

Economies of Scale: Late-Antique Bakeries outside Large Urban Centers

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The study of Roman bakeries sometimes has a tendency to treat them as somewhat different from other crafts and trades in terms of the scale of their production. Helmuth Schneider, for example, posits that Roman workshops “were not elaborately fitted out and it was quite cheap to set up a workshop; a craftsman usually needed only a few tools for his craft and often practiced it in a shop connected with his living quarters. There were some crafts, however, which were dependent on bigger production sites with more expensive equipment: bakeries had their ovens and mills... Bakers and fullers in particular were sometimes quite well-off: the baker Eurysaces, for example, was able to have erected for himself a pretentious monument at the Porta Maggiore in Rome.”¹ Commercial baking is often grouped with fulling as investment heavy industries with undifferentiated product and inelastic demand, allowing for a form of industrialization not evident in other crafts of other sorts.² This understanding of the baking industry has largely been grounded in the material remains of bakeries from central Italy, which are well outfitted with elaborate masonry ovens and large imported millstones. But the idea of the high-production bakery, unique among Roman crafts, is really grounded in the evidence from Ostia where massive installations were capable of milling vast sums of grain and of baking huge numbers of loaves. Pompeian or Ostian bakeries are sometimes even used as a template for commercial baking at other sites, where the evidence is less well preserved,³ but the bakeries elsewhere, even those at Pompeii, are much smaller installations often with much less infrastructure. Such myopia in our examinations has had the effect of placing undue emphasis on economic growth leading into the first few centuries of the Common Era and exaggerating any collapse at the end of antiquity, giving the impression of a shift from near-industrialization and high product dependence to modest production hardly distinguishable from domestic activities.⁴ An expanded examination of the Roman baking industry from urban centers around the Mediterranean indicates that most bakeries were small workshops producing on a modest scale, rather than massive bread factories with close ties to the State. A reconceptualization of late antique bakeries, and workshops in general, as relatively small spaces grounded in the Roman *familia* is consistent with observations about Roman bakeries in earlier periods,⁵ but also matches the types of commercial baking activities we see in the Middle Ages.⁶ Such consistency suggests that we should view the nature of commercial activity at the end of antiquity as an evolution, rather than an interruption or disastrous collapse. On the other hand, there is good evidence for a shift in the localization of bakeries, away from urban centers and centered instead on the grounds of churches and monasteries.

The emphasis on large bakeries with close relationship with the State is not without some corroboration, especially from the Roman jurists and from the material remains

at Ostia Antica. But that evidence has been over-emphasized, largely driven by three narrative strains within the study of Roman history, of the Roman economy, and of Roman bakeries in particular: first, the role of bakers and bakeries in the provisioning of large urban centers; second, an archaeological focus on material evidence from the central Italian cities of Pompeii and Ostia; and third, most recently, an effort to isolate and understand economic growth and ‘industrialization.’

Provisioning Rome

Provisioning of Rome is a very old and familiar topic, from the importance of Sicily and Egypt to Rome’s food supply to the *annona* or *doles*, free distributions of grain (and later bread) to the citizens of Rome.⁷ The narrative is that the Roman state, and in particular the Emperor, was very much concerned with provisioning the capital city to prevent riots and reinforce his image as a capable ruler. Paul Erdkamp writes, “The most direct way to intervene in the grain and bread supply of the Roman populace was to control the activities of the bakers.”⁸ Within this narrative, the Emperor ensured the provisioning of Rome at first by incentivizing increased productivity through concessions to bakers and later by establishing state-run bakeries.⁹

The evidence for the relationship between the baking industry and the state is largely grounded in literary and legal evidence concerning the policies of Roman emperors and the state toward bakers and bakeries. Aurelius Victor records that Trajan re-formed and strengthened the *collegium pistorum*, probably before AD 107.¹⁰

*“Adhunc a Domitiano coepta, forum atque alia multa plus quam magnifice coluit ornavitque, et annonae perpetuo mire consultum, reperto firmatoque pistorum collegio: simil noscendis ocuis, quae ubique e re publica gerebantur; admota media publici cursus.”*¹¹

