4
Trade in the Roman Empire

Andrew Wilson

Introduction: key debates

Back in the 1970s and 1980s, the debates over Roman trade centred around the question of whether there was much long-distance trade in goods other than luxuries. Sir Moses Finley, in his *The Ancient Economy*, had flatly denied that there was any significant non-luxury trade, basing his opinion on the works of ancient authors, largely members of the aristocratic elite (Finley 1973; 1985). Finley's view was very influential among ancient historians for over two decades (e.g. Whittaker 1985), but others, especially archaeologists, vigorously resisted it, objecting that the material evidence showed that staple goods travelled huge distances in quantities that could only be explained by trade (e.g. Carandini 1983; Pucci 1983; Greene 1986; Peacock and Williams 1986; Fentress and Perkins 1988). At the heart of the debate lay the relative weight that one should assign to textual evidence (which may reflect the biases of particular authorial classes) and to archaeological evidence (which may be skewed because of biases in survival, recovery or publication).

That debate is long over, the growing flood of archaeological publications having demonstrated irrefutably that trade in a wide variety of non-luxury goods was extensive and pervasive (Wilson and Bowman 2018a: 1–6). In parallel, the publication of Horden and Purcell's book *The Corrupting Sea* in 2000 introduced a new and sophisticated environmental conceptual framework explaining the impetus towards long-distance exchange in the Mediterranean. They argued that although the Mediterranean shares an essential similarity of climate and

environment at a broad scale, characterised by among other features extreme inter-annual variability of rainfall, it is locally fragmented into a series of micro-regions each with its own micro-climate. The inter-annual variability of rainfall is locally modulated so that different regions might experience a good or a bad harvest in the same year. This uncertainty drove farmers, in Horden and Purcell's words, to 'diversify, store, redistribute'. Diversification of crops spreads risk, and insurance against a bad year could be managed by storing goods that would keep (for either local consumption in a future year, or trade to a region in deficit), or by trading goods that could not keep, in return for cash that could be used to import from elsewhere in a year of shortage locally. Long-distance trade in agricultural staples became essential to manage the uncertainties of yields, and the diversity of micro-regions set up the need for frequent and repeated connections (trading and otherwise) between them – a phenomenon that Horden and Purcell call 'connectivity'. *The Corrupting Sea* has been an extraordinarily influential work, attracting reactions both positive and negative (e.g. Parker 2000; van Dommelen 2000; Fentress and Fentress 2001; Shaw 2001; Malkin 2003; responses in Horden and Purcell 2020), but the basic point about the impetus of Mediterranean 'connectivity' in driving long-distance trade has survived the critiques.

In the place of the debate initiated by *The Ancient Economy* a series of new questions now command attention. To what degree can we trace fluctuations in the volume of trade over time (see e.g. Fentress et al. 2004; Wilson 2009; Wilson and Bowman 2018b)? What was the role of the state? Did the Roman state actively encourage trade, and did it intervene in the market? How significant was trade to the state, in terms of taxes and customs duties? How did the state organise the food supply for the city of Rome, and for the armies on the frontiers – through taxation, through requisitions, or bulk purchase of harvests in advance (Wilson and Bowman 2018b)? And did these flows of goods for a state market stimulate trade in goods for a private market? How integrated was the Roman market economy (for contrasting extreme positions see Bang 2007; Temin 2013)? Did trade form a significant part of elite revenue streams (Wallace-Hadrill 1991; Morley 2000; Tchernia 2016)? Was maritime trade characterised predominantly by 'le grand commerce maritime' – organised repeat flows of bulk shipping between major entrepôts, with local redistribution from them – or by tramping (or 'cabotage'), a smaller-scale pattern of opportunistic coastal trading from port to port, implying much less knowledge or information about conditions in distant markets (Nieto 1997; Horden and Purcell 2000; Morley 2007: 102; Wilson 2011a: 53–54; 2011b; Wilson et al. 2012)?

What was the scale and nature of trade beyond the frontiers of the empire (see e.g.: Silk Roads: McLaughlin 2016; Graf 2018; Red Sea and Indo-Roman trade: Tomber 2008; 2018; McLaughlin 2010; 2014; De Romanis and Maiuri 2015; Cobb 2018a; 2018b; Nappo 2018; Davidde 2018; De Romanis 2020; Saharan trade: Wilson 2012; 2018; Mattingly 2013; Mattingly et al. 2017)?

There is no space here to deal with all of these questions. In this chapter I shall concentrate on the evidence for long-distance trade in pottery, the state's investment in transport infrastructure to support trade, state intervention in the supply of the city of Rome, and the significance of trade beyond the frontiers of the empire.

Tracing trade

Tracing trade in the archaeological record typically relies on being able to identify the region of origin of particular artefacts or materials, and then compare the region of origin with the pattern of distribution of known examples. Such approaches demonstrate an extensive trade in particular types of stone, especially marble for architecture and sculpture (Russell 2013), and timber for construction (Harris 2018; Bernabei et al. 2019).

Pottery is ubiquitous on Roman sites and, for this reason, it is one of the main classes of goods studied by archaeologists. Ceramic petrology allows the identification of source regions of production by matching inclusions in the clay to local geology; assessing the distribution of products of known origin then enables one to gain an idea of trade in those products (Peacock 1974; Tomber and Dore 1998). For the Roman period, the common but not universal practice of stamping many products with the name of the workshop owner or manager can also assist fine-grained analysis of distribution patterns (Oxé et al. 2000; Hartley et al. 2008–11).

