have investigated the role large-scale fishing, fish salting, and aquaculture had in the Roman economy.[38] In that context, I made some considerations on how fish salting and large-scale fishing were organized: the Roman institution of the *societas* or business partnership had a crucial role in allowing individuals of modest means to pull their resources together, while professional *collegia* provided an avenue to access capital and wider social networks.[39] I focussed on the 'fish-salting sector' because, thanks to archaeology, one cannot deny that the production of salted fish and derived fish sauces was a large 'industry' in the Roman world. Both the geographic diffusion and number of amphorae used to transport the final products and the number of fish-salting sites known are indicators of a 'sector' whose cumulative production, although not quantifiable with precision, was on a large scale.[40] The fish-salting sites that were not large factories often clustered together, an arrangement that probably was not only the result of the needs of that particular type of exploitation (e.g. access to a specific geographic spot with rich fisheries), but may have also helped the medium-sized producers access supply and distribution networks.

The cumulative possible production of the various Roman fish-salting sites (as expressed by the volume of the salting vats) for which some data on their chronological phases exists, indicates a peak in the second half of the second century CE, when, for a total of 34 factories located at 22 sites, vat capacity was *c.*2,600 cubic metres; this number represents only a crude assessment of production.[41] In addition to giving us an idea of the production capacity, the variation in the salting capacity of factories as reflected by the construction of their masonry salting vats is also an indication of the degree of capital investment, over time, in the creation of permanent infrastructure for salting fish. The peak in construction activity, as indicated by current available data, occurred in the second half of the first century CE and continued at a good rate for the whole of the first half of the second century CE.[42]

Obviously larger fish-salting establishments needed more labour and also a higher number of other commodities essential to the fish-salting industry, such as salt, than the smaller workshops did.[43] The number of identified Roman fish-salting sites and the attestations of commercialization of their products far and wide are indicative of the successful establishment of a series of supply networks alongside the creation of the material infrastructure and the securing of the needed manpower. Fish-salting sites needed, first of all, fish, so they must have either directly employed groups of fishermen or must have worked in close collaboration with fishermen engaged in large-scale fishing. Then the fishing operations required large quantities of salt, the

[38] Marzano (2013).

[39] Broekaert 2012 on *societates* as a means to combine resources and share risk.

[40] Not only amphorae were used, but probably barrels too, at least in some case, e.g. for the fish-salting sites Brittany: no Roman kilns have to date been identified in the area.

[41] Wilson (2006).

[42] Wilson (2006).

[43] On salt production in antiquity Carusi (2008).

amphorae in which to pack the products, and good distribution channels. How was all this organized? Why did Roman fish-salting factories seem to have been more successful than later ones?

The answer, I believe, is not simply the political unity of the empire, the low taxation levels when compared to later historical periods, or the development of good transport infrastructure, but also the existence of institutions such as the *societates* (business partnerships) and *collegia* (professional associations), which provided a framework that helped communications and connections, established social ties that worked following the same principles found in patronage, and, ultimately, addressed the problem many small and medium producers and traders must have faced: finding the necessary capital.

The Role of Societates

Although we have abundant physical evidence of salting factories, largely from the western Mediterranean, and the various literary passages mentioning geographic locations renowned for their fish sauces and salted fish—Pliny the Elder for instance mentions Leptis, Pompeii, Antipolis, and Carthago Nova among others[44]—we do not know exactly how the business operations were organized and who owned the large fish-salting establishments. Business partnerships, however, must have played an important role, as suggested by some fascinating pieces of evidence. A business partnership, *societas* in Latin, was a contract of partnership concluded between two or more persons with the purpose of sharing profits and losses. The partners contributed to the common business money, other goods, rights, or their professional skills and labour and funds or other things collected became joint ownership of the partners, either equally or according to different shares if the contributions of the partners were not equal.[45] In Roman law, partnerships would normally dissolve at the death or withdrawal of one of the partners, and therefore never achieved the status of juristic entity that allowed the *societas* to function 'as a legal entity distinct from the individuals comprising the partnership'.[46]

Interesting evidence for the use of business partnerships in the context of large-scale fishing comes from the Marmara Sea in the form of two inscriptions in Greek which date to the Roman period.[47] I discuss here the longer of the two, *I. Parion* 5, a text of 16 lines, which I report in translation:

> During the second imperial priesthood of Lucius Flavius, the 'masters of the nets' and tax-farmers (dedicated this) in Neilaion; the lessee being Publius Avius Lysymachus; the 'masters of the nets' being Publius Avius Lysymachus, Publius Avius Ponticus, son of Publius, Marcus Apicius Quadratus, Epagathus son of Artemidorus, and Publius Avius Bithus; the

[44] Plin., *HN* 31.94.