“Furthermore at Rome he improved and decorated in a more than magnificent fashion a forum and many other structures begun by Domitian, and showed admirable concern for the permanent grain supply by reviving and strengthening the guild of bakers.”¹²

Aurelius Victor is specific about Trajan’s motivations; his concern was for the permanent grain supply of the city. There are other instances of Trajan showing care toward the provisioning of the city and directly intervening with the baking industry. Gaius records that the emperor proclaimed that any Junian Latin assuming the responsibility for a *pistrinum* milling at least 100 *modii* for no less than three years would hence forth have rights as expressed by the *ius Quiritium*.¹³

“Denique Traianus constituit, ut si Latinus in urbe triennio pistrinum exercuerit, in quo in dies singulos non minus quam centenos modios frumenti pinseret, ad ius Quiritium perveniat.”¹⁴

“Lastly, Trajan enacted that if a Latin carry on the business of miller in Rome for three years, and grinds each day not less than a hundred measures of wheat, he shall attain Roman citizenship.”¹⁵

Another, recorded in the *Fragmenta Vaticana*, grants an *excusatio tutelae* (exemption from the duty of guardianship) to members of the *collegium pistorum* provided they operated a bakery of a hundred unspecified units.

“Ulpianus de officio praetoris tutelaris. Sed qui in collegio pistorum sunt a tutelis excusantur, si modo per semet ipsos pistrinum exercent; sed non alios puto excusandos, quam intra numerum constituti centenarium pistrinum secundum litteras divi Traiani ad Sulpicium Similem exercent; quae omnia litteris praefecti annonae significanda sunt.”¹⁶

“Ulpian, in his commentary on the (official) function of the *praetor tutelaris*. Yet those in the *collegium pistorum* are exempted from guardianship if they themselves operate a *pistrinum*, but I believe that no others can be released apart from those among their number who operate a hundred *pistrinum* in accordance with the letter of the late Trajan to Sulpicius Similis. And all these matters are given in the letter (to) the Prefect of the *Annona*.”¹⁷

The word *centenarium* is sometimes taken to mean a bakery worth 100,000 *sestertii*,¹⁸ but within the context of Gaius’ explanation concerning the hundred *modii* of grain milled a day, one prefers to view it in that light. This is an important point. Trajan is not merely intervening in the baking industry, he is doing so with the goal of incentivizing increased production. A small bakery run as a side hustle would not suffice. One must operate a large bakery helping to meet the needs of the city in order to enjoy the concessions on offer by the Emperor. The social incentives might also offset desire for profits, keeping the price of bread down.

Hadrian and Caracalla make similar sorts of interventions in the Roman baking industry seemingly with an interest in incentivizing higher productivity.¹⁹ Later, Aurelian is said to have converted the dole from grain to bread in AD 275.²⁰ In the fifth century, Socrates Scholasticus describes massive underground bake-houses which were run by men referred to as *mancipes*, who purportedly used prostitutes to lure unsuspecting strangers into above-ground *tabernae* and then, by means of a trapdoor, enslaved the strangers to work in the mills.²¹ The story forms part of a larger narrative about

the purging of sin and iniquity from Rome by the Emperor Theodosius, including a banning of penal prostitution.²²

Socrates' story is probably apocryphal, but it does fit within a broader habit of Roman emperors seemingly intervening in the Roman commercial baking industry with an apparent eye toward ensuring the provisioning of the city. On the other hand, it is not entirely clear that the intention of the Roman emperors was to compel increased production, particularly where the concessions of Trajan, Hadrian, and Caracalla are concerned. Our understanding of such interventions by emperors hinges on the assumption that Junian Latins would have found the lure of full citizenship appealing enough that they would have maintained a massive bakery.²³ Moreover, Henrik Mouritsen has observed that such measures, particularly where freedmen are concerned, can actually be intended as a buffer to social mobility rather than a sincere effort at modifying social or economic habits.²⁴