Examples of long-distance trade in non-luxuries are provided by the distribution of red gloss table pottery. From about 40 BCE onwards a very popular red gloss tableware, known to modern scholars as Italian Terra Sigillata (ITS), was made at centres in northern Italy, such as Arezzo, Pisa and a number of sites in the upper Tiber Valley north of Rome (Sternini 2019). Its attractive, lustrous red slip and elegant forms assured its popularity, and this pottery was mass-produced in phenomenal quantities. Elegant as it is, it ranks somewhat below metal plates and cups, and possibly below glassware, in terms of status and cost. These are not really luxury goods, yet they achieved very wide distribution. A few *terra sigillata* vessels had closed shapes

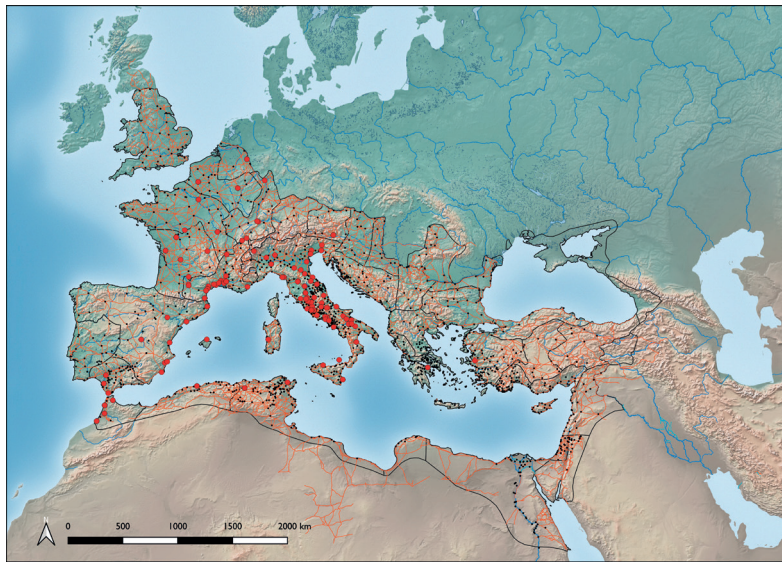

Figure 4.1 Distribution of dated name-stamped *terra sigillata* pottery from the Arezzo workshops, 40 BCE–20/15 BCE. © A. Wilson; pottery data from the Samian Research website by Allard Mees/RGZM: https://www1.rgzm.de/samian/; other data as Fig. 4.5.

and were wheel-thrown, but the majority were open forms (dishes, bowls), which stacked easily for transport, and were mass-produced by mould-forming techniques.

Between 40 and 20/15 BCE, the main centre of production was at Arezzo (ancient Arretium), producing both black and red wares, in non-standardised shapes (Oxé et al. 2000). This 'Arretine Ware' rapidly captured the emerging markets of the central and western Mediterranean (Figure 4.1). It also reached the eastern Mediterranean, and was even exported as far afield as India (Wheeler et al. 1946; Begley 1993; Oxé et al. 2000). From about 20 BCE to 15 CE the production of Arretine ware peaked, with the highest level of output, in standardised shapes; it appears in large quantities at the forts of the Rhine frontier (Figure 4.2). Other workshops making similar pottery were established elsewhere, in the Po Valley and in Campania, some of which were producing pottery stamped ARRETINVM as though it was in fact made at Arezzo. Workshops were also established at Lyon in Gaul in this period. From about 15 CE to 50 CE the workshops of the Po Valley became dominant, again producing standard shapes.

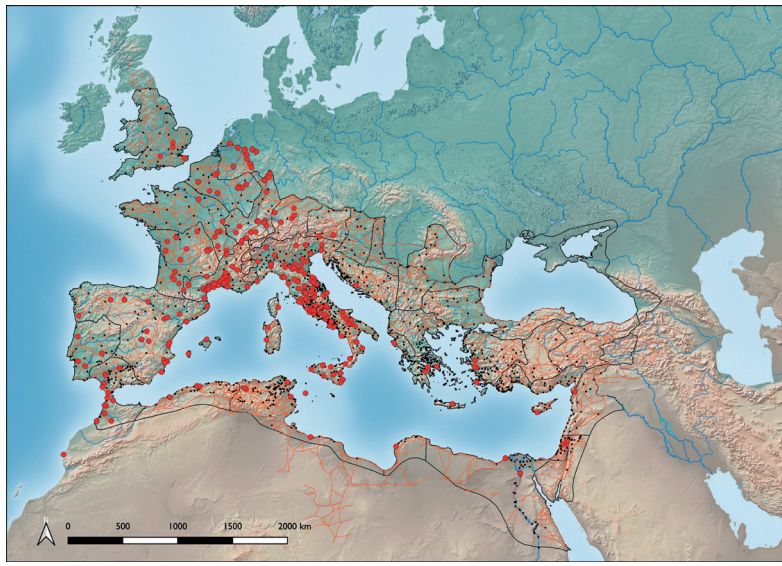

Figure 4.2 Distribution of dated name-stamped *terra sigillata* pottery from the Arezzo workshops, 20 BCE–15 CE. © A. Wilson; pottery data from the Samian Research website by Allard Mees/RGZM: https://www1.rgzm.de/samian/; other data as Fig. 4.5.

