



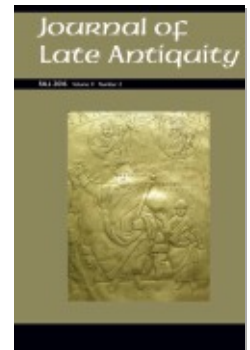
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Capital in the Sixth Century: The Dynamics of Tax and Estate in Roman Egypt

Gilles Bransbourg

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Capital in the Sixth Century: The Dynamics of Tax and Estate in Roman Egypt

The Dioscorus and the Apion dossiers represent a unique opportunity to bring quantitative methods into the study of ancient economies. With a combined total of more than a thousand chronologically overlapping documents from two different Egyptian nomes, many of these account logs, the material from these two dossiers sheds light on the micro-economic situation of large and small estates in late antique Egypt. This paper uses many of these accounts—including some still unpublished—in order to reach estimates of the available agricultural surplus, its distribution between tenants, owners and state, the level of economic rationality undergirding economic choices by large and small owners, and the evolution of the imperial taxation policy at a period when Justinian was working to win back the lost western provinces for the Roman realm. The traditional assumption that the grands domaines grew at the expense of the smaller landowners in this period is drawn into question, and the argument is made that large and small properties display complementary rather than antagonistic economic relationships. Close examination of the documents also provides an image of the ancient economy that contradicts familiar assumptions of stability: taxation evolved in response to political and military necessities, and economic actors had to adapt in order to thrive or at least survive in times of fiscal crisis. The article also provides a sense of provincial unity and of a surprisingly equitable and efficient implementation of tax processing in Egypt.

I wish to thank Jean-Michel Carrié, who first made me aware of the precious value of Egyptian papyri for the history of Antiquity. I am also indebted to Roger Bagnall, Jean-Luc Fournet, and Todd Hickey, who showed much patience dealing with the innumerable and often naïve questions of a non-papyrologist as I was putting the pieces of this paper together. Jean-Luc put at my disposal some of his unpublished and precious materials. Florence Lemaire agreed to share a chapter entitled “La location agricole à Aphrodité. Spécificités du terrain et modalités du bail” from her recently defended dissertation. It will be referred to as Lemaire forthcoming. I am grateful for her expertise on these mostly unpublished Coptic leases from Aphrodito. So also to Lorelei Vanderheyden, who shared some unpublished Coptic documents from her doctoral dissertation in progress. Above all, I must thank Jean Gasco and, once more, Roger Bagnall, who read, reviewed, and commented on a first draft. Noel Lenski provided many encouragements, and suggested significant improvements from the initial versions that were presented to him. Any mistake or inaccuracies are obviously my own. Finally, I am grateful to Dioscorus of Aphrodito and the many middle-managers who ran the Apiones estate and kept written records of their work.

Introduction

Thomas Piketty's *Le Capital au 21^e siècle* made two very powerful statements. The first concerns a long term rise of inequality since the last quarter of the twentieth century, which is built on an underlying divergence between the capital rate of return and GDP growth. As long as capital returns exceed economic growth, inequality can only rise. Beyond being morally wrong, this threatens a society's inner cohesion. The second is that history provides relevant points of comparison. To that effect, the twenty-first-century's statistics were compared to capital and income distribution in eighteenth- and nineteenth-century France and England.

Although late medieval and early modern Europe still provide many relevant, if less comprehensive, economic figures, Antiquity is not so generous with numbers. Unlike Japan or China, where some archives from their earlier imperial periods have partially survived, the collapse of the Roman Empire led to the almost complete destruction of its non-literary documentary evidence. Most of what survives from the ancient economy consists of incomplete, unrelated, and scattered epigraphic, numismatic and papyrological fragments. And, as ancient historians have come to expect, gaps often obliterate part or all of the figures from the original documentation, as if some malignant god had wished to ensure that we should never know too much—a good example being the fourth-century tax edict of the emperor Valens, in which we hear about income sharing between the imperial state and cities of revenues from public land in great detail, with the only missing piece being precisely the most crucial—what the actual amount was.¹

Egypt in the sixth century represents an exception, possibly the only one in Mediterranean Antiquity. Two almost exactly contemporary archives from discreet local contexts separated by little more than two hundred kilometers offer deep insights into the financial relationships linking state officials, large landowners, and small farmers in the fifth and sixth century and particularly between the 520s and the 580s CE. On the one hand, we have access to a range of major public accounting and registration documents originating from Aphrodito (Kôm Ishqaw) in the Antaeopolite nome, north of the Thebaid. Most of these were found within the private archives of Dioscorus, a local landowner with official responsibilities. On the other hand, hundreds of private accounting documents that once belonged to the archives of a senatorial family, the Apiones, have been recovered, mainly from the Oxyrhynchite in northern Middle Egypt. The first dossier speaks mostly to taxation and

¹ Chastagnol 1986, with AE 1906, 30 = FIRA 12: 108 = *Die Inschriften von Ephesos* 1: 42, at line 15: VI[. . .]*solidorum*.

small farmers. The second to taxation, rents, and a large estate. Both overlap chronologically for the most part and represent a unique opportunity in the sense that cross-referencing them allows us to reconstruct the most complete picture of economic and social relations one can dream of for this period, especially because they also put us in a position to compare the economics of small landowners and large estates.

Based on this evidence, this study addresses the question of income distribution, tax equality, and economic growth in late-antique Egypt and—insofar as two Egyptian regions can be seen as representative of wider trends—Late Antiquity more generally.

PART I: THE SOURCES

The Documentary Corpus and the Issues at Stake

Dioscorus of Aphrodito's archives, discovered for the most part in 1905, incorporate about 650 texts in Greek and Coptic, including an administrative corpus linked to Aphrodito's fiscal management in the period between 520 and 570. The village enjoyed fiscal autonomy at the beginning of the period, before reporting directly to Antaeopolis, the capital of its nome. A tax register dating from the fiscal year 525/526 with more than 600 individual entries and tax liabilities represents its masterpiece.

Among the main studies, Johnson and West and then Jones commented on the available Antaeopolite tax evidence; Rémondon used Dioscorus's archives, complemented by later texts, to build a general narrative emphasizing a cycle of tax increases that took place during the reign of Justinian and worsened in the early Arab period; Gascou, working with MacCoull, published Aphrodito's cadaster and then Gascou analyzed Antaeopolis's budgetary table; Zuckerman conducted a comprehensive taxation analysis through the Aphrodito "register," which has become a cornerstone for any study of late Roman taxation. More recently, Fournet has undertaken a partial new edition of Dioscorus's archives, bringing much needed revisions to many crucial texts.² All these works converge around a single dynamic reality: tax proceeds rose and fell, and various actors competed in order to capture a share of the available agricultural surplus. Although villagers claimed to suffer under increased tax-related hardship, the documentation displays a dynamic community where

² Johnson and West 1949, 275–285; Jones 1951; Rémondon 1965; Gascou 2008, 247–306 (updated version of Gascou and MacCoull 1987, 103–58) and 309–50 (1989, 279–313); 1990, 97–101; Zuckerman 2004; Fournet forthcoming. More generally on Dioscorus at MacCoull 1988. Further references to Gascou's works revised in the 2008 publication will use only this most recent reference. Details about original editions are provided by his bibliographic section.

“middle-class” landowners, artisans, merchants, and priests (sometimes in charge of official functions locally) wrote, complained, rented, lent, and spoke about their lives.

The Apiones dossier offers a completely unique documentary ensemble, stretching across at least six generations of one single family who reached consular rank in 539. With over 400 distinct papyri and further attestations in literary, epigraphic, and legal sources, it deals with the family’s estate business through detailed partial accounts. The period covered extends from 439 until 653 with a concentration between 530 and 610.³

These extraordinary documentary survivals have been used to support the traditional narrative that Late Antiquity witnessed the expansion of large landowners at the expense of small farmers. Comparing the grain tax rate in Antaeopolis with a grain tax contribution by the Apiones, Jones suggested that the Apiones would have owned more than one third of the Oxyrhynchite nome, in addition to vast and little-documented properties extending over other regions of Egypt and as far as Sicily. At the same time, so Jones, they benefitted from a weakening of the imperial state by inheriting its powers over taxation and law enforcement over a labor force tied to the land as *coloni adscripticii* and reduced to a quasi-slavery status. The Apiones, capable of generating significant gold surpluses through the rational organization of their estates and of reaching the highest levels of honor and power at the expense of tens of thousands of bound tenants, are taken to have been emblematic of the feudalization that led the Eastern Roman Empire to its final disaster. This same thesis has been advocated more recently by Sarris. For his part, Gascou famously changed the terms of the debate by arguing for a system of shared fiscal responsibility in which the payments processed by the Apiones agglomerated taxes owed by third parties, indicating that the border between tax and rent was fundamentally blurred—an approach already postulated by Johnson and West. Gascou’s analysis fundamentally reduced our estimates of the size of the Apiones’ estates while recasting regular farmers’ social status and wealth in a more positive light. Gascou’s thesis has been supported by Hickey’s economic analysis and numerical assumptions with respect to the Apiones’ economic and financial equations. More recently, McConnell has built on that model, suggesting that the Apiones made a significant share of their money as tax farmers.⁴

What has never yet been attempted is the establishment of a systematic numerical and quantitative relationships between the Antaeopolis–Aphrodito

³ Many of the Apiones papyri belong to the *P. Oxy.* series, although not exclusively. The main reference for the archive in general is Mazza 2001.

⁴ Hardy 1931; Jones 1986 (1964), 784; Sarris 2006; Johnson and West 1949, 50–55 and 273–274; Gascou 2008, 125–214 (1985, 1–90); Hickey 2001 and 2012a; McConnell 2013.

and the Apiones dossiers at both a micro- and macro-level. The potential value of such an approach seems obvious. The Aphrodito material mostly deals with small owners and their individual taxation, while providing one more comprehensive tax account from the nome's capital. The Apiones' land managers were essentially concerned with cash flows, offering limited insights into individual farmers' economic surplus or productivity, especially if we assume that rent rolls had come to replace lease agreements.⁵ At the same time, some more general tax accounts are available, offering an opportunity paralleled only in the Antaeopolite—linking micro and macro-level accounts together and trying to establish common rules between both sources. Since tax yields are available in the Antaeopolite but not within the Apiones' documentation, the only way to put both datasets to work to derive a comprehensive picture of revenues and tax rates is to use the yields from the former to cross-check existing models of the Apiones' estate size, tax liability, and overall profitability. Once this is achieved, the results can be reciprocally compared to what is available with respect to the smaller farmers of Aphrodito. With these numbers on hand, we will then be in a position to offer an assessment of the level of tax privileges enjoyed by the landed aristocracy—provided Aphrodito on the one hand and the Apiones on the other were representative of their respective social categories.

This paper mostly deals with numbers. But there is no such thing as fully accurate ancient records. Moreover, ancient accounting practices did not aim at extracting profitability in a modern fashion. They contended with the production of cash accounts, where positive and negative cash flows were listed in non-analytical fashion, mixing together various expenses, charitable donations, wages and investment-related outflows without any perception that the latter should be amortized. Reaching levels of pre- and post-tax profitability is not made easier by a logic that ignores the very notion of return on capital. In order to reach results, simplifying and normative hypotheses have to be decided upon and followed in a fashion strictly consistent across computations and models. In the process, some degree of inaccuracy has to be assumed, although errors should not prove cumulative as they tend to be mutually uncorrelated.

Most of the projected numbers converge towards orders of magnitude that display remarkable consistency, especially when so many of the different sources are independent from one another. But none of the projected figures made available in this work should be taken as definitive: they are and remain

⁵ Implying a higher degree of standardization, unless individual leases were kept locally and not retrieved, see McConnell 2013, 28–29, from Mazza 2001, 106–10 and Rowlandson 1994, 498–499.

calculated orders of magnitude. Numerical models are genuine and begin from raw materials. I did not use desirable outcomes in order to influence input factors retroactively. As a comprehensive picture started to emerge and converge, I was not the least surprised by what some of those numbers were telling. With an initial academic background in mathematics, I could genuinely enjoy these rare and precious moments that occur when equations using diverse and scattered datasets start to deliver something that looks like a coherent landscape.

The Main Sources

The following section offers a list of the most important papyri that will be used throughout this study, with a brief outline and some of the key relevant references.

P.Cair. Masp. 1: 67057 and P. Freer 08–45 c–d = SB 20: 14494 (ca. 550 and 546/548): the Antaeopolite tax schedule and budgetary table.⁶

P.Cair. Masp. 1: 67057 offers an overall picture of Antaeopolis's tax liability, possibly in 550/551. The grain tax (*embolē*) is assessed at 61,674 artabas for a total area of 51,665 arouras, although the actual levy reaches 62,433 artabas, with a difference of 759 artabas (col. iii l.7), implying a composite *embolē* rate between 1.1937 and 1.2084 artabas per aroura.⁷ Lands are assessed with individual tax rates according to their tax category.