Pompeii and Ostia

Even if the intention of certain emperors was more about buffering citizenship rather than incentivizing production, the levels of production, milling 100 *modii* a day, suggest massive production levels. Indeed, the material evidence from Ostia and Rome does attest to high levels of productivity and production within individual bakeries. Although no bakehouses *in Rome* have been preserved in their entirety, we do have some indications of large-scale production. Just outside the Porta Maggiore, the Tomb of the Baker, Eurysaces, has a frieze across the top that famously depicts the production of bread. Although an idealized, fictionalized depiction of the operation of a bakery, it represents large-scale production on par with the obvious wealth needed to produce such a monument. Furthermore, Eurysaces' title within his profession, *pistor* and *redemptor*, indicates he was some kind of contract baker, possibly working for the state or the army, though he does not specify for whom he contracted. Throughout the frieze, not only does one see large scale production, but also accountants tallying bags of grain as they enter the scene and weighing bread as it leaves. One wants to see these accountants as agents of the state, but they are not labelled and the tomb is hard to interpret in general.

At Ostia, on the other hand, there are more comprehensive remains of the bakeries, studied and published by Jan Theo Bakker.²⁵ The late second- and third-century bakeries in the city are massive in size and in the scale of their production (fig. 1). Bakker identifies eight bakeries, some small with a single oven and others massive with as many as eight millstones and as many mixers. But even in the small one-oven bakeries, the diameters of the ovens are much larger than any of the ovens at Pompeii, some over five meters in average diameter. The Ostian bread factories differ from the bakeries of Pompeii in some significant ways. They are larger; there are no indications of domesticity