[45] Berger (1991, 708), s.v. *societas.*

[46] Kehoe (2011, 146).

[47] *I. Parion* 5 and *I. Parion* 6 (this one is rather fragmentary); Marzano (2013, 42–47; 74–77).

scouts being Epagathus son of Artemidorus and Publius Avius Bithus; the helmsmen being Secundus, son of Avius Lysymachus, and Tubellius Laetus; the 'loosener of the floats' being Tongilius Cosmus; the accountant being Cassius Damasippus; the controller being Secundus son of Avius Lysymachus; and the captains of the boats being Asclepiades son of Asclepiades, Hermaiscus son of Avius Lysimachus, Eutychus son of Avius Bithus, Menander son of Leucius, and Hilarius son of Asclepiades.

(Together with) the shipmates.

This epigraphic text attests a group of people who had constituted a business partnership and leased out a fishing lookout, probably to fish for tuna or other migratory fish such as mackerel.[48] As I have discussed elsewhere, the fact that this group of people was engaged in fishing is revealed by the descriptors that accompany each name, which denote the role each member had in the fishing operation, from those in charge of the fishing nets, to the scouts signalling the arrival of the schools of fish, the boat captains, etc.[49] This was not a small group of subsistence fishermen, but a large, well-organized group: it operated a minimum of five boats (five boat captains are named in the text), manned, in total, by at least thirty men, but probably more.[50]

The advantages of constituting a business partnership for fishing operations are the same as those offered in the case of other activities: the possibility to pull together the required resources, both financial and human, and share the losses. Ethnographic evidence suggests that boats and the long and large fishing nets needed in this type of fishing, together with the lease of lookouts, were rather costly and beyond the means of individual fisherman; in the Middle Ages and in later periods wealthy individuals, not physically involved in the fishing, owned the boats and equipment.[51] While we do not have precise information for the Roman period on the cost of fishing boats and the very large nets used in tuna fishing, it is unlikely that the situation was any different from the Middle Ages, considering that the fishing technique employed was the same.[52]

The role played by business partnerships can be seen also in the establishment of the fish-salting factories themselves and in the marketing of the products. Carthago

[48] Robert and Robert (1950, 81–91) on the correct attribution of this inscription to a business partnership that had leased a lookout. It was initially thought that the place name Neilaion in line 3 referred to the cult of Isis and that the group was a religious group. The inscription had a religious dimension, however, as it was on a block (altar?) which on one side had a relief depicting the god Priapus (who had connection with fishing in this geographic area) next to an altar with a fish on it.

[49] Marzano (2013, 73–76).

[50] Six men per boat, including the captain, is the very minimum; this would comprise four at the oars, one helmsman/captain, one in charge of releasing the seine net. Although artistic depictions of Roman fishing boats normally show small vessels with two people on board, the texts of Aelian (*NA* 15.5), in talking of the boats engaged in fishing on the Black Sea, mentions 12 rowers per vessel and very long and heavy fishing nets, clearly alluding to large boats than those depicted in art.

[51] Bresc (1985, 112): the Bishop of 1380 Arnaud financed fishermen by providing them with boat, wood for night fishing, and cash, and received 50% of night catches and 33.3% of other catches; Faber (1883), 115: wealthy individuals in the Adriatic owning the fishing nets and, in effect, keeping the fishermen in their employ.

[52] A detailed discussion of this issue and the question of when the fix complex tuna traps (*tonnara*) were first used in Marzano (2013, 66–79), with previous bibliography.

Nova (modern Cartagena) seems to have been a case in point. We know, both from literary texts and *tituli picti* on amphorae, that the high-quality and expensive *garum* produced in Carthago Nova was marketed under the label '*garum sociorum*' (from the plural noun *socii* = allies or business partners).[53] Translated at times as 'the *garum* of the allies', *garum sociorum* actually referred to the products of a *societas*, a business partnership. Some scholars believe that a *societas* was formed with the purpose of exploiting the salt-works at Carthago Nova right after the Roman conquest during the Second Punic War and that once this *societas* had control of the salt, it extended its operations also to fish salting, as the area could count on the migratory passage of fish and also on the fish seasonally moving between the Mar Menor, a very large coastal lagoon, and the sea.[54]