P.Cair. Masp. 1: 67057 also reports the military *annona* with its usual components: grain (wheat and barley), meat, wine, and chaff. These contributions were provided to its beneficiaries according to the *annona* and *capita* system, the various quantities of produce being often converted (adaerated) into gold in keeping with official conversion rates.⁸ The tax account indicates that 6,729 artabas of wheat and 40,819 *modii* of barley were levied at their adaerated price in gold (col. iii ll. 8 and 11) as part of the overall amount of the *annona*—6,072 *solidi* 21 carats (col. i ll. 6–7). Using a 1.5 wheat/barley price ratio (as per Bagnall) suggests a consolidated 1.75 artabas/aroura overall grain levy, which was partially paid in gold as regards the *annona*-related proportion. This figure can be lowered to 1.55 artabas/aroura by using the larger 3 3/11 per artaba *modius castrensis* advocated by Gascou in the context of

⁶ Johnson and West 1949, 275–285; Gascou 2008, 309–349; Zuckerman 2004, 52–56. Zuckerman 2004, 54–56 dates *P.Cair. Masp. 1: 67057* to shortly after 550, while Gascou 2008, 316–319 leaves open the possibility of a dating earlier by an entire indiction cycle of 15 years.

⁷ For measurement units most commonly used in Greco–Roman Egypt see Bagnall 2009, 185–89. The aroura measured a little over 0.25 hectare and the most commonly used artaba reached 38.8 liters, although different artabas could be used in specific contexts.

⁸ Jones 1986 (1964), 447, 460–61, 626–30; Mitthof 2001, especially 240–43 and 262–65.

Table 1. Grain Tax (*embolē*) in Antaeopolis

<i>Land Type</i>	<i>Arable</i>	<i>Islands</i>	<i>Reed</i>		<i>Vineyards</i>	<i>Gardens</i>	
			<i>Marshes</i>				
Area (arouras)	40,403	6,873	200		2,578 1/2	1,600	51,654.5
Tax rate (artaba/aroura)	1 1/4	1 1/2	23/40		7/12	0	
Total <i>embolē</i> (artabas)	50,503 3/4	10,310 1/4	115		1,504	0	62,433

Source: *P.Cair. Masp.* 1: 67057.

Note: “Islands” (*nēsoi*) represent a land category created by the progressive accumulation of silt carried by the river, eventually linking with the riverbanks. A land category in its own right here, it is merged within the arable land category in Aphrodito; cf. Gascou 2008, 259; Zuckerman 2004, 119.

sixth-century Egyptian fiscal accounts instead of the more traditional 4.5 per artaba *modius italicus*.⁹ Finally, the comparison with the amounts of food staples displayed by *P. Cair. Masp.* 1: 67057, col. iii, ll. 8–12, and by the earlier *P. Freer* 08–45 c–d = SB 20: 14494, with its contributions in wheat, barley, wine, chaff, and meat, should theoretically lead to the official conversion ratios between these staples and gold. Unfortunately, as pointed out by Gascou, there are just too many degrees of freedom with these factors, with no firm and complete contemporary evidence regarding their prices.¹⁰ Finally *P. Cair. Masp.* 1: 67057, col. i, provides gold levies under the fiscal title *kanonika* amounting to 3,707 *solidi* 14 carats together with 641 *solidi* 7.5 carats of gratuities and payments to officials.

Some of these annona levies have been considered unusually high and were thus thought to be related to an extraordinary level connected with military activity.¹¹ The actual gold tax rate, obtained by adding all the amounts paid in gold and dividing by the stated area in arouras, stands at 0.2017 *solidus*/aroura, equivalent to 4.84 carats/aroura with a *solidus* of 24 carats.¹² Then the consolidated extraction rate in grain and gold, once converted to its gold value, equalled 7 2/3 carats/aroura.¹³

⁹ Bagnall 1985, 289–308; Gascou 2008, 320–321.

¹⁰ Gascou 2008, 333–34 with n. 97 and 98; Zuckerman 2004, 143–178.

¹¹ Johnson and West 1949, 276 and Jones 1951, 272.

¹² Annona (= 6,072.875) + *kanonika* (= 3,707.58) + gratuities (= 641.31) = 10,421.77 *solidi*. Total area: 51,654.5 arouras (above Table 1, adding the areas in l. 2). 10,421.77/51,654.5 = 0.2018 *solidus*/aroura = 4.84 carats/aroura.

¹³ Jones 1986 (1964), 820. The composite grain tax yield, ca. 1.20 artabas/aroura, adds a little under 3 carats/aroura with the *solidus* worth about 10 artabas.

P.Mich. Inv. 335v = *SB* 14: 12208 and *P.Cair. Isid.* 11 (early to mid-fourth century): land tax paid in grain in the Oxyrhynchite and Arsinoite nomes respectively.

These two papyri lead to a 1.55–1.60 artabas/aroura composite weighted average yield for the grain tax. At the same time, we learn that the Oxyrhynchite nome included 202,534 arouras of land sown under grain in the mid-fourth century, including 163,687 arouras of private land of which 3,073 were orchards and vineyards converted into grain and *arakos* (a kind of flat bean).¹⁴ This could be compared to Bagnall's overall estimate of the nome's total area, 283,140 arouras. The neighboring Cynopolite nome had lost its west bank territory to the Hermopolite and Oxyrhynchite and would have retained 39,930 arouras in total by that time. Using a similar ratio of cultivated lands to total land area would thus imply 28,562 arouras under grain for the Cynopolite.¹⁵

P.Flor. 3: 297, 298a, b and f, *P.Stras.* 699, inv. 1595, inv. 1596 = *P.Aphrod. Reg.* (Aphrodito tax register); *P.Lond.* 5: 1663, 1674, 1670, 1679; *P.Hamb.* 1: 56; *P.Flor.* 3: 292, 293; *P.Cair. Masp.* 67019, 67280, 67287, 67030, 67058, 67056, 67030, 67320, 67321, 67002; *P.Erl.* 41; *P.Ross. Georg* 5: 62 (between 525 and 568): a tax register listing the properties falling under the village (*kōmētika*) category, with their owners and their gold tax liability, as well as a final synthesis, plus additional papyri dealing with various aspects of Aphrodito's taxation in wheat and gold for different years within this period.¹⁶

The *embolē* paid by the village fluctuates between 4,880 and 6,100 artabas between the years 538 and 546, with an average of 5,525 artabas. With a combined 4,435.5 arouras of arable, vineyards, and garden land, the composite yield stands at 1.25 artabas/aroura. If the 508.75 artabas of garden lands are excluded, since they do not pay grain tax in *P.Cair. Masp.* 1: 67057, we obtain 1.41—Zuckerman's figure is 1.59, but he uses the *embolē*'s highest reading and does not take into account the vineyards.¹⁷ These numbers are not far different from the results obtained in the Oxyrhynchite and the Arsinoite. With respect to the gold tax, it would have been assessed at a rate

¹⁴ Youtie 1978; Bagnall and Worp 1980; Bagnall 1977, 330, n. 1; Bagnall 1985, 301. On *arakos*, see Bagnall 1993a, 26, nn. 68–69.

¹⁵ Bagnall 1993a, 334–335, and n. 3 for the Cynopolite's much reduced area, based upon Butzer 1976, 74, Drew-Bear 1979 and Pruneti 1981; cf. Hickey 2008, 91, n. 21.

¹⁶ Zuckerman 2004, 115–22, 185–93, 213–19, 247–67.

¹⁷ Zuckerman 2004, 193 and 215.

of 2 carats/aroura on arable land and 8 carats/aroura of vineyard in the public standard at the beginning of the observation period around 525. By 568, the respective tax rates would have reached 4 and 23 carats respectively, two additional levies adding another of 2.5 carats.¹⁸ Unfortunately, it cannot be systematically cross-checked with the Aphrodito cadaster for the tax yields of individual properties since the cadaster deals only with *astika* properties (the lands that settled their fiscal debt through the city of Antaeopolis rather than through Aphrodito).¹⁹

P.Oxy. 1: 127 (late sixth-century): list of payments collected by the Oxyrhynchite and Cynopolite branch of the Apiones estates.

The quantity of grain collected for the *embole* by the glorious house (*endoxos oikos*, the common designation for the the Apiones' estate) stands at 87,818.5 artabas on its Oxyrhynchus branch and 52,800 at least (last two numerals are missing) in Cynopolis. As a result, the total *embole* reached a minimum of 140,618.5 artabas. Some payments in gold appear as well.²⁰

P.Oxy. 16: 2026 (early sixth-century): *embole* from an estate where a Christodora of Cynopolis held a third interest.

The entire property contributes a grand total of 41,170 artabas, of which 4,849 belong to a fifteenth indiction, 9,930 to the current first indiction, and 20,248 artabas are used as an advance on the approaching second indiction.²¹

P.Oxy. 16: 1909 (late sixth-century): assessment of the gold owned for taxation purposes by the combined Oxyrhynchite/Cynopolite nomes, the Herakleopolite nome, a fragment dealing with the Nilopolite nome.

The Oxyrhynchite/Cynopolite contributes a gold tax of 24,500 *solidi*, the grain tax (*embole*) of 350,000 artabas being adaeerated into gold at a rate of 10 artabas per *solidus*, leading to a grand total of 59,500 *solidi*. The adaeeration of grain into gold should be linked to the reign of Maurice.²²

¹⁸ Zuckerman 2004, 120–22.

¹⁹ Gasco 2008, 257–58.

²⁰ Johnson and West 1949, 274; Hickey 1998, 161 and 2008, 90.

²¹ Johnson and West 1949, 55–56, 244–45 and 272–73. There are 15 annual indictions in a tax cycle, starting each July 1 since the later fourth century. This is when the tax schedules defined by the annual *delegatio* are sent to the local authorities; see Bagnall and Worp 2004, 22–35.

²² Johnson and West 1949, 286–87; Gasco 2008, 133, n. 49; Banaji 2001, 65; Zuckerman 2004, 217; Hickey 2008, 94–95.

P.Oxy. 16: 2040 (566/567): list of contributions for a public bath at Oxyrhynchus and at the village of Takona.

The Apiones contribute 25% of the total, or 30% once Takona is added. This could be compared potentially to *P.Mich.* 15: 737, a late fifth-century list of gold contributions whose purpose is missing, where a Strategios pays 22% of the overall payment.²³ Gascou has pointed to several sixth-century contributions where the Apiones seem invariably to be assessed at a rate of about 1/3 of the overall figure.²⁴

P.Oxy. 16: 1918v (ca. 542): accounts of receipts and tax expenditures in gold from the Oxyrhynchite and Cynopolite branch of the Apiones estate.²⁵

The supervisors (*pronoētai*) of the Apiones' estates collected 14,325 9/48 *solidi* on the Alexandrian standard as well as 5,685 43/96 *solidi* from the "other villages."²⁶ The gold expenses (*analōmata*) stood at 6,917 35/48 *solidi*, most likely a gold tax payment. On first reading it might seem that the Apiones had collected 20,010 *solidi* in rents (14,325 + 5,685) and paid 6,917 as tax.²⁷ Building on the later *P.Oxy.* 18: 2196v and Gascou's analysis in *Les grands domaines*, Hickey suggests a different arrangement: the Apiones, as part of their fiscal responsibility, collected the gold tax from villages with which the estate had little interaction, acting as simple intermediaries in that function,

²³ Alston 2002, 315, tab. 5.12; Hickey 2007, 296–97, fig. 14.3; Gonis 2002 and Sarris 2006, 85. The Apiones' share stands much lower in the adaerated barley-related contribution list *P.Oxy.* 16: 2020 (580s), where they acted on behalf of another much smaller tax payer: Gascou 1972, 250–52; 2008, 170–71.

²⁴ Gascou 2008, 168–69, with *P.Oxy.* 16: 2039, 2040, 1921 and 1909.

²⁵ Gascou 1972, 243–45; Hickey 2008.

²⁶ The issue of the gold standards used in these papyri—notably pure gold (*obryza*), public, private, and Alexandrian standards—has been interpreted either as the result of using light or worn *solidi* or as a combination of fees, conversion, weighing and transportation charges applied to payments accounted in various qualities of gold coins, or delivered effectively in bronze currency. Some of the attested ratios between the Alexandrian and public standards are 93/92, 130/129, 447/444, 145/144 (equivalent to adding 1/6 carat per *solidus*): see notably *P.Oxy.* 1: 154; 55: 3805; 67: 4930, and their editors' comments. In *P.Oxy.* 1: 126, a public standard *solidus* (=24 carats) is equated with 22.5 carats of pure (*obryza*) gold, implying a 6.25% discount between the two standards. In *P.Oxy.* 1: 144, 45 *solidi* need to be added to 720 *solidi* Alexandrian standard to reach pure gold standard, a 6.25% discount as well (Johnson and West 1949, 274 n. 22 and 287 n. 25; Hendy 1985, 351; Zuckerman 2004, 113). In *P.Oxy.* 16: 1907, 735 *solidi* 6 carats Alexandrian standard are worth 692 *solidi obryza*, a 5.88% discount and 6.25% premium. For further considerations at Carlà 2009, 220–33 and 367–90; Banaji 1998; Bogaert 1997, 129–32; Maresch 1994; Carrié 1980; West and Johnson 1944, 132–3 and 140–56.