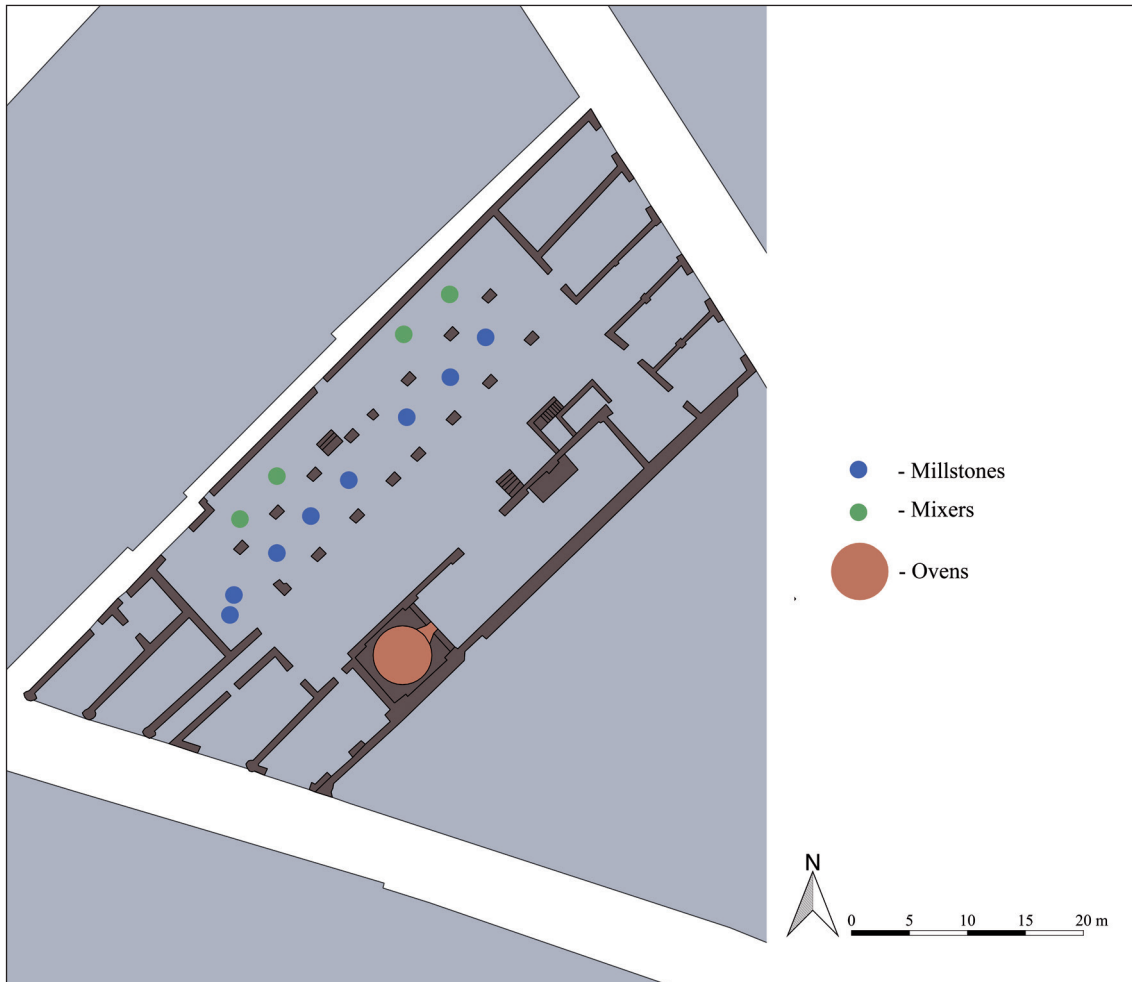


Fig. 1: The Molino from Ostia, I.13.4.

such as wall decorations, lararia, or other usual domestic architectural forms. This is not to say that no one could have lived in the bakeries, but it does contrast starkly with the close relationship almost universally evident throughout Pompeii between production and domesticity. Where the Ostian bakeries have as many as eight millstones, the Pompeian bakeries never have more than four and they are much smaller. The average oven diameter in Pompeii is just over 2 meters; the average diameter of the Ostian ovens, on the other hand, is about 5 meters.

Economic Growth

One is tempted, as Emanuel Mayer has done, to create a linear, developmental trajectory from Pompeii and Ostia, a trajectory of increasing levels of production and productivity.²⁶ Such an emphasis on high levels of production and product dependence at the end of Antiquity contrasts starkly with our evidence for production in the Middle Ages, disproportionately emphasizing decline or discontinuity. In fact, the high levels of specialization and product dependence insinuated by the massive bread factories of Ostia and the narrative of state intervention in baking industry have been used as evidence for the severity of collapse at the end of antiquity, most notably by Brian Ward Perkins.²⁷ But it is not entirely clear that we should accept this narrative of increasing production and productivity or that specialization should necessarily exacerbate collapse. Would the baking industry of Pompeii have developed into something akin to that of Ostia if the city had been allowed to survive another 200 years? I think we all suspect not; Ostia had some unique attributes that Pompeii did not, not the least of which was its special relationship with the Empire's capital, but also its much larger population.

In fact, Ostia and Pompeii loom large in the study of Roman industries and Roman studies in general. To some extent, this is a bias of preservation. The evidence – from workshops to baths – are better preserved at these sites than almost anywhere else in the Roman world. On the other hand, there is also a bias in study. We, our discipline, have chosen to focus on central Italy not only because the cities there are well preserved, but also because of the cachet they hold through their proximity to Rome itself and the narratives of life, destruction, and rediscovery. More recently, a search to understand growth in the ancient economy has shifted to a gathering of proxy data more broadly throughout the Empire.²⁸

Even if the discipline has moved past a focus on the central Italian sites, their superior preservation, combined with the myopic search for economic growth, results in a false narrative of increased production Empire wide. For example, millstones are a subject of regular study and even if the old linear technological progress charts have been abandoned, the regular use of proxy data derived from such technologies creates a similar type of linear trajectory of increasing productivity through technological innovation. Comparisons of millstones from Morgantina (3rd century BC), Pompeii (1st century AD), and Ostia (2nd–3rd centuries AD) indicate that innovation in millstone technology was occurring and that such innovation was likely driven by demand for devices that could offer increased productivity (fig. 2). Similarly, the oven technology, although very understudied, reveals a similar trajectory of increasing productivity (fig. 3). Ovens at Morgantina in the third and second centuries BC are never more than 0,75 m in average diameter and they are constructed out of reused bricks, tiles, and pottery. The masonry ovens of Pompeii are about 2 m in average diameter. The massive ovens at Ostia average of ca. 4 m.²⁹