But already from the late first century BCE Arretine ware was being imitated in France, first at Lyon and then at the large pottery production centre of La Graufesenque in southern France. Many of these vessels are stamped with the name of their producer, and this enables us to see that some of the key producers from northern Italy were involved. There is still unresolved debate as to whether this means that Italian producers were setting up branch workshops in Gaul, to be nearer those markets, or whether the producers were actually migrating from Italy to Gaul. What is clear is that within a matter of years the Gaulish production captured the north-western European market formerly dominated by the Italian products (Figures 4.3 and 4.4). Over the course of the first century CE the significance and market share of the Italian pottery production declined and was largely replaced by the Gaulish wares.

The pattern of establishing new production centres closer to developing markets continued, and other large centres of pottery production grew up in southern Gaul at Montans (Augustan to late Antonine period), whose products were traded throughout western Gaul and into northern Spain; and in central Gaul at Les Martres-de-Veyre, exporting mainly in the first half of the second century CE, and Lézoux

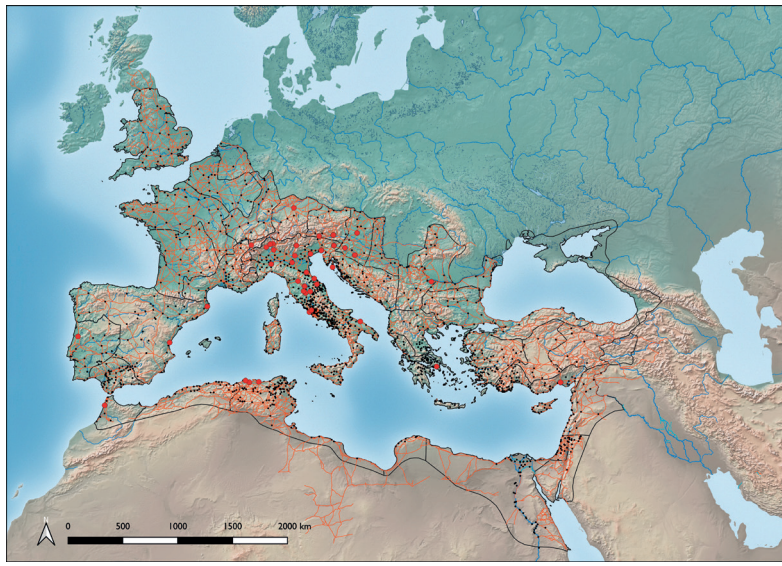

Figure 4.3 Distribution of dated name-stamped *terra sigillata* pottery from the Arezzo workshops, 20–60 CE. © A. Wilson; pottery data from the Samian Research website by Allard Mees/RGZM: https://www1.rgzm.de/samian/; other data as Fig. 4.5.

(Augustan to late second century). Their products were distributed throughout northern and eastern Gaul and reached Britain, the Rhineland and the Danube provinces. Sites in eastern Gaul and the Rhineland – Rheinzabern, Trier and the Argonne – supplied not only their own regions but also Britain and the Danube provinces, particularly in the second century and until a little after the middle of the third (Bémont and Jacob 1986). In Spain, *terra sigillata hispánica*, produced at Tritium Magallum (Tricio) in La Rioja in the upper Ebro valley, is widely distributed through much of the Iberian peninsula, but not often found outside it.

In the eastern Mediterranean, four main fineware types have been identified: Eastern Sigillata A, B, C and D (abbreviated ESA, ESB, ESC and ESD). Of these, production centres have been definitively identified only for ESC, in the region of Pergamon and at Çandarli on the Aegean coast. ESA was made somewhere in the Maeander valley of western Turkey, perhaps at Tralles (modern Aydın); ESB somewhere in the Levantine coastal region between Tarsos and Latakia; and ESD probably in western Cyprus (Hayes 1994; Bes 2015). All these wares were exported across the eastern Mediterranean (Carrignon et al. 2022), but those produced near larger urban centres were more widely and effectively distributed

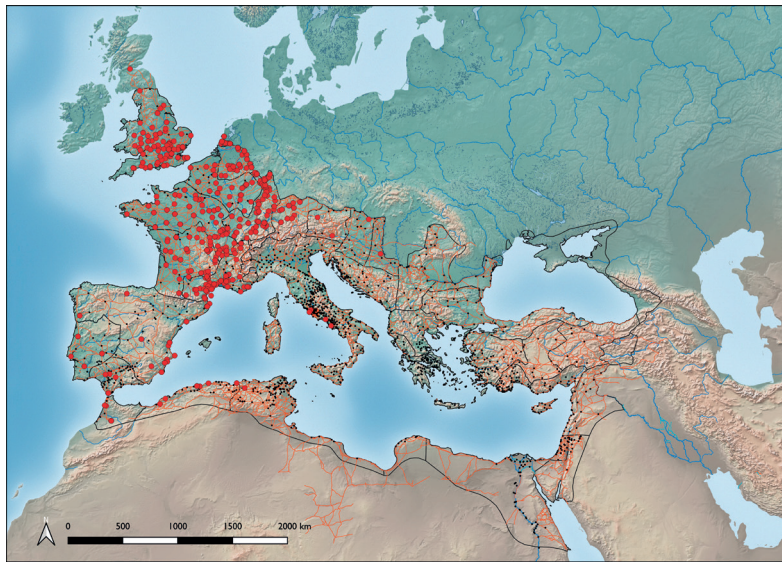

Figure 4.4 Distribution of dated name-stamped *terra sigillata* pottery from La Graufesenque, 20–60 CE. © A. Wilson; pottery data from the Samian Research website by Allard Mees/RGZM: https://www1.rgzm.de/samian/; other data as Fig. 4.5.