²⁷ Banaji 2001, 223 table 2.

while they received gold gross income from their own estates, incorporating the tax component. In that case, the Apiones had to render as tax 48.3% of the gross rents they collected (6,917 out of 14,325 *solidi*) instead of a fiscal ratio of 34.6%.²⁸ Further complicating matters, properties that did not belong to the Apiones were incorporated into the rents collected by the *pronoētai*.²⁹ In these cases, the payments would fulfil fiscal obligations rather than rents. The difference between the category “other villages” and the districts under direct oversight of the Apiones’ estate managers would have been the latter’s much higher degree of integration within the Apiones’ lands.

P.Oxy. 18: 2196v (ca. 586–587): accounts of receipts and expenditures in gold and grain of the Apiones estate: “one of the most important papyri in the Apion dossier.”³⁰

The first section of the document provides a breakdown of wheat receivables at the level of the overall estate: 108,816.5 artabas (*choinikes* lost) from the lands under direct management by Apiones’ overseers and at least 53,000 artabas (last three digits lost) from the “villages.”³¹ The grand total, 162,213 artabas (fractions and *choinikes* lost) imply between 53,490 and 53,500 artabas from the villages. The reason behind these accounts has to be tax-related, the Apiones being responsible for the *embole* collection over lands some of which they did not own. These grain figures would represent gross receipts as no grain payment from the estate’s *pronoētai* to central estate managers is recorded, and *embole* payments are handled locally.³²

Hickey implicitly assumes the account covers both the Oxyrhynchite and Cynopolite nomes (although the papyrus does not say so), given that he subtracts the villages’ subtotals in *P.Oxy. 18: 2196v* (rounded to 53,000 artabas) from *P.Oxy. 1: 127* (140,618 artabas from both nomes) in order to reach an estimate of what the *oikos*’s direct tax liability in grain might have amounted to—108,816.5 artabas.³³ This seems like a solid assumption, as a consolida-

²⁸ Fiscal ratios close to 50% are reported for some sixth and seventh-century large estates in Byzantine Italy; see *P.Marini* 87 = *P.Tjäd.* 2 and *Liber Pontificalis Ecclesiae Ravennatis* 111.

²⁹ Hickey 2008, 89, n. 9. *Les grands domaines* refers to Gascoü 2008, 125–213.

³⁰ Hickey 2008, 88.

³¹ The actual figures may represent ideal targets rather than actual amounts with their annual variations: Hickey 2008, 90, n. 12; Mazza 1998, 169.

³² Grain is never sent to a higher administrative level within the *oikos*’s structure: McConnell 2013, 54–57 and Hickey 2008, 90 with nn. 13–14, 94. Local accounts are summarized in Banaji 2001, 223, tab. 2; see also McConnell 2013, 77, tab. 1.

³³ Hickey 2008, 90.

tion between both nomes is found often in the Apiones' accounting practices. Moreover, if the 53,000 artabas had concerned only the Oxyrhynchite, they would have represented over 60% of the 87,818.5 artabas controlled by the Apiones for the Oxyrhynchite in *P.Oxy.* 1: 127. This seems very high, leaving the Apiones with less than 35,000 artabas as their direct *embolē* contribution. Having received 108,816.5 artabas from the non-villages accounts, they would have kept a very significant grain surplus, something none of the surviving accounts indicates.³⁴

Based on receipts of 108,816.5 artabas, an average yield in grain of 10–12 artabas/aroura, and 50% of the production being retained under share cropping agreements. Hickey arrives at a range of 18,000–22,000 arouras as an estimate for the Apiones' properties in both nomes.³⁵ This would confirm his previous low assessment of about 21,000 arouras, mostly achieved through calculations based on the size of their vineyards.³⁶ Jones's estimate, obtained by assuming *P.Oxy.* 1: 127 involved only properties belonging directly to the Apiones, calculated 112,000 arouras. He had used the total *embolē* figure from *P.Oxy.* 1: 127, 140,000 artabas, and divided it by the 1.25 artabas/aroura tax rate from *P.Cair. Masp.* 1: 67057.³⁷

The second section of *P.Oxy.* 18: 2196v provides us with the gold receipts from the villages, for a total in the range of 5,527–6,526 *solidi* (with variation based on the possible values of one lacunose line). The third section deals with the actual gold receivables of the Apiones estates (as stated above, incorporating some lands not belonging to the Apiones): 18,512 *solidi* 191.75 carats = 18,519.99 *solidi*. The fourth section concerns money expenses, i.e., tax payments, for a total of 13,541.875 *solidi*, most likely on the Alexandrian standard, as is the case with the other numbers. This fits with the tax valuation expressed as 12,694 *solidi* (ll. 3), to which charges of 822.64 and 25.64 *solidi* (ll. 2 and 5) are added. As $12,694/13,541 = 0.9375$, this ratio is compatible with the aggregated 6.25% (= 1.5 carats per *solidus*) fee charged for the conversion from the imperial into the Alexandrian standard often displayed in sixth-century accounts related to the Apiones.³⁸

³⁴ In local accounts, between 80% and 100% of all the grain receipts are used towards the *embolē*; see Banaji 2001, 223, tab. 2. Gascou 1972, 247 had initially considered *P.Oxy.* 18: 2196v as an Oxyrhynchite-only account.

³⁵ Hickey 2008, 90–91 and 98, n. 48.

³⁶ Hickey, 2001, 70–74. The same argument is summarized and refined Hickey 2012a, 153–55.

³⁷ Jones 1986 (1964), 784. This view is fundamentally upheld by Sarris 2006, 83–85.

³⁸ Hickey 2008, 94 n. 31; Zuckerman 2004, 113–14; Henny, 1985, 346–53. See also n. 26 above. In order to standardize future computations involving Alexandrian *solidi*, we will convert them into pure (*obryza*) imperial *solidi* by applying a 6.25% discount. When we use the term *solidus* without any mention of the standard, it should be taken to mean imperial *solidus*.

Table 2. Size of the Apiones' Estate according to Jones and Hickey

	<i>Total embolē (artabas)</i>	<i>Villages' contribution (artabas)</i>	<i>Apiones' share (artabas)</i>	<i>Resp. Tax rate, Rent rate (artabas/ aroura)</i>	<i>Crop sharing</i>	<i>Apiones estate (arouras)</i>
Jones 1964	140,618			1.25		112,494
Hickey 2008 ^a	140,618	53,000	87,618	10	50%	19,471
	Apiones' lands under vines (arouras)			Average proportion of vineyards in Egypt		
Hickey 2001 and 2012a	600			2.80%		21,429

Source: Jones 1964, Hickey 2008; 2001 and 2012a.

^aHickey 2008 deals with the Apiones' arable lands only, hence the lower figure.

PART TWO. SIXTH-CENTURY TAXATION IN THE ANTAEOPOLITE—AND POSSIBLY ELSEWHERE IN EGYPT

The Structure of Sixth-Century Taxation

Ancient polities had the choice of levying taxes in various staples—among which grain or human labor—and money, whether in the form of coin or precious metals. The Tetrarchic reform in the early fourth-century CE brought a degree of standardization to Roman taxation practice, with various levies being tarified in wheat, barley, chaff, wine, military equipment, recruits, horses, etc., based on a tax schedule incorporating measures of land and labor. Most of them could be converted to cash (*adaeratio*) according to local and regional needs, with tariffs denominated in current currency units (*denarii*) or quantities of gold and silver. Annonarial levies—food supplies for the capitals, the army, or the bureaucracy, tended to be managed by the prefectural authorities, whether in kind or adaerated—while the non-alimentary military-related dues, again adaerated or not, fell under the responsibility of the *comes sacrarum largitionum* (CSL).³⁹ As gold came to occupy a preeminent monetary role from the mid-fourth century onward, more and more levies tended to be effectively reckoned in that medium. *P.Oxy.* 16: 1905, a tax assessment dated 356/357 or 371/372, testifies to that shift as it provides

³⁹ Delmaire 1989, 3–23.

tariffs for a range of levies like the tax on recruits, on army horses, some transportation costs, etc. With the exception of four relatively minor taxes tariffed in current *denarii*, all other cash requirements involved gold. Carrié suggested that gold taxes amounted to 2 pounds of gold per *capitulum* of 2,000 or 3,000 arouras at that time, in Egypt and potentially Empire-wide.⁴⁰ As the grain *embolē*, providing for the free distributions of bread in Rome and then Constantinople, amounted to between 1.20 and 1.5 artabas/aroura, that is, between *ca.* 3 and 6 pounds of gold per *capitulum*, cash payments would have amounted to around one-third of the overall tax burden in the later fourth century, at least in Egypt.⁴¹

When we reach the sixth century, most non-*embolē* levies were adaerated into their gold equivalent more often than not.⁴² A tax account like *P.Cair. Masp.* 1: 67057 provides 1,737 *solidi* under the *tituli largitionales* and 6,072 *solidi* for the military annona in lieu of commodities. In 533, Justinianopolis in Caria won an exemption from a tax burden of 20 *solidi* in favor of the *sacrae largitiones* and 41 *solidi* for the praetorian prefect's *arca*—a word that theoretically referred to any treasury but usually pointed to the praetorian prefect's accounts.⁴³ In Aphrodito, the *kanonika*—which relates to the levies of the *largitiones*—and military annona liabilities were settled in gold. The annona decreased in relative terms from almost twice the amount of the *kanonika* in 525/526 to less than 1/8th in 550/551.⁴⁴ In 572, *P.Oxy.* 1: 126

⁴⁰ The overall military and civil taxes in gold reach 2 lbs. gold per fiscal macro-unit (the *capitulum*), exceeding the *ca.* 1.25 artabas/aroura attested for the period, Carrié 1993.

⁴¹ If the *capitulum* was worth 2,000 arouras and the tax yield 1.20 artabas/aroura, one *capitulum* would have provided: $2,000 \times 1.20 = 2,400$ artabas or, at 10 artabas per *solidus*, 240 *solidi*, equivalent to 3 1/3 lbs. at 72 *solidi* per lb. The upper range is obtained by using 3,000 arouras and a yield of 1.5 artabas. On the *embolē* tax rates, see above nn. 7, 9, and 17.

⁴² The comparison between *P.Freer* 08–45 c–d and *P.Cair. Masp.* 1: 67057 highlights a comprehensive adaeration process; see Gascou 2008, 322–27. The same conversion process leads to cash payments in Aphrodito in lieu of deliveries in kind. Anastasius's reign may have been the turning point in this process, see Zuckerman 2004, 143–70 and 176–78. The Apiones provided a few military contributions in kind, but they were dwarfed by their payments in gold; see Hickey 2001, 153–64 and 225–47, tab. 4.4–4.7 with *P.Oxy.* 27: 2480, 16: 1920, 2046 and *PSI* 8: 953; see also Zuckerman 2004, 164–66. Contributions in kind never disappeared; they are, for instance, attested in Egypt as late as 639/640, with various requisitions provided to the Byzantine army during the Arab conquest, see *P. Lond.* 1: 113–10 = *W.Chr.* 8, which could also have been issued by the Arab authorities; see Papaconstantinou 2010, 66–67 and n. 31.

⁴³ Feissel 2004, 198, l. 16–28 = *AE* 2004, 1410 = *SEG* 54, 1178. On *arcarika* in papyri, see Johnson and West 1949, 302–3.