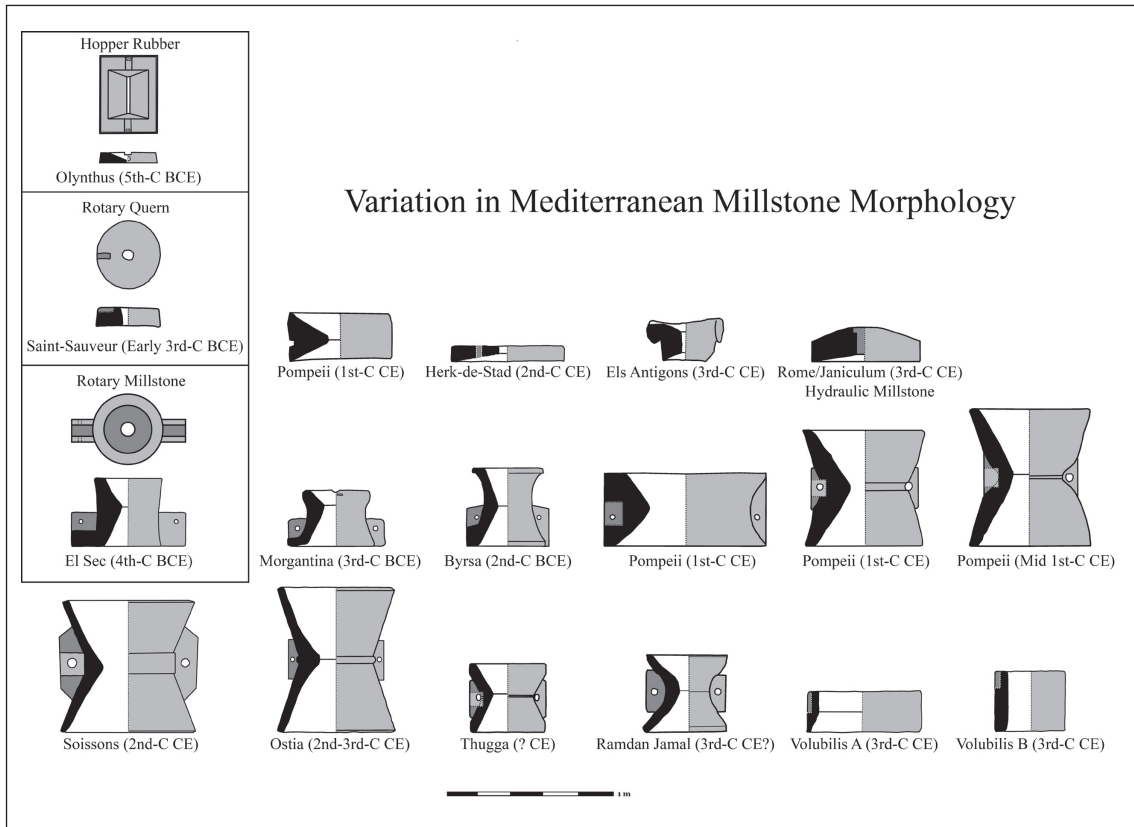


Fig. 2: Variation in Mediterranean Millstone Morphology.