When it comes to commercial distribution and shipments of salted fish, business partnerships and professional associations appear to have had an important role. An association of traders from Malaca (Malaga) kept its headquarters in Ostia, as has been inferred from a funerary inscription that mentions the *corpus negotiantium Malacitanorum* ('the association of traders from Malaca') and one of its high officials, P. Clodius Athenio.[55] This *corpus* was, in all likelihood, trading largely in salted fish and fish sauces, since one of its officials, the *quinquennalis* P. Clodius Athenio was a trader in salted products: he defines himself in the funerary inscription as *negotians salsarius*.[56] In the area of Malaca, production of the typical amphorae for salted fish is well-attested from the Flavian period down to the later empire, with kilns located at Huerta del Rincon, near Torremolinos, so exports of salted products and the existence of traders specializing in these foodstuffs for Rome and environs are possible.[57] If the suggestion made many years ago to identify this P. Clodius Athenio with the prominent citizen *P. Clodius* […]*io* mentioned in a second-century CE honorific inscription discovered in Malaca itself is correct, it is evident that the label *negotians salsarius* that defines Clodius in the Italian funerary inscription could be applied to individuals of a certain social standing and indicated trade operations on a large scale.[58] Indeed, the inscription from Malaca honours Valeria Lucilla, the wife of L. Valerius Proculus, prefect of the *annona* in 144 CE. P. Clodius is

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[53] Mart. 13.102; Strabo 3.4.6; Plin. *HN* 31.93–94. *Tituli* attested on amphorae for fish sauces/salted fish are '*SOCI*'; '*SOC*'; '*S. CET*': see Étienne and Mayet (1994).

[54] See Étienne and Mayet (2002, 19–26). Marzano (2013, 48). On the cutting of an artificial channel to connect the lagoon to the sea, possibly to allow the fish to migrate and ergo fishing activity: Polybius 10.10.12.

[55] *CIL* 6.9677: *D(is) M(anibus) / P(ublius) Clodius Athenio / negotians salsarius / q(uin)q(uennalis) corporis negotiantium / Malacitanorum et / Scantia Successa coniunx eius / vivi fecerunt sibi et liberis suis et / libertis libertabusque suis posterisque eorum / in fronte p(edes) XIII in agro p(edes) XII*.

[56] Curtis (1991, 63).

[57] Amphora types Beltrán IIA and IIB; IVA and IVB (=Dressel 14); see Haley (2003, 93).

[58] *CIL* II.1971: *Valeriae C.f. / Lucillae / L. Valeri Proculi / praef(ecti) Aegypti / d(ecreto) d(ecurionum) Malac(itanorum) / cives e[…]/ aere co[nla]to / posue[runt] / P. Clodius […]io / honore accepto / conlationem / reddidit*. See introduction to *CIL II*, p. 251 by Hubner, and Manacorda (1977, 325, n. 47).

recorded as having paid back the sum that the citizens had collected in order to erect a statue to Valeria, thus gaining considerable honour for himself for this generous act. Considering Roman social norms and the workings of patronage ties, Clodius' intervention in the matter of the statue to be erected to Valeria Lucilla signals that he was close to her and her husband Valerius Proculus. As pointed out by Haley, such personal ties as indicated by the epigraphic text may signal that there was a close involvement of the *annona* with traders from Baetica supplying Rome with foodstuffs such as salted fish.[59] Associations of traders with representation at the locations receiving most of the products they traded in (or other forms of associative order, such as religious groups, which expressed a clear foreign, ethnic identity in port towns and commercial hubs) as the *corpus* of traders from Malaca attested in Ostia absolved an important function. They helped with logistics, but above all they helped in establishing ties and links with other similar groups, in creating connections with prominent figures who would be chosen as patrons, and also in establishing trust within the local communities.[60] To continue with the example of P. Clodius Athenio, he was probably also one and the same with the *Klodios* honoured as patron in a fragmentary Greek inscription, also from Malaca, set up by an association (*koinon)* of Syrians and Asians (? the reading of the text is uncertain), also to be understood as a group of traders, perhaps importing wine from the Aegean.[61]

This phenomenon has been seen as an example of mechanisms that developed to somehow address the problem of enforcing Roman law when it came, for instance, to compensation in a business lawsuit. An established and known foreign group such as the foreign traders resident in Puteoli could act as a sort of guarantor for a new individual coming from their same town. Institutional and market mechanisms in practice worked thanks to personal ties. The web of social relations thus encapsulated, with its criss-crossing among different geographic regions, goods traded, social ranks of individuals involved, and recurrent key players (e.g. P. Clodius in the example examined above) reminds us that the capillary trade networks attested in the Roman world relied as much on personal and social ties as on the physical transport infrastructure (roads, canals, ports).

Key Factors

The geographic distribution of Roman fish-salting installations, from large factories to smaller workshops, and the spread of preserved fish products commercialized across the empire indicate a complex organization behind this activity. As we have mentioned, it required not simply the ability to find capital to build the installations and to mobilize the necessary manpower, but it also needed salt in abundance and the

[59] Haley (2003, 94).