⁴⁴ Zuckerman 2004, 188. In the West, at the time of *P.Marini* 87 = *P.Tjäder* 2 (565–570), 1,153.5 *solidi* went to the *canon praefectorum* while only 85.5 *solidi* were owed to the *tituli largitionales*, see Jones 1986 (1964), 821. Delmaire 1989, 708–714 sees a general weakening of the CSL vis-à-vis the prefectural authorities during the fifth and sixth centuries. The same is not traceable at Aphrodito.

records cash payments almost equally split between the *kanonika* and the *arcaricarius* or the *embolator*.⁴⁵

What sixth-century Egyptian papyri often display on the ground are two distinct channels of tax collection, the grain of the *embolē* on one hand, and everything else, combining gold *kanonika* and local annona in kind or gold, on the other. The separation of the latter into what belonged to the prefectural *arca* versus the *largitiones* occurred at a higher level.⁴⁶ The *embolē* grain ended up with local boatmen responsible for its transportation to Alexandria, while the gold and local payments in kind were handled by specific officials at the village, city, or large estate level, irrespective of these payments' final destination—*largitiones* or prefectural titles. In *P.Oxy.* 1: 136 (583), Serenos is hired by the Apiones as an estate manager (*pronoetēs*). He is thus in charge of levying grain and cash dues, the wheat being delivered to a *dēmosios nautēs* and the cash to a *trapezitēs* (ll. 20–22). When annona-related payments were adaeerated, which generally became the norm in the sixth century, overall tax liabilities (often called *dēmosia* or *dēmosion*, sometimes *synteleia*) appear to have been split between the *embolē* (paid in kind) and *chrysika* (in cash—sometimes called *argyrika*).⁴⁷ For instance, *P.Aphrod.Reg.* does not include any tax assessment in grain. Aphrodito grain payments appear in separate documents through different channels.⁴⁸ When transportation fees linked to the *embolē* were paid in cash instead of kind, they seem to belong to the gold accounts.⁴⁹ This does not mean that all taxpayers made payments in gold: smaller amounts were generally paid in copper coinage and then converted into gold, most likely at a profit for the local intermediaries, before being sent to the appropriate imperial officials.⁵⁰

⁴⁵ Johnson and West 1949, 259 and 302–3.

⁴⁶ In *Edict* 13. 11. 2, the responsibility for levying cash dues is split between the prefectural *arca* and the *largitionalia*; *P.Oxy.* 1: 126 also testifies to this distinction, see Johnson and West 1949, 302–3. However, most papyri provide cash dues as one single amount paid to a single official. In *P.Aphrod.Reg.*, the split appears at the final accounting level, once all dues have been collected from taxpayers as single payments, and Dioscorus's archives incorporate some tax receipts displaying payments to both the *embolē* and the tax in gold, as for example *P.Flor.* 3: 298. In another late fifth or early sixth-century tax account, *CPR* 7: 26, the provincial authority deals with the *embolē*, sent to the Augustal Prefect, while the tax payments that belong to the *largitionalia* and the income from imperial estates are managed by the *comes largitionum*, see Gascou and Worp 1988.

⁴⁷ Johnson and West 1949, 305 and 320; Gascou 2008, 140 and n. 97. See for instance the Apiones tax declaration *P.Oxy.* 62: 4351, where taxes are split between *chrysika* in cash and *embolē* in grain, cf Mazza 2001, 129.

⁴⁸ Zuckerman 2004, 26–28 and 190–93.

⁴⁹ The amounts are demanded in gold by Justinian's *Edict* 13.7–8 and settled in cash for instance in *P.Bad.* 4: 95, *P.Freer* 08–45 c–d, and *P.Cair. Masp.* 1: 67057; Gascou 2008, 334–35 for the Antaeopolite accounts.

⁵⁰ Zuckerman 2004, 66–78. A contemporary sixth-century Hermopolite tax register shows that most taxpayers used copper rather than gold, since the size of their contributions fell below the value of the smallest available gold coins; see Bagnall, Keenan, and MacCoull 2011.

Table 3. Consolidated Tax Rates (grain + gold) in Carats per Aroura, and Percentage Paid in Cash in Various Sixth-Century Tax Accounts.

	<i>Approximate date</i>	<i>Average tax rate in carats/aroura</i>	<i>Proportion in cash</i>
<i>P.Bad.</i> 4: 95	Early 6th	3.1	53.6%
<i>P.Aphrod.Reg.</i>	525/526	4.9	37.2%
Aphrodito (Zuckerman 2004, 188)	545–550	6.0	48.6%
<i>P.Cair.Masp.</i> 1: 67057	550	7.7	62.8%
<i>P.Lond.</i> 5: 1686	565	9.9	69.0%
<i>P.Hamb.</i> 1: 56	567/568 ?	9.6	67.7%
<i>P.Cair.Masp.</i> 1: 67169	569	2.7	55.6%
<i>P.Oxy.</i> 1: 126	572	4.7	22.7%
<i>P.Oxy.</i> 16: 1907	574–582	?	47.5%
<i>P.Oxy.</i> 16: 1944	500–600	7.0	57.1%
<i>P.Oxy.</i> 16: 1909	Late 6th	6.2	41.2%
<i>Stud. Pal.</i> 20: 160	7th	15.6	76.9%

Note: We assume a 1 *solidus* = 10 artabas conversion rate, equivalent to 1 artaba = 2.4 carats. Garden lands have been taken into account in Aphrodito and Antaeopolis, although their gold tax rate is absent from the papyrological evidence. We use the tariffed and not the actual grain *embolē* figure in Antaeopolis. Aphrodito's gold tax contributions have been adjusted downward to take into account the tax payments owed by the village's artisans. The numbers for Aphrodito's *embolē* as well as its gold contributions for the years 545–550 have been averaged, as per Zuckerman 2004, 47–51, 188 and 193. Adaration of grain and tax rebates have been ignored in the case of *P.Oxy.* 16: 1907 and 1909. Areas are sometimes reported by the papyri. If not, we have estimated them through the use of standard *embolē* rates between 1.25 and 1.5 artabas/aroura in the cases of *P.Oxy.* 1: 126; 16: 1944; *P.Bad.* 4: 95. For *P.Bad.* 4: 95, our estimates for arable lands and vineyards are 230 and 74 arouras respectively, a very close match to the figures used at Hickey 2007, 303, nn. 113–14. We use the ninth and tenth indications, but not the eighth, since tax numbers are missing for it, nor the twelfth, since significant rebates impacted it. In this estate account, the conversion price between wheat and gold is stated to have been 12 artabas = 1 *solidus* – 6 carats (Schnebel 1928, 36, n. 4 and F. Morelli 1998, 140 n. on l. 55), leading to 1 *solidus* = 16 artabas, a very low price for wheat. Using a more standard 1 *solidus* = 10 artabas would increase the estimated combined tax rate to 3.9 carats/aroura and the cash proportion would decrease to 42%, much closer to the figures computed through *P.Aphrod.Reg.* Moreover, according to our computations, it is likely that non-arable lands benefitted from some tax exemption, possibly linked to significant plantations of new vineyards. This would bring the tax rate in line with *P.Aphrod.Reg.* The tax rate in *P.Cair. Masp.* 1: 67169 seems remarkably low, including its unusual 0.5 artaba/aroura grain tax rate. The estimated tax rate from *P.Oxy.* 16: 1909 uses Bagnall's analysis of *P.Mich. Inv.* 335v = SB 14: 12208 (see above n. 15). *Stud. Pal.* 20: 160 indicates a significantly higher cash proportion as well as overall tax rate, but may belong to the Arab period, when gold taxation would have risen to higher levels; see Rémondon 1965.

In Antaeopolis at the time of *P.Cair. Masp.* 1: 67057, about 62,000 artabas were contributed to settle the *embolē* account. This was equivalent to *ca.* 6,200 *solidi* at a rate of 1 *solidus* for 10 artabas of wheat. Meanwhile, a little over 10,000 *solidi* were levied in gold for the military annona and the *kanonika* accounts, implying a cash component of approximately 2/3 for the overall fiscal dues. In Aphrodito, gold taxes rose from 352 to almost 600 *solidi* between 525/526 and 545–550, while the *embolē* fluctuated between 6,100 and 4,880 artabas, with an average of 5,710. The gold proportion then increased from a little over one-third to about one-half of the overall tax liability.⁵¹ Later, in a tax year that could be 567/568, *P.Hamb.* 1: 56 provides regular land tax in gold (*dēmosia*) amounting to 748.5 *solidi*, to which two other levies were added, for 216.4 and 230.7 *solidi* respectively, amounting to a total of 1,195.7 *solidi* without incorporating the artisans' component.⁵² *P.Oxy.* 1: 126 records fiscal dues split between 63 artabas and 44.5 carats.⁵³ In this case, the cash component barely amounted to 25% of the entire levy, an unusually low level. Other sixth-century transactions display higher cash proportions varying between 50% and 70% of the overall dues.⁵⁴

If we were to explain the way taxation operated in sixth-century Egypt in the simplest terms, it would not be too far off the mark to say that taxpayers generally had to pay fiscal dues in relatively comparable proportions of cash and grain.

Tax Rates

Table 3 displays an apparently confused picture of sixth-century Egyptian taxation, with widely variable tax rates and cash components: “the variations in rates seem to indicate that no uniform system of taxation on land was imposed.”⁵⁵ However, one needs to keep in mind that papyri relating to individual properties often reflect very specific situations. At the same time,

⁵¹ From Zuckerman 2004, 188 and 193.

⁵² Zuckerman 2004, 120–21 and 214–16; Rémondon 1965, 409–13.

⁵³ Johnson and West 1949, 259 and 302–3.

⁵⁴ In Aphrodito, 14 arouras of arable land carried a fiscal burden of 18 artabas of wheat and 4 *solidi* during a sale transaction (*P.Lond.* 5: 1686), while another sale at Hermopolis in 569 mentions quite low tax dues of 0.5 artaba and 1.5 carats per aroura (*P.Cair. Masp.* 2: 67169). *P.Oxy.* 16: 1944 has 300 artabas and 40 *solidi* as tax liabilities. *P.Oxy.* 16: 1907 reports 25,372.5 artabas and 2,297.4 *solidi*, and the gold contribution in *P.Oxy.* 16: 1909 constitutes 40% of the overall fiscal dues before complete adaeration of the grain tax. In the Arsinoite, a seventh-century papyrus concerns a plot of 2 arouras that pays 3 artabas and 1 *solidus* (*Stud. Pal.* 20: 160 = *Stud. Pal.* 20: 780; see Johnson and West 1949, 257–59 and 287). Finally, *P.Bad.* 4: 95 provides detailed accounts incorporating tax dues over four successive tax years on a property where arable lands probably predominated; see Johnson and West 1949, 56–57 and 272–73; Schnebel 1928; Morelli 1998.

⁵⁵ Johnson and West 1949, 258.

tax rates could change—as testified by the petition *P.Lond.* 5: 1674—and various types of lands bore different rates, increasing the natural variability of any sample of tax accounts. In that sense, larger accounts dealing with entire regions or villages should have more weight since they tend to smooth out local variability, as for example *P.Aphrod.Reg.*, *P.Cair. Masp.* 1: 67057, *P.Hamb.* 1: 56, *P.Oxy.* 16: 1909, or even *P.Oxy.* 16: 1944 (which deals with a large tax payment). As displayed in Table 3, these particular accounts display a higher degree of compatibility once chronological trends are taken into account.

Once contributions to the military annona had (largely, if not systematically) given way to settlements in cash, the land tax was split into two main components: an *embolē*-related grain tax and gold accounts incorporating payments to the *kanonika* and the *largitionalia*. As we have seen previously, the average *embolē* rates usually belonged to a 1.20–1.55 artabas/aroura range, the variations in the barley or other military annona contributions being a possible explanation for their variability.⁵⁶ Combining the cultivated 202,534 arouras in the Oxyrhynchite and the estimated 28,562 arouras in the Cynopolite in the mid-fourth century with the 350,000 artabas of the *embolē* tax attested in the late sixth-century *P.Oxy.* 16: 1909 provides an *embolē* ratio very close to 1.5 artabas/aroura,⁵⁷ a result that reinforces a sense of overall stability across large territories.

Nevertheless, effective grain tax payments by individual taxpayers sometimes indicate limited but significant annual variations of about 20% between highs and lows.⁵⁸ At the same time, we have explicit testimony of rates differing over time, as in the case of *P.Ryl.* 4: 617 (*ca.* 317), where an *embolē* yield of 5/6 artaba/aroura increases to 2 and then 3 artabas/aroura.⁵⁹ Specific situations, both geographical and historical—in this instance preparations for the war between Licinius and Constantine—could affect tax rates, while the lowest *embolē* payment recorded in Aphrodito in 544 may be linked to the initial outbreak of the plague.⁶⁰ Finally, adaeration of grain into gold or the reciprocal use of grain to pay gold tax liabilities could introduce significant variation.⁶¹ Nevertheless, at the wider level of the nome, a rate of 1.25–1.5

⁵⁶ See above, nn. 7, 9 and 17.; Bagnall 1985, 301; Gasco 1990 and 2008, 323, tab. 1.

⁵⁷ See above nn. 14, 15 and 22.

⁵⁸ Zuckerman 2004, 193; Bagnall and Lewis 1979, 93; Johnson and West 1949, 232–33 and 271, although the variability suggested by the first editor of early fourth century *SB* 5: 7521 (Kase 1933, 5) could have been reduced significantly through partial adaeration (Bagnall and Worp 1984, 57–8.

⁵⁹ Zuckerman 2004, 216–17.

⁶⁰ Zuckerman 2004, 193–12.