(Hanson et al. 2022). But the Gaulish and other western productions began to face competition in their turn from products made in what is now Tunisia, Africa Red Slip ware (ARS), which began to be exported from North Africa around 90 CE, and is found in large quantities at sites throughout the western Mediterranean in the second and third centuries, and across the whole of the Mediterranean from the fourth century onwards (Hayes 1972; Bonifay 2018; 2022). The extraordinary success of ARS is thought to be explained by its travelling from Africa with grain cargoes to Portus, and its wider distribution was then assisted by travelling as return cargoes on ships heading back to other parts of the Mediterranean (Fentress and Perkins 1988). Its distribution to the eastern Mediterranean really occurs only after the foundation of Constantinople, and may be due to the gravitational pull of the new capital.

The significance of the distribution of different tablewares such as ITS, Gaulish sigillata and ARS is not that they were valuable items in themselves (they were not, particularly), but that they show how large trade flows in relatively low-value, common items were possible on an interprovincial scale, and how major production centres might compete with each other for geographical markets. The point is made

even more strongly by the fact that cooking wares (ceramic cooking pots, pans and casseroles) produced in certain regions – for example, coastal North Africa – were also widely distributed by maritime trade to the coastal regions of other provinces, although not so far inland as the tablewares (Leitch 2011). This suggests that the cooking wares were cheaper and less resilient to the costs of transport than the tablewares, but that nevertheless the flows in bulk maritime goods, on which the pottery cargoes piggy-backed, were considerable enough to subsidise the transport of the ceramic cargoes.

Tablewares and cooking wares were traded for their own value; by contrast, another common class of pottery, amphorae or ceramic transport jars, were traded for their contents – principally wine, olive oil or fish products, but sometimes other commodities too (alum, pitch, salt, even grain). The distribution of both amphorae and other forms of pottery shows a coastal concentration and, sometimes, a clustering along river valleys, illustrating how the cheaper costs of maritime and riverine trade, compared to road transport, influenced distribution (Loughton 2003). Importantly, however, distribution was not limited to riverine and coastal areas, and the distribution of Arretine pottery in Gaul, and La Graufesenque pottery throughout Gaul and Britain, even well away from the main navigable rivers, shows that road transport was therefore *not* prohibitively expensive. The facile assumption that it must have been, common in scholarship of the 1980s and 1990s (e.g. Finley 1985: 32, 126) and even persisting later in some quarters, ignores fundamental technological issues to which I now turn.

The role of the state: investment in infrastructure

The Roman period saw considerable improvements in overland trade, with developments in wheeled transport (suspension, movable front axles for steering: Greene 1986: 38–9); and roads, bridges and communications infrastructure. This latter factor is especially important; the Roman Empire built thousands of kilometres of roads (Figure 4.5), as part of a state policy that while militarily driven nonetheless also recognised the economic benefits (cf. also Pliny *Letters* 10.41, 42, 61 and 62, on the economic benefits of cutting a transport canal in Bithynia).

Roman roads were usually paved or metalled, with lateral drainage ditches, in contrast to later, medieval, roads that were unpaved tracks covering wide swathes of ground so that livestock could be driven along them and riders and carts had ample opportunity to meander around the

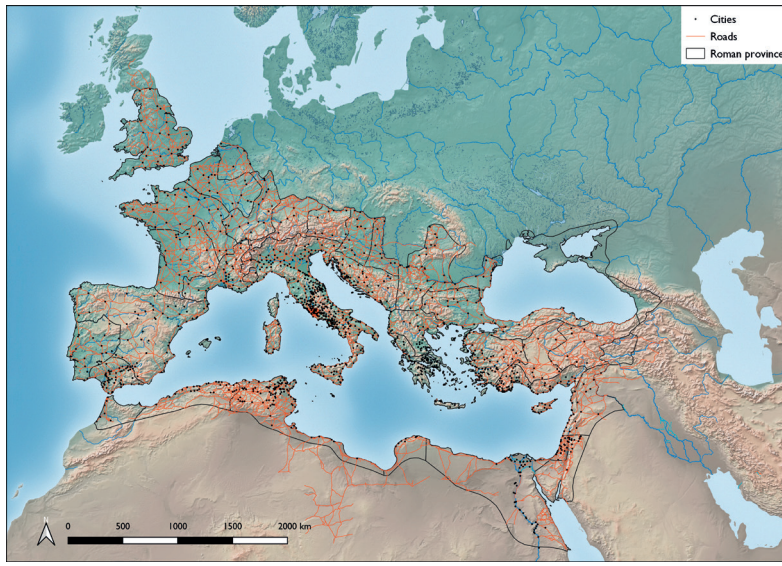

Figure 4.5 Cities and the road network of the Roman Empire. © A. Wilson; cities: Jack Hanson; roads: Ancient World Mapping Centre; provincial boundaries: Andrei Nacu.

worst of the mud. In the Roman world, conditions of security enabled greater capital investment in built road infrastructure to facilitate the physical progress of travel by wheeled traffic (Hitchner 2012; cf. Laurence, Chapter 1 this volume). The point is underlined by the difference between Roman and medieval bridges: the vast majority of Roman bridges were wide enough for two vehicles to pass; many medieval bridges, by contrast, at least in northern Europe, were narrow and steep humpbacked affairs intended for packhorses rather than wheeled transport. Put simply, the transport infrastructure of the Roman Empire was vastly superior to that of medieval Europe.