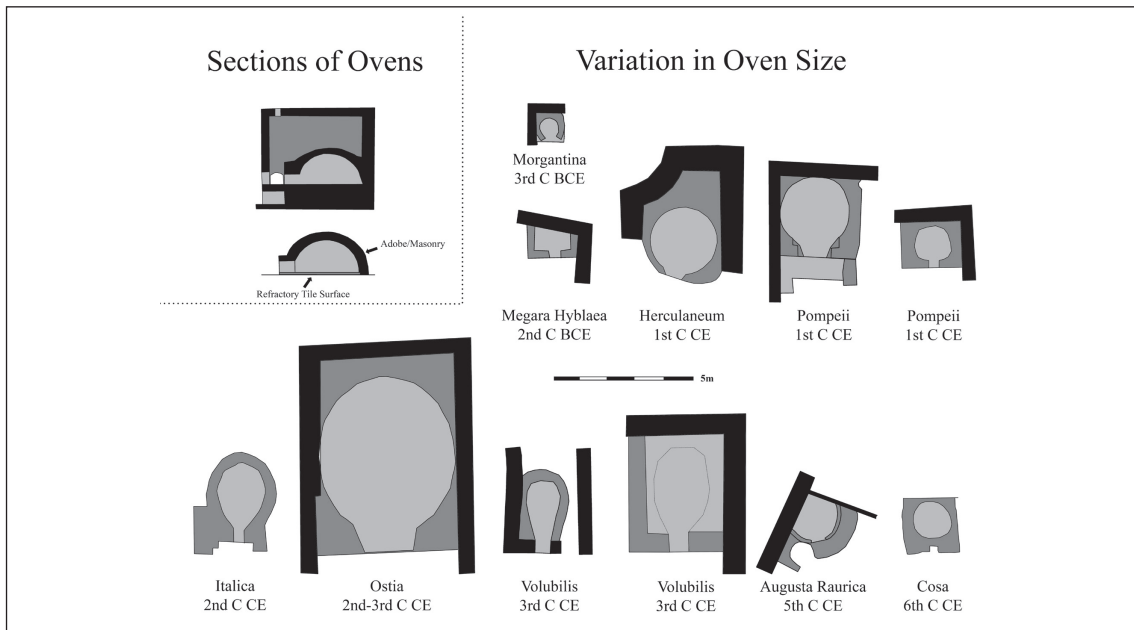


Fig. 3: Variation in Masonry Ovens.

An Expansive Approach

Even if there was technological innovation driven by demand for increased productivity, not all areas experienced technological innovation the same way, especially in the Roman world.³⁰ Furthermore, locations that do benefit from such technological innovation are often also the best-preserved sites due to the very infrastructural advantages that allowed them to benefit from innovation. As such, bias is introduced to proxy data through the lacunae of unpreserved or poorly-preserved evidence, even without a deliberate focus on Rome and its environs. This is especially true for commercial baking, which is achieved in Ostia and Pompeii with elaborate masonry ovens so similar that they invoke the notion of sub-industries specializing in commercial oven construction.

Other sites do not share this preservation or infrastructure. Some of our best evidence for Roman bakeries exists in the bakeries of Volubilis, a Roman city in North Central Morocco.³¹ The bakeries there largely date to the third – and possibly the early fourth – century AD. Bakeries in the NE quarter were initially identified by Robert Etienne and they were preliminarily studied by Mathieu Leduc, focusing mostly on their distribution throughout the city and on the capacity of kneaders. Production in Volubilis bakeries appears closer in scale to that of Pompeii than that of Ostia and, if anything, was probably somewhat lesser. Although the annular millstones in the bakeries are relatively portable compared to the hour-glass Pompeian and Ostian millstones, there are never more than two in a bakery.

Moreover, unlike the massive 5-meter diameter ovens of Ostia, the bakeries in Volubilis are 1,5 to 2,0 meters in diameter, more akin to ovens of Pompeii. The bakeries of Volubilis, however, are far from carbon copies of those of Pompeii. The ovens of Pompeii are remarkably homogenous, which suggests a close relationship with construction contractors or workshops of some sort. They consist of well-built masonry that integrates with the buildings around them. This is less true of Volubilis where the remains of the ovens are sometimes just refractory tiles on the floor with what one imagines was an adobe dome above.

Further evidence comes from Augusta Raurica in Northwest Switzerland. A number of ovens cluster just west of the theater, including a remarkably intact baking oven. The oven and its building were discovered in 1966 and were uniquely preserved by a collapse of an upper story sometime in the fourth century AD. Sandra Ammann and her colleagues, after careful analysis of the legacy data of the excavation, hypothesize that the building produced bread, but that the presence of other faunal remains and seemingly domestic items such as mirrors, indicate that the building may well have been bakery, but was *also* an inn.³² Confirmation of such a hypothesis would be difficult and one could easily interpret the evidence another way: that the domestic items and dining detritus are not indicative of an inn, but an integration of domestic and commercial habits.