⁶¹ For example, *P.Cair.Masp.* 2: 67138, col. i, recto, with comments by the editor: Maspero 1913, 28.

artabas/aroura seems normal in the sixth century as an ideal target for the assessment of the grain tax liability, given that it stands as a relevant and recurring measure for entire nomes across two centuries.

With respect to gold tax, the petition of Dioscorus in *P.Lond.* 5: 1674, dated to 568 or 570,⁶² represents a key document. It quotes several tariffs explicitly: 2 carats/aroura on arable land and 8 carats/aroura for vineyards represented the traditional rates, but these were increased to 4 and 23 carats respectively once the village was incorporated in the pagarchy in the early 550s. Applying the earlier rates to the 3,847.25 consolidated arouras of arable lands and reed-marshes and 79.5 of vineyards belonging to the village account (*kōmētika*) in the cadaster, Zuckerman obtains 347 *solidi* 2.5 carats, a result remarkably close to the 341 *solidi* 18 carats of gold tax assessed on the land by the register in 525/526. He then applies the second set of higher rates to the *dēmosia* displayed by *P.Hamb.* 1: 56 for a first indiction, possibly 567/568 on the assumption that Dioscorus's petition *P.Lond.* 5: 1674 complained about precisely this high level of taxation. This leads to 717 *solidi* 9.5 carats, again not too far from the actual 748.5 *solidi* before tax supplements.⁶³ This is a close match when we take into account the 45 years separating this document from the original register, especially considering that the village's area might have grown between both dates.⁶⁴ Finally the Aphrodito receipts from the 537–551 period would be compatible with an intermediary rate of 3 carats/aroura of land under grain and 12 carats on vineyards, the 3 carats tariff being attested in the Fayum as well.⁶⁵

P. Lond. 5: 1674 also complains about a 2.5 carats/aroura supplemental charge (l. 53), added to the higher 4 carats/aroura tariff on arable lands (l. 42).⁶⁶ On top of the main tax (*dēmosia*), *P.Hamb.* 1: 56 reports (col. i) a payment of 216.43 *solidi*, of which 85.545 are provided by the landowners and 130.885 by non-owners (ll. 19 and 27) as well as a *diagraphōn* (col. vii) of 230.74 *solidi*. The reading of the name of the first tax, from which only the last four letters are legible, remains uncertain. (*Syneth*)eias had been suggested by the editor as a possible restoration, but this hypothesis was opposed

⁶² ca. 570: Bell 1971, 55–58, followed by MacCoull 1988, 47. Spring or summer 568: Fournet 1999, 324, 334; Zuckerman 2004, 120.

⁶³ Zuckerman 2004, 120–22, 188, 213, 265, and above n. 52.

⁶⁴ Rémondon 1965, 428, with *P. Cair. Masp.* 3: 67329 and 2: 67150, some villages being aggregated into the Aphrodito territory.

⁶⁵ Zuckerman 2004, 120–121 and 188–189; Johnson and West 1949, 258. A reform dated 536/537 would predate *Edict* 13, from 538; see Zuckerman 2014, 52–4. On the date of *Edict* 13, see Rémondon 1955.

⁶⁶ As discussed in Fournet forthcoming and Zuckerman 2004, 120 and 214–16.

Table 4. Levels of Gold Tax in Aphrodito, Comparing Tabulated and Actual Numbers

<i>Land Type</i>	<i>Arable and islands</i>	<i>Vineyards</i>	<i>Gardens</i>
<i>Tax year</i>	525/526		
Area (arouras)	3,847.25	79.50	508.75
Tax rate (carats/aroura)	2	8	0
Gold tax (carats)	7,694.50	636.00	0.00
Gold tax (<i>solidi</i>)	320.60	26.50	0.00
Total tabulated gold tax			347.10
Actual gold tax			341.08
<i>Period</i>	537/551		
Area (arouras)	3,847.25	79.50	508.75
Tax rate (carats/aroura)	3	12	0
Gold tax (carats)	11,541.75	954.00	0.00
Gold tax (<i>solidi</i>)	480.91	39.75	0.00
Total tabulated gold tax			520.66
Actual gold tax			536.57
<i>Tax year</i>	567/568?		
Area (arouras)	3,847.25	79.50	508.75
Tax rate (carats/aroura)	4	23	0
Gold tax (carats)	15,389.00	1,828.50	0.00
Gold tax (<i>solidi</i>)	641.21	76.19	0.00
Total tabulated gold tax			717.40
Actual gold tax			748.50

Source: Zuckerman 2004, 120–22 and 188–89.

Note: This data applies the two sets of actual rates provided by *P.Lond.* 5: 1674 to the various categories of taxable village lands provided by Aphrodito's cadaster; see Gasco 2008, 281 and Zuckerman 2004, 119–22. A 0% tax rate is applied to gardens and orchards since the petition does not provide any rate for these. These figures are then compared to the actual fiscal dues in *P.Aphrod.Reg.* (525/526) and *P.Hamb.* 1: 56 (perhaps 567/568). It does not incorporate the surcharges from *P.Hamb.* 1: 56 and *P.Lond.* 1: 1674. Zuckerman assumes an undocumented tax rate increase to 3 and 12 carats on arable lands and vineyards respectively in ca. 537. We compute the average of the actual tax levies provided by Zuckerman over the period 537–551, adjust the figure downward by assuming a proportional increase in artisans' contributions (see Zuckerman 2004, 224–25 and 265; Rémondon 1965, 409), and use it as the actual gold tax figure for that period. As suggested by Zuckerman, this is a close match with the modeled figure, vindicating his hypothesis that an intermediate tax increase was implemented between the 520s and the late 550s.

Table 5. Components of *P.Hamb.* 1: 56 and Respective Tax Rates in Gold

	(Syntel)eia	Diagraphōn	Demosia	Overall Tax on Lands
Tax components in <i>solidi</i>	216.43	230.74	748.50	1,195.67
Tax rates in carats/ aroura if orchards are excluded	1.32	1.41	4.57	7.31
Tax rates in carats/ aroura if orchards are included	1.17	1.25	4.05	6.47

by Rémondon who suggested *synteleias* instead.⁶⁷ Dividing these two taxes and the main land tax by the *kōmētika* area in Aphrodio with and without the gardens leads to the following composite tax rates (Table 5).

When we add in the two supplemental taxes, we arrive at a number very close to 2.5 carats/aroura, with or without the orchards. This would also seem to confirm that *P.Hamb.* 1: 56 and *P. Lond.* 5: 1674 were roughly contemporary.⁶⁸ A rate increase would have occurred between 526 and 537, with a second in the early 550s, and these were then followed by tax surcharges in the late 560s. As a result, Aphrodito's overall land tax contribution would have increased step-by-step from 350 *solidi* in 525, to *ca.* 550 *solidi* in the 540s, then 750 in the 550s, and as high as 1,200 *solidi* including tax surcharges in 567/568, excluding the artisans' contributions.

Applying these same higher rates of 4 and 23 carats (but no surcharge) to *P.Cair. Masp.* 1: 67057, following Zuckerman's interpretation of the Aphrodito schedule with islands and reed-marshes assessed at the arable land rate and gardens exempted from gold tax, we arrive at a hypothetically calculated yield of 10,383.73 *solidi*. This is remarkably close to the 10,421.77 *solidi* actually recorded, with a weighted composite rate of 4.84 or 5 carats per aroura depending on whether gardens are accounted for or not, suggesting Aphrodito rates could apply to Antaeopolis. At the same time, it would vindicate the assumption that the fiscal dues recorded at *P.Cair. Masp.* 1: 67057

⁶⁷ Rémondon 1965, 409–416, notably at 410–11; Zuckerman 2004, 120–21, 213–16 and above n. 52.

⁶⁸ See above, nn. 62–3.

Table 6. Gold Tax in Antaeopolis in the Early 550s, Comparing Tabulated and Actual Numbers

<i>Land Type</i>	<i>Arable</i>	<i>Islands</i>	<i>Reed</i>		
			<i>Marshes</i>	<i>Vineyards</i>	<i>Gardens</i>
Area (arouras)	40,403	6,873	200	2,579	1,600
Tax rate (carats/aroura)	4	4	4	23	0
Gold tax (carats)	161,612	27,492	800	59,306	0
Gold tax (<i>solidi</i>)	6,734	1,146	33	2,471	0
Total tabulated gold tax (<i>solidi</i>)				Total	10,384
Actual gold tax from <i>P.Cair.Masp.</i> 1: 67057	<i>Annona</i> 6,073	<i>Kanonika</i> 3,708	Gratuities 641	Total	10,422

were normal. This topic had not been universally accepted. Johnson and West had suggested that the tax yield had stood exceptionally high as a result of some military build-up. Their view, however, was strongly opposed by Jones, who claimed, “In no circumstances would a city pay more gold taxes because additional troops were stationed in it. . . .” Gascou’s comparison with *P.Freer* 08–45 c–d = *SB* 20: 14425 also suggests an overall stability of the fiscal burden over a period of several years, even if the composition of the military *annona* could vary.⁶⁹

The *embolē* rate of 1.25 artabas/aroura from *P.Cair. Masp.* 1: 67057 and the gold tax rate of 4 carats/aroura on arable land from *P.Lond.* 5: 1674 can be tested against *P.Oxy.* 16: 1944. This undated tax petition provides an overall tax liability of 300 artabas and 40 *solidi* on some unspecified property. Given that 300 artabas/1.25 = 240 arouras; and given that 40 *solidi* × 24 = 960 carats, and 960 carats/4 = 240 arouras, this Oxyrhynchite account would seem to be exactly compatible with the Aphrodito/Antaeopolite tariffs from the period 550–560 as applied to 240 arouras of arable land. This is a potentially very significant observation, as it implies the existence of an Egypt-wide taxation rate in kind and in gold.

Unless rebates, privileges, additional levies, or surcharges applied, a standard grain tax yield of 1.25–1.50 artabas/aroura and gold levies tariffed between 2 and 4 carats/aroura (depending on the date), would seem to represent fair estimates of the basic taxation levied on arable lands in sixth-century Egypt.

⁶⁹ Johnson and West 1949, 279–280; Jones 1951, 272; Gascou 2008, 309–49.

Further Issues

The Contribution of Vineyards

Taxation is rarely a neat reality and several significant issues remain. In *P. Lond.* 5: 1674 (l. 36), Dioscorus mentions another unclear charge of $5 \frac{2}{3}$ linked to the old 8 carats/aroura rate on vineyards. The initial editor had understood this to be some converted amount derived from the 8 carats charge. A recent and still unpublished reading of the papyrus indicates without ambiguity a levy of $5 \frac{2}{3}$ artabas/aroura on vineyards on top of their contribution in gold.⁷⁰ This is not linked to the *embolē*, as Dioscorus's petition clearly separates the standard fiscal charges on arable lands and vineyards (*kanon*) used to sustain soldiers (ll. 28–43) from the grain *embolē* (l. 44). Moreover, the rate is completely out of proportion with the vineyards' *embolē* contribution in Antaeopolis, which stood at $7/12$ artaba/aroura. We must therefore be dealing with a contribution to the military *annona* in kind.⁷¹ That vineyards could contribute grain implies mixed cultivation or that landowners had to purchase the grain, which is not without precedent. In the undated sixth/seventh century *P. Berol. Inv.* 25001, one of the vineyards is assessed at 2 carats and 15 artabas (l. 8). Given that $5 \frac{2}{3}$ artabas is very close to 0.5 *solidus* (12 carats) at customary adaeration rates,⁷² the combination of the gold (8 carats) and grain charges provides us with a cash-equivalent tax rate of 20 carats/aroura on vineyards that was separate from the *embolē*. The tax increase to 23 carats known to have occurred later was thus proportionally much smaller than what occurred on arable lands, where the tax rate jumped from 2 to 4 carats. Since *P. Aphrod. Reg.* does not provide any tax assessment in wheat, one must assume that vineyards did not contribute wheat for very long or that accounting practices implied a conversion into gold.

⁷⁰ Fournet forthcoming.

⁷¹ See above Table 1, col. v l. 3.

⁷² Regarding adaeration, commutation, or conversion rates attested for the sixth century, 12.2 artabas per *solidus* is often reported in military-related taxation contexts. This is equivalent to the fifth-century 40 *modii* per *solidus* adaeration rate and was still used in the sixth century; see Mitthof 2001, 243; Zuckerman 2004, 163; and *P. Cair. Masp.* 3: 67320, l. 10 (541/542). Other papyri provide rates in the same range: 12 artabas per *solidus* private standard, as in *P. Oxy.* 16: 2023 (l. 6), from the Apiones documentation (cf. Banaji 2001, 223, tab. 2 and 224 note e); 9 and 10 artabas per *solidus*, with *P. Cair. Masp.* 1: 67058 and *P. Oxy.* 16: 1920 (cf. Zuckerman 2004, 161), or *P. Oxy.* 55: 3805 (l. 46), 16: 1909; as high as 16 artabas in *P. Bad.* 4: 95, while Rea 1988, 133, discounts the very high price in *P. Oxy.* 55: 3804, ll. 184–5, as a transfer price in the context of a charitable gift. Generally speaking, a range of 8–16 artabas accounts for most of the known conversion and market rates; see Johnson and West 1949, 177–78. Note that the reading from *P. Bad.* 4: 95, l. 55, that led several authors to quote a rate of 4.4 artabas per *solidus* is actually derived from a lacuna; see Morelli 1998, 140. Comparing these rates implies taking into account potential monetary standards (see above n. 26) as well as the type of artaba or *modius*; see Gascou 2008, 320–22; Bagnall 2009, 187; Fournet forthcoming.