Effective long-distance trade networks required considerable infrastructure. For maritime trade this was made possible by improvements in shipping technology (greater capacity, improved bilge pumping equipment, faster sailing times), harbour construction (with concrete that could set under water) and harbour infrastructure such as cranes and dredging vessels (three were found at the port of Marseille) (Wilson 2011a; 2011b). It has been proposed that a dramatic reduction between the first and second centuries CE in the number of known shipwrecks may be in part the result of increased harbour construction, particularly along the Italian and Gaulish coasts (Robinson et al. 2020).

Shipwreck evidence does suggest that there were important changes in the size of the largest shipping between the Hellenistic and early medieval periods. Small ships were, of course, common at all periods, and ships of less than 75 tons were common throughout the Roman period, as they were both before and afterwards. But during the period 100 BCE to 300 CE we find wrecks of well over 200 tons, even over 350 tons, which we do not before about 100 BCE or between 400 CE and 1000 CE (Wilson 2011b: 212–17). The transport of obelisks weighing between 200 and 500 tons from Egypt to Rome in the reigns of Augustus and Caligula, and again under Constantine in 337 CE, gives an indication of the minimum capacity of the ships needed to carry them (Wilson 2011a: 40, n. 33). Most telling, perhaps, is the late-second-century CE regulation exempting shipowners from civic *munera* if they put at the state's disposal a ship of *c*.340 tons, or several ships of *c*.70 tons (Suetonius, *Claudius* 18.3–4; Gaius, *Institutes* 1.32C; Scaevola, *apud Digestam* 50.5.3; cf. Casson 1971: 171, n. 23). This implies that such ships were not too uncommon, and affordable by private shipowners. Indeed, the financial burdens of *munera* were so heavy that elite landowners were thus encouraged to invest in large shipping to escape them.

Large ships required more effective propulsion. The addition of a foremast is seen already on some ships of the sixth century BCE (Casson 1971: 70, 240), and became a regular feature of larger Roman merchantmen, as on an early third-century CE mosaic from the frigidarium of the baths at the small port of Themetra near Sousse – the foremast sharply raked forward and carrying a square sail (Foucher 1958; 1967). In combination, the evidence for improved shipbuilding technology, larger ships and harbour construction in the Roman period supports the view that large-scale maritime trade flows directed between major ports ('le grand commerce maritime'), rather than opportunistic tramping, explains the widespread distribution of goods visible (chiefly in the form of ceramics and amphorae) in the archaeological record (Nieto 1997; Wilson 2011a: 53–54; 2011b; Wilson et al. 2012).

The role of the state: supplying Rome

The *annona*

When considering the involvement of the Roman state in the economy, it is impossible to ignore the *annona*. The handout of free or subsidised grain at Rome was an important aspect of Roman politics from 123 BCE

onwards, and imperial attempts to secure and safeguard the grain supply to prevent political unrest resulted in the creation of first the Claudian and then the Trajanic harbours at Portus. The emperor Claudius began construction of the first harbour in 42 CE after a bread riot in Rome, when the crowd pelted him with stale crusts, because the grain fleet from Alexandria had not been able to dock and supply grain in the quantities required, and there was a grain shortage (Suetonius, *Claudius* 20). In 100–112 CE Trajan built the inner, landlocked hexagonal harbour, which increased capacity and provided a safer and more sheltered anchorage than the Claudian harbour, whose basin was so big that it did not prevent ships at anchor being wrecked within it, during a large storm only a few years after it had been built (Tacitus, *Annals* 15.18; on the harbour at Portus, see Keay and Paroli 2011; Keay 2012).

But, although we have the impressive harbour remains, the perishability of grain makes tracing the *annona* institutions at Rome through the material record almost impossible. Instead, I want to focus on what I see as an analogous initiative for another foodstuff, olive oil.

The supply of olive oil to the city of Rome

Near the Tiber in Rome is the large roughly triangular hill of Monte Testaccio – 'potsherd mountain', covering an area of 20,000 m^2 at its base and 35 m high, but probably once considerably higher (Figure 4.6) (Blázquez Martínez and Remesal Rodríguez 1999; 2014; Funari 2001). It is entirely artificial, composed of fragments of amphorae which have been deliberately smashed *in situ*. They are all olive oil amphorae, and over 80 per cent are the so-called Dressel 20 type from Baetica in south-west Spain. The total quantity is estimated at 24.75 million amphorae accumulated over nearly 300 years.

The exclusive composition of olive oil amphorae suggests that this is something other than simply an oversized urban waste dump, and study of the composition of the hill confirms this. Discard was not haphazard but done in an organised way; the amphorae were carried up whole and smashed on the spot (excavation has shown that they can be completely reconstructed), and as the dump grew it was raised in level terraces with retaining walls built of amphora sherds. The formation goes back much earlier than 138 CE and probably to Augustus or Claudius. The coarse layers composed of thick fragments of Spanish Dressel 20 amphorae were stabilised by packing them with the smaller debris from the lighter, thinner-walled African amphorae. Then everything was carefully sprinkled with powdered lime to neutralise the rancid smell. All

Figure 4.6 Monte Testaccio, an artificial mound 100 feet high, composed of broken olive oil amphorae. © A. Wilson.

this points to a centralised and highly organised discard of the packaging containers for olive oil coming into Rome, the scale of which immediately suggests some form of state involvement.