Several sixth-century bread ovens (fig. 4) were found in the area of the basilica at Cosa by the team led by Lisa Fentress. The ovens range from 1 and a half to 2 meters in

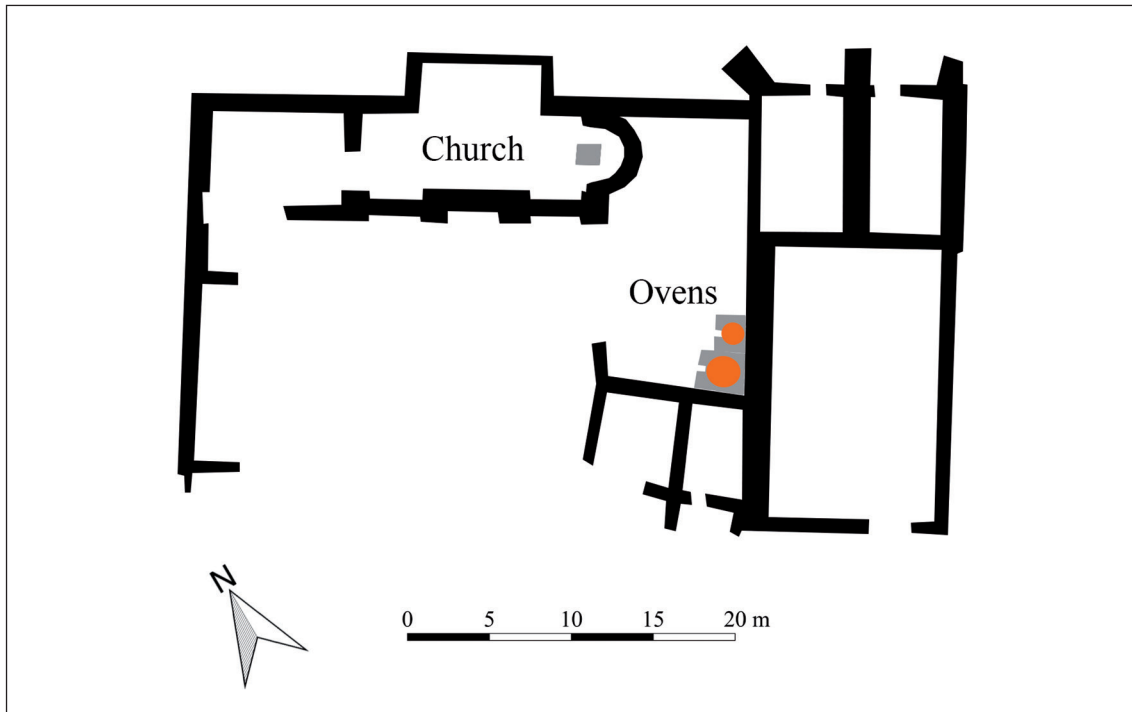


Fig. 4: Late-Antique Ovens in the Church Grounds at Cosa.

diameter, matching the more modest oven sizes at Volubilis and Augusta Raurica. But the nature of the production to which the ovens contributed remains unclear. There are no millstones or other bread-producing technologies, as far as I know, associated with the ovens and their location within the built environment is unique as part of a repurposed public space. They are possibly communal ovens, but they hold a closer relationship with the church in Cosa than they do with houses as was formerly the case.

In fact, there is some good evidence that the focal point – the architectural context – of Roman baking shifts in late antiquity from the Roman city and the household to the church and monastic space. A sixth-century contract from Oxyrhynchus attests the lease of a bakery located in a monastery by a noble woman named Serena to two “bakers and master-millers.”³³ The contract indicates that the bakery contained three ovens and two millstones. Three ovens could be interpreted as large-scale production, but we do not know their size and the facilities at both Augusta Raurica and Cosa contained more than one small oven. It also seems unlikely that the bakery’s production – and thus also profits – were relatively high considering that the miller-bakers paid their rent – at least in part – with eggs and chickens.

In conclusion, if we set aside the evidence (both archaeological and juridical) from Rome and Ostia as unique and not representative of the western Mediterranean region at large, and focus instead on the evidence from other sites, we see a less dramatic difference, even including Pompeii as just another typical Roman town. Where the evi-

dence from Ostia and Rome served to highlight the challenges of late antiquity and the early Middle Ages, average oven diameters by century, excluding the exceptional data from Ostia, suggest a more gradual decline and greater continuity albeit with qualitatively worse construction leading into the fifth and sixth centuries. Finally, we also see a transition occurring in the sixth century with baking shifting from cities and houses to churches and monasteries. Such a transition remains evident in the Middle Ages for which we have ample evidence of baking in monastic settings such as the bakeries on the plan of St. Gall. Admittedly, the evidence is sparse and sometimes difficult to interpret, but my hope is to offer a narrative that better represents the evidence of a broader geographical area and also challenges the view that the existence of specialization and specialists (such as bakers) only exacerbated collapse. In fact, the evidence presented here underscores some continuity from Antiquity to the Middle Ages, even as fundamental shifts were underway.