The Contribution of Orchards

As previously noticed, *P.Lond. 5: 1674* does not report any tax rate for garden lands and orchards, an explicit land category in both the cadaster and in Antaeopolis. Since *P.Cair. Masp. 1: 67057* already shows that the 1,600 arouras of garden lands did not contribute to the *embolē*, is it possible that gardens did not pay any tax? Zuckerman manages to obtain close estimates of Aphrodito's actual tax disbursements in gold while leaving the very significant 508.75 arouras of garden lands out of the equation, and we have done exactly the same with Antaeopolis.⁷³

However, gardens, orchards, palm trees and other related lands producing olives, nuts, or balsam had always belonged to a specific tax category and had paid rents and taxes during the High Empire.⁷⁴ In Hermopolis in the early second century, various categories of *paradeisou* land managed by the state paid their grain dues in a range from 1/6 to 2 1/2 artabas/aroura, implying mixed cultivation.⁷⁵ In the Karanis tax roll *P.Mich. 4: 223* (172 CE), no less than 261 entries refer to *paradeisou* lands and six to *ampelou* alongside legal categories like catoecic lands. The early third-century land register *P.Yale. 3: 137* lists 3,826 arouras of arable lands and 757 arouras of orchards (and probably vineyards) deemed *dendrikē gē*. After the Tetrarchic reform, in *P.Mich. Inv. 335v*, *ampelou* and *paradeisou* lands sown under grain are the only categories listed next to regular arable lands. These same categories are present alongside royal and private lands in a 297–308 Mendesian land register (*P.Oxy. 44: 3205*).⁷⁶ In the sixth-century, *P. Cair. Masp. 1: 67059* (506/507), col ii l. 1, reports some orchards making a tax payment in gold. The line may be mutilated but is unambiguous. Orchards also define a specific tax category in both Aphrodito's cadaster and Antaeopolis's tax accounts, unlike lands producing flax or vegetables.⁷⁷

⁷³ See above n. 63 and Tables 4 and 5.

⁷⁴ Johnson 1936, 516–22; Hohlwein 1939, 1–74 with *P. Hamb. 1: 68*; Geremek 1969, 54–57, 105–106; L. C. Youtie, D. Hagerdorn and H. C. Youtie, 34–40; Hagerdorn and Schubert 1990. *Lachanon* is a general word for vegetable or garden greens or herbs in classical Greek, possibly with the narrower sense of a lettuce cultivated for its seeds; see Bagnall 1993a, 27–28. *Paradisiou* or *paradeisiou*, derived from the Persian, and *pomariou*, from the Latin *pomarium*, designate orchards dedicated to tree-based cash crops and *ktēma*, *chorion*, *ampelon* and their derivatives can be used to mean vineyard; see Cadell 1975, 36–37; Gascou 1977, 364; Bagnall 1999, 329–33; Hickey 2012a, 41–44. Very few papyri make use of both *paradeisou* and *pomariou*, as does the third-century *P. Flor. 1: 50* (ll. 13, 46, 59, 88, 98, 109).

⁷⁵ Chang 2014, 111–12, 131.

⁷⁶ Schubert 2001, 12; L. C. Youtie 1978; Rowlandson, 2005, 178 fig. 3; Blouin 2014, 161–167.

⁷⁷ Bagnall 1993a, 27: “That the legumes are only modestly documented, of course, owes much to the fact that they were a medium of neither taxation, like wheat or barley, nor commercial farming, like wine.” Many fruits and vegetables are absent from estate accounts as they were produced for local use; see Rathbone 1991, 381. One aroura dedicated to flax production paid its annual rent

Table 7. Estimated Gold Tax Rate for the Orchards/Gardens Belonging to Count Ammonios Needed to Match Estimated with Actual Gold Tax in *P.Cair. Masp.* 3. 67140 (= SB 20. 14670).

	<i>Arable land</i>	<i>Reed- marshes</i>	<i>Vineyards</i>	<i>Orchards/ Gardens</i>	<i>Simulated gold tax</i>	<i>Actual gold tax</i>
Respective areas in l.14	58.625	1	1	6.75		
Simulated rates	3	3	22	10		
Tax (in carats)	175.875	3	22	67.5	268.375	269
Respective areas in l.17	15			5		
Simulated rates	3			4.5		
Tax (in carats)	45			22.5	67.5	67

In the roughly contemporary *P.Cair.Masp.* 3: 67140 (SB 20: 14670), probably from the early 540s, the gold tax on 15 arouras of arable land and 5 of orchards that belonged to Count Ammonios in Aphrodito reaches 2 *solidi* and 19 carats (l. 17). Without the gardens, the resulting rate would be 4.5 carats/aroura on arable lands, far too high for this period. For this reason, Zuckerman has tentatively suggested a tax rate on gardens close to 6 carats per aroura, compatible with 2.5 carats on arable lands.⁷⁸ In the same document, another payment of 11 *solidi* 5 carats (l. 15) is recorded.⁷⁹ We will now estimate rates on orchards taking as standard rates the 3 carats/aroura on arable lands that probably applied for this period after 537 (see Table 4 above) and using an intermediate rate of 22 carats for vineyards. Interestingly, the calculated rates on orchards/gardens differ between the two cases—10 versus 4.5 carats/aroura (Table 7).

P.Oxy. 19: 2243a, an account of the Apiones dated 590, provides a tax (*synteleia*) yield of 55/96 *solidus* private standard per sown aroura on a garden plot of 13 arouras (ll. 53–58).⁸⁰ This is almost exactly 0.50 *solidus* (12

at the time of the third and last installment of a twelfth indiction (1 *solidus* minus 2 carats private standard): *P.Cair. Masp.* 1: 67116; see Comfort 1936.

⁷⁸ Zuckerman 2004, 122. *Dendron* and *paradeisos* are clearly equivalent as they designate the same property in *P.Cair.Masp.* 3: 67140 (l. 16) and *P.Freer.* 08–45 a–b (l. 291); Gasco 2008, 251, n. 23 and 295, n. 16.

⁷⁹ The reading is confirmed by *P.Cair.Masp.* 2: 67138; Gasco 2008, 294, note on l. 15.

⁸⁰ *Synteleia* often stands as a generic term for tax contribution, as in *P.Lond.* 5: 1686 (565) where *synteleia* (l. 23) is then broken down between all its potential tax components (*kanonos*, *chrysisikos titlos*, *diagraphōn*, *embolē*, *naulon*) in ll. 24–26. In *P.Musée. Copte inv.* 4057, *synteleia* is used

carats) per aroura. *P.Aphrod.Reg.* records one explicit palm tree tax contribution as well, while seven contributions refer to oil producers and one to a gardener.⁸¹ Overall, these nine contributions total almost 7 *solidi*. Recently excavated ostraka testify to oil contributions in Aphrodito.⁸² *P.Cair. Masp.* 1: 67057 provides, among the *kanonika*, a contribution named “small fruits” valued at 66 *solidi* 2.5 carats. This is equivalent to 1,586.5 carats, almost exactly 1 carat/aroura for the 1,600 arouras belonging to the land listed under “gardens” in the papyrus.

Thus orchards did not escape from regular taxation in sixth-century Aphrodito, although *P.Lond.* 5: 1674 covers a vast array of contributions without mentioning them. Considering that Dioscorus worked hard to create a bleak impression of Aphrodito’s tax situation, it seems odd that he might have failed to mention a tax on orchards, especially since such lands constituted more than 11% of the village’s taxable lands. If we apply Zuckerman’s suggested rate of 6 carats/aroura on orchards to the 508.75 arouras of garden lands in Aphrodito, this would have added 127 *solidi* to the city’s tax burden. This is clearly not compatible with the figures from Table 4 (above), since calculated and actual numbers are already very close to each other without accounting for the orchards. The results would be further skewed if we assume a higher taxation rate on orchards of say 12 carats/aroura.

Additional Tax Charges and Orchards

The supplemental charges in the petition *P.Lond.* 5: 1674 were probably called *synteleia*. The same term is used for the fiscal liability on the orchards in *P.Oxy.* 19: 2243a, raising the possibility that taxation on orchards was assessed in a different fashion from the rest of regular taxation. This has been suggested by Zuckerman, based on the lack of attested rates for orchards in *P. Lond.* 5: 1674, although this explanation left him unsatisfied.⁸³ Indeed, too many documents show *synteleia* to be a fundamentally generic term. The almost contemporary *P.Lond.* 5: 1686 (565) records a comprehensive tax assessment, which it terms *synteleia* of 4 *solidi* and 18 artabas on 14 arouras of arable land (ll. 30–32).⁸⁴ This leads to respective rates of 6.86 carats and 1.29 artabas/aroura, entirely in keeping with the 6.5 carats overall gold tax rate on arable land found in *P. Hamb.* 1: 56, the petition that includes supplemental

interchangeably with *dēmosion* (l. 6, 10, 12 and 15); see Vanderheyden 2012, 796–97. An online search into DDdPP provides 66 hits between 300 and 650 CE.

⁸¹ 18.25 carats, as per Zuckerman 2004, 122 and 262, XIV, l. 612; *elaiourgou*—ll. 33, 58, 73, 130, 134, 414, 421, and *pomaritou*, l. 13.

⁸² Zuckerman 2004, 122, n. 11, 12, and 13.

⁸³ Zuckerman 2004, 122.

⁸⁴ See above nn. 52, 80 and Rémondon 1965, 412 and 413 n. 1.

taxes and the actual rates (see Table 5 above). Thus *synteleia* could not have been used to designate garden lands specifically. Thus the question of how orchards settled tax payments remains unsolved.

Did Aphrodito Pay a Capitation Tax?

Synteleia was actually split between owners and non-owners, with the latter having been responsible for about 60% of the tax. In his commentary on the Aphrodito papyri, Rémondon suggested this tax could have something to do with the *synteleia (tēs) kephalēs* (poll tax), which occurs in some sixth-century Oxyrhynchite accounts and receipts.⁸⁵ In the absence of any individual receipt for the *synteleia*, and considering the fact that some of the Apiones administrative units pay that tax while others do not, and given the apparent stability of the payments between two accounts, which are separated by 9 years, Laniado finds the arguments that this was a poll tax to be less than compelling.⁸⁶ However, Hickey recently noticed a correlation between the attestation of *enapographoi*⁸⁷ and the *synteleia kephalēs* in the Apiones' accounts.⁸⁸ But as the term *enapographoi* is essentially attested in the Oxyrhynchite, often associated with irrigation workers as wage laborers,⁸⁹ the potential relationship with Aphrodito's *synteleia* has yet to be firmly established. To further complicate matters, tenants could pay the land tax,⁹⁰ and *enapographoi* could own land,⁹¹ implying that the tax they were paying did not have to be a form of *capitatio*.

There are also plausible arguments that the second surtax of *P.Hamb.* 1: 56, the *diagraphōn*, may represent a poll tax. Rémondon had convincingly argued that the *diagraphōn* was an additional tax on land, quite widespread

⁸⁵ Rémondon 1965, 411, with reference to *P.Oxy.* 10: 1331 and, from the Apiones estates, *P.Oxy.* 16: 1911 (col. i l. 23 and col. iv l. 86); 16: 1912 (col. ii l. 30); 18: 2195 (col. iii ll. 34, 48 and col. x l. 175); 19: 2243a (col. ii l. 26); 55: 3804 (col. ii l. 30, col. iii. l. 46, etc.), *PSI* 8: 954 (l. 19–21), cf. Laniado 2015, 169, n. 193. It is unlikely that the *synteleia kephalēs* had any relationship with the *epinemeseis* payments that appear in *P.Oxy.* 16: 2037, as suggested by Mazza 2001, 119. This charge must be linked with the compulsory assignments of lands, cf. Bagnall 2003; Gagos and P. J. Sijpesteijn 1995; Geremek 1969, 19, n. 37. One can notice in *P. Oxy.* 16: 2037 that each individual payment equals almost exactly 10% of the overall assessment, which would fit if the overall liability had been shared equally between 10 owners. The term *epikephalia* is also used in a sixth-century tax schedule from Caesarea Maritima; see Lifshitz 1957. Here it may represent some urban local tax; see Gascou 2015, 149.