[60] Verboven (2009, 2011) and Terpstra (2013).

[61] *IG* XIV.2540; the inscription is now lost; the transcription was made in the seventeenth century. Manacorda (1977, 325, n. 47) and Haley (2003, 94).

amphorae for the distribution of the product. In this respect the difference between the phenomena observed in the Roman era and later epochs is striking. In the late nineteenth-century Adriatic, large quantities of shad, mackerel and pilchard caught by the fishermen went to waste because there was not enough salt to preserve them. Contemporary fishermen engaged in tuna fishing in the Argolic Gulf faced similar problems: they had to try to deliver the entire catch fresh, as no salting operations existed.[62] In the former case, the problem was a monopoly on salt imposed by the Austro-Hungarian Empire and the limited quantity of salt sold at a controlled price that the salting operations could receive. In the latter, the problem was the lack of economic means, i.e. of capital, that could have allowed the establishment of salting operations.

In the Roman Empire, political unity, the existence of a limited number of custom barriers when compared to later period, and commercial organization permitted the development of fish-salting activities even at smaller settlements. The relative facility with which business partnerships could be created and dissolved, and the possibility to find capital with loans provided by patrons or bankers, helped the creation of small and medium businesses. But the most successful cases, those which reached a notable volume of production are not simply those which had more capital available and the backing and connections (social, political) of some prominent individual. Another important element is the diversification of the production, in order to have an optimum working cycle. Large-scale fishing operations relying on migratory fish are not a year-round activity but seasonal, running roughly from April/May to October. The large fish-salting factories complemented this with the salting of other foodstuffs. In Brittany, excavations at fish-salting sites have found evidence that also meat was being salted, as bones of sheep, mutton, and cow have been found.[63] At Iulia Traducta, in Spain, joints of horse meat, beef, and mutton were discovered, as well as molluscs, such as oysters.[64] Once the production infrastructure had been created, manpower secured, and the supply and distribution channels put in place, it made sense to operate throughout the year by turning to the salting of meat when the fishing season was over. In the case of salting operations in Iberia and in Brittany, which appear to have regularly supplied the Roman army on the German frontier and in Britain, such diversification was very sensible, as both salted fish and salted meat featured prominently among the military food supplies.

Conclusions

In this paper I offered some considerations on three fundamental facets of the Roman economy: technological innovation, organization of labour, and economic investment in production facilities. My starting point has been how our understanding of some

[62] Marzano (2013, 120–21).

[63] Wilson (2006, 536).

[64] Bernal Casasola (2007, 2009).

aspects of the Roman economy has changed according to the theoretical framework adopted by the researchers over time. From Marxist thought and emphasis on the slave mode of production, which prevented researchers from recognizing the application of technological innovation, to the focus on the role of the state and the market, propelled by the adoption of NIE, all these shifts in approach have resulted in new interpretations and new understandings of the workings of the ancient economy and society.

I have used the case of the watermill and other practical applications of water-powered machines as an example of technological innovation, which, to a degree, was adopted on wealthy estates in order to increase efficiency and rationalize the use of manpower. Availability of capital and reliance on good social networks were crucial elements when considering adoption of new technology or the development of large-scale commercial operation in the Roman world. However, Roman society had some institutions, such as *societates* and *collegia*, which allowed middling individuals to pull resources together and have access to funds and labour. Under many respects, this was a more dynamic situation than in later periods. There were also ways in which the capital and labour investment in a given activity, such as the example of fish salting discussed above, could be optimized by diversifying production and thus offsetting the problem posed by what was essentially a seasonal activity. However, the Roman economy, particularly trade, ultimately relied greatly on *personal* ties and social networks; the institutional framework, important as it was, had crucial limitations, such as the inability to enforce judicial decisions stemming from law suits among private parties. As such, trade networks centred on the personal contacts of one main individual were not resilient to serious disruptions affecting the networks, but rather fragile. Perhaps this is the reason why, as noted by André Tchernia,[65] a fundamental difference between Roman merchants and those of later epochs is that by and large Roman traders appear to have limited themselves to a single domain (e.g. the trade in salted fish; trade in wine). The specialization and the tendency to maintain over time commercial relationships with the same groups, which included one's slaves and freedmen, contributed to the stability of the network. As with so many aspects of the ancient world, there is always the other side of the coin to consider.

Acknowledgements I am very grateful to the editors and the anonymous reviewers for their useful comments on an earlier draft; any shortcoming remains my responsibility.

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[65] Tchernia (2011, 70).

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