This idea is confirmed by a study of the amphorae, especially the Dressel 20s – a globular Spanish olive oil amphora produced in the Guadalcuivir valley in south-west Spain. This type is common around the western and central Mediterranean, but is distributed mainly in north-west Europe (especially in Britain and on the Rhine frontier; military sites especially), and is also found in large numbers at Rome. Production started in the first century CE, and continued until the third quarter of the third century – it is last attested in 267 CE.

Particularly important for an interpretation of the purpose and function of Monte Testaccio is the fact that the Dressel 20 olive oil amphorae found there all seem to have carried inscriptions – *tituli picti* – written in black ink on the body of the amphorae just below the neck. Since these were written after firing, they must relate to the contents rather than to the production of the amphorae, and detailed analysis shows that they followed a highly organised schema.

Five main classes of inscription have been recognised, referred to as alpha through epsilon, of which the first three are always present on the Dressel 20s from Monte Testaccio, and the last two may be present:

α = empty weight of amphora, in Roman pounds.

β = name, in capitals, of the *navicularius* or shipper; from the third century on, after confiscation of estates in the civil war of 192–3 CE, it is replaced by the formula *Fisci rationis patrimoni(i) provinciae Baeticae* ('belonging to the treasury of the province of Baetica').

γ = weight of contents, in Roman pounds.

δ = up to five lines of cursive script; the mark of the authorities controlling export. May contain some or all of: date (by consular year), names of officers performing the export check, estate where the product is from, and the town where control was carried out (usually Hispalis, Seville).

ε = a numeral, whose significance is uncertain, but which may relate to loading or storage.

As different *tituli* on the same amphorae are often in different scripts, several people were involved in adding these records to the amphorae, at different times.

The nature of these *tituli picti* differs radically from those on amphorae of wine or fish products, which are usually more concerned to advertise the contents; here the emphasis is on checking quantity and, sometimes by reference to estates, quality. The emphasis on control confirms a state involvement, which can also be linked to the epigraphic attestation of an *adiutor praefecti annonae ad oleum Afrum et Hispanum recensendu* ('assistant to the prefect of the *annona* for assessing African and Spanish oil') at Rome in the mid-second century CE (*CIL* II.1180). The combination of centralised discard and the rigorous checking of contents indicates a highly organised system in which the state intervened to check the quantity and quality of product for which it has contracted. The Roman state did not hand out olive oil free as part of the *annona* until the reign of Septimius Severus, yet Monte Testaccio began much earlier than that. What, then, is going on?

The most plausible answer seems to be that, since olive oil was in vast demand in the ancient world – as a foodstuff, as lamp fuel, as massage oil and mechanical lubricant – it was a staple product, and since the demand generated by a city the size of Rome was enormous, the state intervened to ensure that it reached Rome in sufficient quantities. Shortages, for whatever reason, would cause price spikes and this could provoke unrest, just as disruptions to the grain supply did. The quantities involved are too great to be seen simply as taxation in kind, and it must be presumed that the state contracted with producers in Baetica to purchase oil at a price agreed beforehand. The producers gained the security of knowing that they had sold perhaps their entire harvest while it was still on the tree, while the state had obtained an assured price and contracted

for a fixed quantity. (The advance sale of grain, wine and olive oil was not uncommon in the Roman world: see Erdkamp 2005: 120–34.) On this hypothesis, the state must then have sold the oil at Rome, since it was not handing it out free; but this would provide a context for decanting the oil from the 66-litre amphorae, which were optimised for maritime transport, into smaller vessels more convenient for retail throughout the city. At this point the amphorae needed to be disposed of – and since they carried state control marks, it was all the more desirable to smash them and ensure they could not circulate further for fraudulent reuse. This reconstruction, while hypothetical, has the merit of accounting for all the observed evidence in a way that I think alternatives cannot. It also supports the view that the other main concentration of Dressel 20 olive oil amphorae, on the north-western frontiers, is the result of state contracts for military supply. Note, though, that this is the state intervening in the market primarily as a large customer with the negotiating power for a bulk discount; it does not exclude private activity, and indeed the merchants handling the shipments were not retained by the state but seem to have interacted with it on a private basis.

Since excavations at Monte Testaccio have not got below the levels of 138 CE, we do not know when this phenomenon starts, although it has been suggested that the formation of Monte Testaccio may have originated in the reign of Claudius or even Augustus. At the other end of the scale, none of the *tituli picti* is later than 267 CE; and there are no amphorae of the form Dressel 23, the late and smaller replacement of the Dressel 20, first attested on the Port Vendres wreck alongside Dressel 20s in 267 CE. This period, the sole reign of Gallienus, saw the collapse of the silver currency and a temporary massive drop in the fineness of gold coinage. The conclusion seems inescapable that the fiscal difficulties faced by the state in 267 CE, and the loss of Spain to the Gallic Empire, which was in revolt from the centre, rendered the operation unfeasible and brought it to an end. Even when the later Dressel 23 olive oil amphorae from Baetica are found on other sites, they are never inscribed with *tituli picti* as the Dressel 20s are, showing that the system requiring the imperial checks and record-keeping had ended.