⁸⁶ Laniado 2015, 169–72 and as well P. M. Sijpesteijn 2007.

⁸⁷ *adscripti coloni* for Hardy 1931, 54–72 and Jones 1986 (1964), 799–802, although the exact meaning of the term raises several not yet fully settled issues, see below nn. 330–33.

⁸⁸ Hickey 2012a, 82–83.

⁸⁹ Hickey 2001, 100–7 and 2012a, 81–89, with n. 116.

⁹⁰ Mirkovic 2008 and Lemaire forthcoming, 39, n. 71.

⁹¹ McConnell 2013, 22, n. 49 and 47, n. 118.

throughout the sixth century.⁹² Nevertheless, Vanderheyden has presented evidence that a poll tax may have begun to be assessed earlier than the Arab period, when it is well attested.⁹³ In her still unpublished doctoral dissertation, she discusses a Coptic papyrus dated around 573 where the *diagraphōn* is tarified at 2 1/2 1/3 carats per taxpayer,⁹⁴ a unique testimony for the Byzantine period. This leaves open the tantalizing possibility that some form of *capitatio* was indeed implemented before the Arab invasions. Since 230 *solidi* 17 5/8 carats were paid in Aphrodito for the *diagraphōn*, a similar rate would imply about 2,000 taxpayers, which is consistent with the approximately 7,000 total inhabitants posited for the town by Zuckerman.⁹⁵

Pending more publications from the Coptic corpus, it is difficult to reach a general conclusion. However, in the case of Aphrodito in 568, Dioscorus equates the combined weight of the *synteleia* and the *diagraphōn* with 2.5 *solidi*/aroura (*P.Lond.* 5: 1674, l. 53–54). When both taxes are added, their total amounts to 447 *solidi*, equivalent to 2.42 *solidi*/aroura of the total cultivated land under Aphrodito's tax jurisdiction,⁹⁶ a figure consonant with Dioscorus's calculation. At the same time, it shows that Dioscorus consolidates these charges irrespective of who is paying them, owners or farmers. *P.Cair. Masp.* 1: 67002 (567) and *P.Ross.Georg.* 5: 62 (undated, but sixth century) provide further evidence of supplemental charges being added to a comparable tax base.⁹⁷ The first document is another petition from Dioscorus, written a year earlier. It appears that 700 *solidi* (ll. 24–25) and another 117 *solidi* had been levied as advances on the *dēmosion* for the first indiction (567/568), while a supplemental payment of 200 *solidi* had been provided on top of the regular unstated *dēmosion* for the previous fifteenth indiction (566/567). Then *P.Ross.Georg.* 5: 62 records a total tax payment of 1,015 *solidi* 2¼ carats for Aphrodito for an unspecified year. The numerical relationships are striking: on the one hand, the rates quoted in *P.Lond.* 5: 1674 from 568 are compatible with the actual levies in the undated first indiction *P.Hamb.* 1:

⁹² Rémondon 1965, 411–14, with a list of papyrological uses of *diagraphōn* during the Byzantine era, especially *P.Cair. Masp.* 2: 67228 (sixth century), 3: 67325 col. viii verso (probably dated to 574/575), 1: 67058 (549/550) and 67059 (dated 506/507, as Zuckerman 2004, 183 n. 187), *P. Ross. Georg.* 5: 38 (sixth century). *Diagraphōn* appears under the rather obscure combination *hyper tou diagraphou teganou* next to the *embolē* in *P.Oxy.* 1: 127 (ll. 3 and 9) at a rate of 55.5 *solidi* per 10,000 artabas, cf. Johnson and West 1949, 317; Sarris 2006, 84, n. 16. It may be linked to the *embolē*'s shipment fees instead, as it is worth about 5% of the grain's value.

⁹³ Papaconstantinou 2010.

⁹⁴ *P.Ismailia Inv.* 2240. I am grateful to Lorelei for having shared these details ahead of a future publication.

⁹⁵ Zuckerman 2004, 223.

⁹⁶ See above Table 5, adding the numbers from col. ii and iii l. 4.

⁹⁷ Rémondon 1965, 428; Zuckerman 2004, 213–14; Azzarello 2012, 101–3.

Table 8. Land Tax and Supplements in Aphrodito, from Three Papyri

	P.Hamb. 1: 56 (<i>with the artisans</i>)	P.Ross.Georg. 5: 62	P.Cair.Masp. 1: 67002	
			15th indiction	1st indiction
<i>Demosion</i>	794.2			817
<i>Synteleia</i>	216.4			
<i>Diagraphōn</i>	230.7			
Unspecified supplement			200	200?
Total	1,241.40	1,015.10		1,017?

56. Then *P.Cair.Masp.* 1: 67002 from 567 provides a provisional *dēmosion* figure of 817 *solidi*, just 3% higher than the actual figure from *P.Hamb.* 1: 56. Finally, the undated *P.Ross.Georg.* 5: 62 attests a total tax charge equivalent to *P.Hamb.* 1: 56 where only one of the supplements would have been levied, its total tax being almost exactly the sum of the *dēmosion* and the 200 *solidi* charge from *P.Cair.Masp.* 1: 67002. Zuckerman has suggested, based on these convergences, that it is highly likely that *P.Hamb.* 1: 56 belongs to that same first indiction (567/568) while *P.Ross.Georg.* 5: 62 could be chronologically very close. Assuming that these taxes were assessed on land, we ultimately arrive at compatible estimates.

Aphrodito and the Embolē's Transportation Fees

In chronological order, *P.Cair. Masp.* 3: 67280 and 67286, *P.Flor.* 3: 292 and 293, and *P.Cair. Masp.* 1: 67030 provide information on *embolē* grain shipments from Aphrodito for five different indictions. Two of these documents apply to the same year.

Such variability puzzled Zuckerman, especially the low contribution of 4,880 artabas in 544/545, which he explained as the likely result of a 20% discount (of a 6,100 artabas assessment) that the imperial authorities would have granted to the Egyptian taxpayers in the wake of the population collapse in Constantinople caused by the outbreak of the plague in 542. The apparent swift recovery indicated by the jump in 546/547 he explains by positing the arrival of refugees repopulating the city within a very few years.⁹⁸ An explicit discount seems unlikely. The food situation was so serious in Constantinople in 545 that additional fiscal grain had to be purchased from Phrygia,

⁹⁸ Zuckerman 2004, 207–12.

Table 9. *Embolē* Shipments in Aphrodito

<i>Indiction</i> (<i>Year</i>)	II (538/539 – <i>probable</i>)	VI (542/543)	VII (543/544)	VIII (544/545)	X (546/547)
<i>Embolē</i> (in artabas)	6,100	5,759	5,759	4,880	6,053

Source: Tabulated from Zuckerman 2004, 190–93.

Bithynia, and Thrace. Granting a rebate in that context would have implied very poor planning on the part of the authorities. At the same time, imperial legislation issued a few years before and after that date shows great concern for the stability of the grain deliveries.⁹⁹ A different explanation might involve the way transportation fees, usually called *naulon*, were paid. Some fees had always been charged for the transportation of taxed grain when this task was not undertaken as a liturgy.¹⁰⁰ Evidence for specific transportation taxes paid in cash during the later Empire appear from 316 CE onward.¹⁰¹ The Antaeopolite table, *P.Freer.* 08–45 c–d = SB 20: 14494 reports transport-related gold payments, gathered under the heading *chrysikos titlos*.¹⁰² This included a *logos navarchias* of 751.33 *solidi*, a *logos naulon arourationos* of 71.83 *solidi* and a *logos pholetron* of 20.66 *solidi* complemented by a transportation supplement of 18.5 *solidi* (not related to the *embolē*) for a total of 862.16 *solidi*—in theory used to transport an *embolē* of 61,674 artabas.¹⁰³ As shown by Gascou, this levy, which theoretically was linked to the *embolē*, is still mentioned in *P.Cair. Masp.* 1: 67057 as 862.5 *solidi* (col. iii l. 13), but it is instead used for expenses related to the military annona at the time of the composition of this papyrus, a few years after the issuance of the Antaeopolite table.¹⁰⁴ In *P.Cair. Masp.* 1: 67057, just one supplemental levy of 126.33 *solidi*

⁹⁹ Rémondon 1971, 776, with *Edict* 13 and *Nov. Iust.* 163.

¹⁰⁰ Johnson 1936, 400–19 and 569.

¹⁰¹ Johnson and West 1949, 254–59; Sirks 1991, 193–239, esp. nn. 14 and 15. The late fourth-century comprehensive money tax schedule *P.Oxy.* 16: 1905 records a transportation charge of 1 *solidus* for every 243 arouras (l. 9) in conjunction with the *embolē*. Between the late fifth and the early seventh centuries, we note *P.Oxy.* 51: 3634; *P.Baden* 4: 95; *BGU* 17: 2724B (l. 4 and 5); *P.Jena* 2: 38; *P.Lond.* 4: 1438 and 5: 1762. The *naulagē* fees in *CPR* 7: 26 (l. 10)—reedited in J. Gascou and K. A. Worp 1988—also seem to have been paid in money. See also G. Rouillard 1928, 131–48.

¹⁰² *Titlos* is a very generic term defining part of a fiscal schedule. In this context, it refers to the taxation paid in gold, see Mitthof 1994, 258–65.

¹⁰³ Gascou 2008, 336–38, l. 2–3 and 14.

¹⁰⁴ Gascou 2008, 334–35, with *P. Cair. Masp.* 1: 67057 (col. iii l. 13).

(for the *pholetra*, col i l. 31) remained allocated to transportation costs. This would mean that their consolidated, unstated total would have been $862.16 + 126.33 = 988.49$ *solidi*, unless the *pholetra* did not relate to the *embolē*.

Comparing these transportation charges to the level of the *embolē* requires converting artabas into *solidi*. As shown by Gascou, the *modius* used by the Antaeopolite table is the *modius castrensis*, tariffed at $3 \frac{3}{11}$ *modii* per artaba. Applying the rate of *adaeratio* from *Nov. Val.* 13.4 yields a conversion rate of 1 *solidus* = 12.2 artabas.¹⁰⁵ These transportation charges may be compared with the amount stated in *Edict* 13.8, which lists 80,000 *solidi* per 800,000 units (artabas).¹⁰⁶

The difference between the Antaeopolite charge and Justinian's *Edict* 13.8 may allow us to approximate the actual split between the *navicularii* in charge of transporting the grain from Alexandria to Constantinople and the local costs of transport as far as Alexandria, a point to which we shall return shortly (Table 10).

In Antaeopolis (and in *Edict* 13.8, applicable to the *navicularii*), transportation costs are incorporated with gold payments, a practice well attested in the papyri.¹⁰⁷ This does not mean they do not represent a tax category of their own, as is clear from *P.Lond.* 5: 1686, where *synteleia* is broken down between all its tax components, *kanonos*, *chrysikos titlos*, *diagraphōn*, *embolē*, *naulon*.¹⁰⁸ In Aphrodito, the *embolē* and the *naulon* are explicitly listed in *P.Lond.* 5: 1674 (l. 44) as charges paid on top of the increased gold tax. This makes sense, as *embolē*-related fees should be assessed on grain lands in proportion to their contributions rather than indiscriminately on all types of land irrespective of their grain dues. Only 8 *solidi* for *philikon* appear to have any connection with *embolē*-related transportation fees in the earlier accounts at *P.Aphrod. Reg.*, amounting to about 1.7% of the average *embolē* figure in Aphrodito (5,710 artabas). This amount must have constituted only a small part of overall transportation fees, and a third of it is used explicitly for other purposes.¹⁰⁹

¹⁰⁵ Mitthof 2001, 243; Zuckerman 2004, 161–64; Gascou 2008, 320–21.

¹⁰⁶ The unit is not specified in the *Edict*. Sirks 1991, 21, has argued that the *embolē* would have been measured in *modii castrenses*, implying less than 2.5 million artabas. Using calculations based on estimated cultivated area in grain and available tax rates, Rathbone 1987, 171–73 argues for 8 million artabas. This same hypothesis is convincingly defended at Carrié 1994 and 2003. Using *modii castrensis* would imply transportation charges of about 40% of the cargo, which would be completely out of line with all available evidence, hence our strong preference for artabas.

¹⁰⁷ For example, *P.Lond.* 5: 1686 (l. 27), *P.Cair.Masp.* 1: 67118, (l. 27), 2: 67169 (l. 18), 3: 67325 (col. vi l. 2).

¹⁰⁸ See above n. 80.

¹⁰⁹ Zuckerman 2004, 146 and 266–67; Johnson and West 1949, 281.