Notes

¹ Schneider 2007, 169.

² Hawkins 2016, 93.

³ Broekaert – Zuiderhoek 2013, 323; Mauné et al. 2013; Bustamante Álvarez et al. 2014, 15–19.

⁴ Ward Perkins 2005, 102–121.

⁵ Flohr 2013; Monteix 2016; Murphy 2016; Ellis 2018.

⁶ Reith 2008, 128.

⁷ Rickman 1980; Garnsey 1989; Sirks 1991; Erdkamp 2005.

⁸ Erdkamp 2005, 252.

⁹ Sirks 1991, 406.

¹⁰ The letter mentioned in FV 233 is to Sulpicius Similis, who ceased to be Prefect of the Annona in 107 AD. D'Escurac 1976, 334. Sirks 1991, 315.

¹¹ Aurelius Victor *de Caes.* 13.5.

¹² Trans. Bird 1994, 15.

¹³ A precedent for Trajan's concession occurred during the principate of Claudius, who gave concessions to those who built merchant ships (*naves mercaturae*), each according to their status. He gave Roman citizens a *vacatio* from the *lex Papia Poppaea*, which prevented low-born Roman citizens from marrying into the Senate or equites. Claudius gave to Junian Latins protection under the *ius Quiritium*, the law protecting the rights of citizens. And to women, reprieve from the *ius quattuor liberorum*. Suetonius, *De Claris Rhetoribus*, 18.4,19.

¹⁴ Gaius Inst. 1.34.

¹⁵ Trans. Poste 1894, 52.

¹⁶ Frag. Vat. 233.

¹⁷ Trans. Sirks 1991, 315 with the exception of *centenarium*, which was translated separately by author.

¹⁸ This interpretation predates Sirks' translation.

¹⁹ FV 234 and FV 235. The fragment records that Trajan's concessions concerning guardianship did not extend to the *collegium pistorum* at Ostia. Yet Sirks notes that fragment 234 is conspicuously positioned between Trajan's allowance and Caracalla's limitation of it. Sirks 1991, 6.58.305.

²⁰ Watson 1985, 138–39.

²¹ Socrates HE 5.18.

²² McGinn 2004, 28–29; also Bond 2016, 145; makes the case that mills were places impugned as places of prostitution because they were places where the sexes met. This is largely constructed from the sixth century passage from the HE and from Plautus' third-century use of the word *alicariae*, mill-girls, to refer to a specific group of prostitutes.

²³ Garnsey 1999.

²⁴ Mouritsen 2011, 281.

²⁵ Bakker 1999.

²⁶ Mayer 2014, 25.

²⁷ Ward Perkins 2005, 102–121.

²⁸ Bowman – Wilson 2009.

²⁹ The ovens also have interesting lines clearly worn into the stones that form the base of the oven dome. Bakker hypothesizes that a sort of turn wheel might have made the wear marks, but they exist at two levels and all of the ovens are ovoid, making it impossible for the ovens to have an internal rotation element. I hypothesize that the wear marks were actually made by trays which were inserted and manipulated by long poles. The Caseggiato dei Molini has cavities in the wall behind the oven, which Bakker identified as vents or for the passage of goods, which may be true, but the space is too narrow for poles to be used unless there was a way to extend them through the wall behind the oven operator and the apertures in the wall are angled to aim at the oven. Such sophistication in technology and procedure indicates the extent to which desire for increased productivity was driving innovation in these areas.

³⁰ Humphrey 2006; Schneider 2007; Cuomo 2007.

³¹ Leduc 2008; Leduc 2011; Benton 2020.

³² Ammann et al. 2011, 275–318.

³³ P.Oxy. 1890.

Image Credits

Fig. 1: Bakker 1999, fig. 19. – Fig. 2, 3: by author – Fig. 4: Fentress 2003, fig. 27.

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