The area where the majority of the amphorae from Monte Testaccio – the Dressel 20s – originated was the province of Baetica in south-west Spain, and especially the valleys of the Guadalcuivir and the Genil (Mattingly 1988: 38–44). Baetican olive oil had a reputation for quality – African olive oil by contrast had a poorer reputation, although it was still in demand, especially for lamp fuel. The lower plain of the Guadalcuivir valley was devoid of villas and associated olive presses and may have been

used for growing cereals. Across the higher ground, though, which would have favoured intensive oil cultivation, there is an even scatter of villas, farms and oil press sites – some farms have two, three or four presses. The kiln sites for the Dressel 20 amphorae, however, are concentrated along the rivers of the Guadalcuivir and the Genil, arguing for overland transport of the oil from the farms in skins, to specialised bottling plants on the rivers which bottled the produce of multiple estates. Over 70 different kiln sites are known to have produced Dressel 20s, some with batteries of multiple kilns (Mattingly 1988: 38–44). Here we can see large-scale investment in processing plant for export production, and vertical specialisation within the industry, and we can argue that in part this was stimulated by the security of the guaranteed market for the oil which the state constituted. In essence, if the state was regularly contracting with the same landowners to purchase large quantities of their olive oil, there was a considerable incentive to invest in processing machinery, which enabled producers to maximise their production and sell more to a reliable buyer whose demand was enormous.

The significance of external trade to the Roman state

Rome's external trade has been the subject of a growing amount of research in recent years, and it is increasingly clear that trade with the Indian subcontinent was not merely a small-scale trade in exotic luxuries, but a phenomenon of great significance both fiscally and culturally: pepper and incense have been found on civilian sites in the northern provinces (e.g. Tomber 2008; McLaughlin 2010; 2014; 2016; Sidebotham 2011; De Romanis and Maiuri 2015; Cobb 2018a; 2018b; Wilson and Bowman 2018b). The annexation of Egypt after the defeat of Antony and Cleopatra at Actium in 31 BCE gave Rome a gateway to the Red Sea and Indian Ocean trade routes (Figure 4.7). This enabled capitalisation on the relatively recent discovery of the monsoon winds, which facilitated a direct passage to and from India, rather than coast-hopping around the Arabian peninsula (Casson 1980; Tchernia 2005); and the introduction of Mediterranean shipbuilding technologies to the Red Sea ports allowed the construction of large ships, of several hundred tons' burden, that could ride out the sea conditions created by the monsoons, so that those direct routes could now be exploited on a regular basis. Finally, the development of the road infrastructure between the Nile and the Red Sea, begun by the Ptolemies, was improved to service caravans, so that goods could be offloaded at Berenike or Myos Hormos and carried across the

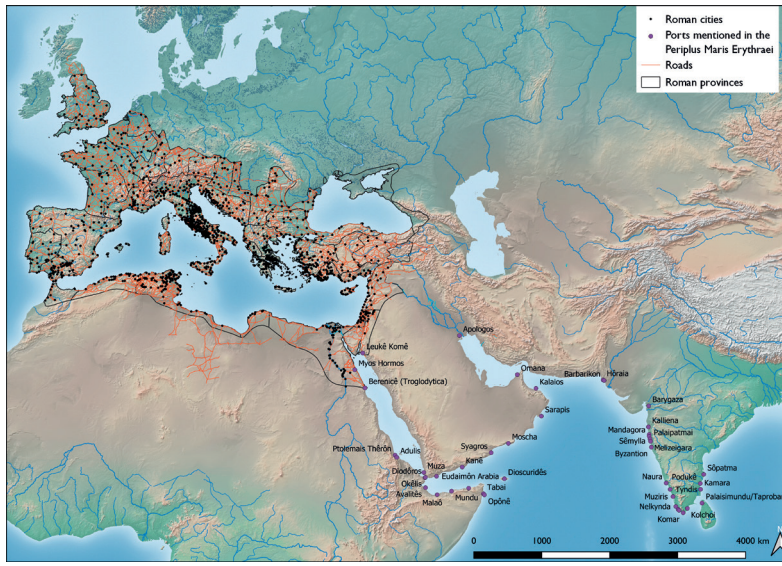

Figure 4.7 The Roman Empire and the ports mentioned in the *Periplus Maris Erythraei*. © A. Wilson/Oxford Roman Economy Project, with the assistance of Giada Manzinali.

desert to the Nile, avoiding the need for ships to beat up the Red Sea to Suez against the prevailing northerly winds which made sailing difficult in the northern Red Sea (on Red Sea sailing conditions, see Cooper 2011).

In the first century CE the Roman state established fortified watering points or *hydreumata* along the roads from Koptos on the Nile to the Red Sea ports at Myos Hormos and Berenike (Figure 4.8). Perhaps as early as the reign of Augustus, cisterns were built at the forts of Apollonos Hydreuma, Compasi and Berenike (*ILS* 2483; Kennedy 1985; De Romanis 1996: 219–24; Bagnall et al. 2001: 330), and more fortified wells and cisterns were built at other sites in 76/77 CE, at the direction of the prefect of Egypt, as attested by inscriptions from the forts at Didymoi and Aphrodites, and at Wadi Sikayt near Berenike (Plin. *HN* 6.102–3; see Sidebotham 2011: 125–74 for the most recent synthesis on the routes across the Eastern Desert in the Roman period). Caravans using these routes across the desert had to pay a tax, which defrayed the costs of maintaining the transport infrastructure, and were provided with armed escorts for protection against nomadic desert tribes (Sidebotham 1986: 80–81; *OGIS* 674, the Koptos Tariff of 90 CE, sets out the charges for these travel permits). The main motive for the creation and upkeep

Figure 4.8 Roman Egypt: routes between the Nile and the Red Sea.
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of the Koptos–Berenike and Myos Hormos routes and their associated water-supply infrastructure was clearly to support the Red Sea and Indian Ocean trade and the transfer of those cargoes to the Nile Valley.

This state policy was continued and even extended in the first half of the second century CE: Trajan had a road built between Aila on the Red Sea and Bosra in southern Syria, the Via Nova; he also dredged and revived the old canal linking Clysma (Suez) with the Nile at Babylon (Old Cairo), where he built a new river port at the junction of the canal and the Nile. He is also said to have stationed a fleet in the Red Sea; all of these measures seem connected with the annexation of the Nabatean kingdom in or just after 106 CE, and demonstrate the consolidation of Roman control over trading interests in the area. His successor Hadrian built a road from Antinoopolis to Berenike along the Red Sea coast, linking the various smaller harbours en route, apparently for surveillance and to facilitate regional communications and supplies between the Rea Sea ports. In the

mid-second century the naval presence established by Trajan in the Red Sea was pushed further southward, with the stationing of a detachment of troops and their ships on the Farasan Islands, 1,000 km south-east of the southernmost Roman Red Sea port at Berenike (Villeneuve 2004; Villeneuve et al. 2004). Presumably, the aim was to protect Roman shipping from piracy whilst entering or leaving the Red Sea.

These measures – infrastructural and military – represent considerable state investment in the routes supporting Red Sea trade, and the explanation no doubt lies in the customs dues that the Roman state received from Indian and Arabian trade up the Red Sea (Young 2001: 207–12; McLaughlin 2010: 164–72 – but many of the figures he gives are for the revenues of Egypt as a whole, not the revenues on eastern trade; Wilson 2015; Wilson and Bowman 2018a: 14). Customs dues on cross-frontier trade, where we have direct evidence for their levels on the eastern frontiers, were 25 per cent at least until sometime in the third century CE. The so-called 'Muziris papyrus' values the cargo of the ship *Hermapollon*, which sailed from Muziris in India to the Red Sea in the mid-second century CE, at 1,151 *talents*, 5,852 *drachmae* of silver, or nearly 7 million *sestertii*. (To put this in perspective, to qualify as a senator one had to own property of at least 1 million *sestertii*.) This valuation was made after the deduction of the 25 per cent customs tax, so that the pre-tax value of the cargo was 9,215,803 *sestertii*, and the customs dues were 2,303,951 *sestertii* on this cargo alone (Morelli 2011; De Romanis 2012; 2020; Wilson 2015). We do not know whether the *Hermapollon* was typical or exceptional, though statistical probability is in favour of the former; but over a hundred years earlier Strabo (*Geography*, 2.5.12) says that 120 ships per year left Myos Hormos for India, and if we imagine just 100 such cargoes each year, then the customs revenues on imports from India alone would total *c*.230 million *sestertii*, one-third of Rome's estimated annual military budget of 643–704 million *sestertii* (Duncan-Jones 1994: 36, table 3.3 for the military budget). One needs to also add the customs dues on merchandise from the coast of Africa and the Arabian Peninsula, and also the export dues (also at 25 per cent) on cargoes leaving the Red Sea ports for the African coast, Arabia and India. Moreover, most of the goods imported via the Red Sea to Egypt will have been exported again through Alexandria, with further inter-provincial customs dues of (usually) 2.5 per cent. Also to be added are the revenues on overland Silk Routes trade, ultimately to China, via Palmyra and other centres, whose importance is increasingly being recognised (McLaughlin 2016; 2018; Meyer and Seland 2016; Graf 2018). The total revenues on external trade must have been several hundred million *sestertii* per annum in the first and second centuries CE, an important share of total

state revenues and a key enabling factor in supporting the army and the state's expenditure on transport and urban development (Wilson 2015; McLaughlin 2018).

Conclusion

The unification of the Mediterranean world under the hegemony of Rome significantly reduced transaction costs across a pan-Mediterranean market through the use of common laws, a common currency (except for Egypt), two *linguae francae* (Latin and Greek) — at least one of which would be (largely) understood anywhere in the empire — the establishment of peace, and the virtual eradication of piracy in the mid-first century BCE. Technological developments in shipping, and the state's investment in roads and harbours, all reduced the costs of trade. These created favourable conditions for long-distance trade in agricultural produce, pottery, glass, timber and a host of other goods. This contributed to a partial homogenisation of Roman culture, with certain goods widely available across the empire, although there were still of course regional differences in consumption patterns. Growing urban populations provided concentrated markets, and agricultural production was increasingly organised around villa estate centres engaged in market-oriented cash crop agriculture. As we have seen with the olive oil supply for Rome, sometimes the state would intervene in the market as a powerful actor, thus stimulating large-scale production further (as in the Guadalcuivir valley). Trade with the east, both across the Syrian desert to the Silk Routes to central Asia, and, with the acquisition of Egypt, via the Red Sea to the Indian Ocean, brought in flows of goods, the customs duties on which were a source of considerable revenue to the Roman state. These conditions depended on the political unity and stability of the empire, and when in late antiquity these collapsed and the empire fissured, both internal and external trading networks fell apart and were radically reconfigured under the empire's successor states.

Abbreviations

CIL: *Corpus Inscriptionum Latinarum*. Berlin: Berlin-Brandenburg Academy of Sciences and Humanities, 1863–.

OGIS: Dittenberger, W. 1903, 1905. *Orientis Graeci Inscriptiones Selectae. Supplementum Sylloges inscriptionum graecarum*, 2 vols. Leipzig: S. Hirzel.

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