Table 10. Transportation Charges and Civilian Grain Tax (*embole*) in *P.Freer. 08-45 c-d = SB 20. 14494* and Justinian's Edict XIII

	<i>Antaeopolis,</i> <i>complete sum</i> <i>P.Freer. 08-45</i> <i>c-d, col.i.l. 19</i>					
	<i>Partial sum</i> <i>col.i.l. 2</i>	<i>logos</i> <i>nauarchias</i>	<i>logos nauulon</i> <i>arourationos</i>	<i>logos</i> <i>pholetron</i>	<i>Iron transport</i>	<i>Edict 13.8</i>
Transportation charge in <i>solidi</i>	862.16	843.66	751.33	71.83	20.66	18.50
<i>Embole</i> (artabas)	61,674	61,674	61,674	61,674	61,674	8,000,000
Transportation charge as a percentage of total <i>embole</i> valued in <i>solidi</i>	17.1%	16.7%	14.9%	1.4%	0.4%	0.4%
						12.2%

Table 11. Theoretical *Embolē* in Aphrodito Calculated Using Antaeopolis's Tax Schedule

	<i>Arable lands</i>	<i>Reed marshes</i>	<i>Vineyards</i>	<i>Orchards</i>	<i>Total</i>
Area in arouras	3,824.38	22.875	79.5	508.75	
Civilian grain tax rate in artabas per aroura	1.25	0.575 (23/40th)	0.5833 (7/12th)	0	
Resulting <i>embolē</i> in artabas	4,780.50	13	46.4	0	4,840

Transportation fees could also be charged in kind, as indicated by many *embolē*-related accounts of the period.¹¹⁰ The involvement of the monastery of Metanoia with the transportation of Aphrodito's *embolē* illustrates this, as the grain cargos are deemed to incorporate unspecified transportation fees to which are added two surcharges called one hundredth and one twentieth—1% and 5%—all in kind.¹¹¹ This means that some charges and fees could “migrate” between grain and gold payments, creating additional variability.

To illustrate the impact on Aphrodito's *embolē* figures of this uncertainty, we have applied Antaeopolis's grain tax schedule to Aphrodito's contributing lands (Table 11).

The result is extremely close to the *embolē* of 4,880 artabas recorded for the eighth indiction (544/545), the lowest in the series (see Table 9). 4,880 artabas thus probably represented the standard *embolē* figure for Aphrodito, to which transportation fees in kind were then added in some years. This explains the variability of *embolē* contributions. Indeed, 5,759 artabas, the figure from indictions 6 and 7, is 879 artabas or exactly 18% above the 4,880 artabas postulated as the standard *embolē*. This would be compatible

¹¹⁰ For example, *P.Mich.inv.* 5262 where 20 artabas for naulage charge are added to a 200 artabas cargo; in the Aphrodito dossier, e.g. *P.Cair. Masp.* 3: 67286 (l. 7 and 18) or *P.Flor.* 3: 298 (l.55 and 74) where the grain shipment incorporates transportation costs. In *P.Oxy.* 1: 126 (l. 11), 63 artabas are inclusive of the *embolē* and the *naulon*. More generally: Johnson and West 1949, 240–49. *P.Oxy.* 16: 1908, an account listing arrears in *embolē* and transportation charges, appears most interesting, as most *naulagē* charges are denominated in gold (ll. 3, 10, 11, 12, 14) but one is expressed in grain with a gold supplement (l. 15).

¹¹¹ Rémondon 1971, with *P.Cair. Masp.* 3: 67286 (l. 7) and *P.Flor.* 2: 292; Fournet and Gascou 2002, with *P.Berol.* 16383 and *P.Lond. inv.* 2822. See also *P.Cair.Masp.* 3: 67347 (l. 10).

with a primary charge of 12% for shipment costs (identical with the proportion computed from *Edict* 13.8) to which surplus fees of 1% and 5% were added, all of them provided in grain and fully incorporated into the shipment itself.¹¹² In this case, a surcharge of about 12% of the base *embolē* would have been assessed for the shipment from Alexandria to Constantinople and 6% for local transportation costs. The total, 18%, is almost identical with the transportation fees recorded for Antaeopolis (Table 10, col ii l. 4, above).¹¹³ If we add the 126.33 *solidi* mentioned in *P.Cair. Masp.* 1: 67057, for the *pholetra* (but there is no evidence this is linked to the *embolē*) and the 8 *solidi* for *philikon* to the transportation fees for Antaeopolis and Aphrodito respectively, we arrive at almost 20% for the overall transportation charges in both cases.

The highest grain shipment for *embolē* recorded for Aphrodito reaches 6,100 artabas in the tax year 538/539, 25% above 4,880 artabas and thus 5% above the postulated norm. Here partial commutation may be suspected, unless transportation charges could be assessed higher.

The imposition of an 18% to 20% surcharge in gold or in grain to the *embolē* for the purpose of transportation fees may explain why grain tax proceeds in Egypt often produce an actual yield rate of about 1.50 artabas/aroura,¹¹⁴ even though the Antaeopolite tax schedule explicitly attests a rate of 1.25 artabas/aroura on grain land:

$$1.25 + 18\% = 1.4750$$

$$1.25 + 20\% = 1.50$$

The medium in which transportation charges were paid (cash or grain) would appear to have been the key factor behind the difference in these ratios.

P.Cair.Masp. 3: 67347 could be used to challenge this very neat reconstruction. During a sixth indiction (542/543), Ammonios's Antaeopolite

¹¹² Charges of 10% and surcharges of 5% are attested in the fourth century as well; see Johnson and West 1949, 240–43. In *P. Mich. Inv.* 335v I (a), l. 3, a surcharge of 1/7th (=14.28%) is added to the grain tax. In *SPP* 20: 93 (334/335), 10,000 drachms/artaba of wheat are paid under two different components of the *naulon*. As a *solidus* is worth about 97 talents at that time and between 8 and 10 artabas, the *naulon* tax is once again equivalent to 14% of the wheat equivalent in gold; see Bagnall and Worp 1983, 2–3. In the early sixth-century Hermopolite, *P.Bad.* 4: 95 reports a 1 *solidus* 1.5 carat *naulon* charge that relates to a shipment of 104.67 artabas; see M. Schnebel 1928, 37–38. Using the 16 artabas per *solidus* conversion rate used in these accounts renders a 16.25% ratio.

¹¹³ In the Apiones *P.Oxy.* 1: 142, 11.15 *solidi* are allocated to transporting 1,485.25 artabas to Alexandria (Mazza 2001, 140), which works out as an added 9% at 12 artabas/*solidus* and 7.5% at 10 artabas/*solidus*.

¹¹⁴ See above nn. 9 and 17.

astika properties seem to have made a grain tax payment of 74 artabas for the *embolē* (ll. 17–21), with transportation fees and the same unspecified 1% and 5% charges included. At the same time, the contemporary *P.Cair. Masp. 2: 67140* (l. 14) provides a breakdown of the *astika* lands owned by Ammonios: 58.625 arouras of arable lands, 1 aroura of marshlands, 1 aroura of vineyards, and 6.75 of orchards. Applying the Antaeopolite *embolē* rate of 1.25 artabas/aroura on Ammonios's arable lands would yield 73.3 artabas. This is almost equal to the actual figure of 74 artabas, a number that is supposed to incorporate all transportation fees—we would thus have expected a higher figure based on a rate of 1.4750 or 1.50 artabas/aroura. However, Fournet's recent (unpublished) reading of the papyrus shows that Maspero had in fact ignored the last lines belonging to the actual *embolē* account at *P.Cair. Masp. 3: 67347*: Ammonios' *astika* properties had paid a second amount slightly over 19 artabas, resulting in a total contribution of 93.52 artabas (ll. 22–25). This is confirmed by the amount from the following seventh indiction, a rounded 93 artabas (*P.Cair. Masp. 2: 67138 II r*, ll. 39–46).¹¹⁵ The yield on the total arable lands, marsh lands and vineyards thus reaches an effective rate of 1.54 and not 1.25 artabas/aroura, again consistent with our hypothesis. Generally speaking, the difference in papyrological materials between grain tax (*embolē*) yields reported at 1.25 artabas /aroura and those reporting 1.50 appears to have stemmed from whether these incorporated transportation fees in cash or in kind.

Ideally, we would need two series of gold and grain levies in Aphrodito in order to assess whether years with high grain shipments corresponded with low gold expenses to demonstrate that the main variability factor between grain and cash components was the medium in which transportation fees were paid. Unfortunately, Aphrodito's five grain and six gold payments over these 14 tax years overlap only once, in 538/539. It is suggestive that this is the highest available *embolē* levy, and that it is associated with one of the lowest available gold tax assessments, but further coincidences of gold and grain yields would be necessary to prove the hypothesis (Table 12).

¹¹⁵ We are once again grateful to J.-L. Fournet who provided advance copies of several receipts belonging to his forthcoming new volume of Aphrodito papyri. Regarding the previous reading and interpretation, see Rémondon 1971 and Johnson and West 1949, 253. One oddity appears at l. 23, where it is written that the 93.52 artabas include transportation charges but not the 1% and 5% surcharges. However, its main component, 73.3 artabas, was deemed to include them all (l. 10), and thus the earlier anomaly may represent a copying error by the scribe. He worked from an original receipt that had used abbreviations; so Fournet forthcoming, note on ll. 23 and 10.

Table 12. Civilian Grain Tax and Gold Tax in Aphrodito between 537 and 551

<i>Indiction Year</i>	<i>Embolē (artabas)</i>	<i>Gold tax levies (solidi)</i>
537/538		535.4
538/539	6,100	536.5
539/540		
540/541		
541/542		
542/543	5,759	
543/544	5,759	
544/545	4,880	
545/546		566.2
546/547	6,053	
547/548		
548/549		589.6
549/550		566
550/551		532.8

Source: Zuckerman 2004, 188, 193.

Note: The grain tax was defined ahead of the regular *delegatio* by a *praedelegatio*, normally available by May 1, then collected and sent at the beginning of a new indiction year, between July and September. Gold payments, usually in three installments, occurred mostly later in the year; see Zuckerman 2004, 118, 126, 130–31, 182–84 and 190.

Orchards Should Not Be Ignored

We used a 4-carats rate to estimate the tax liability in *P.Cair. Masp.* I 67057 (above, Table 6). However, the account dates from the early 550s or even the late 530s (above, n. 6), when a 3-carats rate applied. Then the *largitionalia* payment of over 1,737 *solidi* is associated with an unspecified rebate. Furthermore, 963.625 *solidi* within the *kanonika* payments relate to a previous indiction. Based on this information, the following Table 13 attempts to outline numerically compatible tax rates on orchards in Antaeopolis, factoring in potential rebates on the *largitionalia* that fits with the typical ratios used in Egypt—essentially 25%, 33%, and 50%. Only two combinations of rebates and tax rates on orchards are compatible: 25% and 15-carats/aroura, or no rebate and 6-carats. The first result seems too high, implying that the rebate mentioned in *P.Cair. Masp.* I 67057 might have been insignificant.

With respect to Aphrodito, the 51 *solidi* and 1,220 artabas respective variability of the overall gold tax and of the *embolē* (above, Table 12) may be hiding the orchards' contribution, although we cannot point to any evaluation. We cannot exclude the possibility that they are missing from the accounts because the payment cycle on orchards was distinct from the main gold tax. Maybe palm groves, which are normally harvested between late August and early October (when the Nile flood made normal work on arable lands impossible), paid their tax dues in one payment at the end of the tax year.¹¹⁶ Overall, the little evidence we can assemble on orchards and garden lands points to a wide range of 4–12 carats/aroura average tax rate.

At the same time, orchards, palm trees, and olive trees are often linked as various types of mixed fruit cultivation in the papyri, a reality exemplified by the compound word *elaionophoinikoparadeisos* and other similar agglomerations of associated terms found in papyri dealing with such lands.¹¹⁷ As such, a wide range of tax contributions was to be expected given that the category “orchards” covered many different types of lands, including, on the one hand, highly profitable cultivations like dates, figs, and possibly olives, and vegetable gardens on poorly irrigated soils producing low-value staples with limited marketability, on the other.¹¹⁸

Given that tax schedules had to create some form of categorization, the most likely scenario is that lands principally dedicated to grain or vines fitted easily into a cohesive category of their own, but the wide array of other lands fell under a catch-all tax category for “orchards,” with no pre-defined tax rate but to which individual rates applied. This might explain why the petitioner in *P.Lond.* 5: 1674 decided not to quote this category due to the lack of a defined tax rate.

Tax Rate Fluctuation in the Sixth Century

A series of increases in the gold tax rate on arable land brought the yield from 2 carats/aroura in the 520s to 4 carats in the 560s, with an intermediate rate of 3 carats/aroura in the period 537–550s. Meanwhile contributions to the *embolē* in grain remained stable. The rate on vineyards also climbed from 20 to 23 carats.

¹¹⁶ Hohlwein 1939, 56; Bagnall 1993a, 21 n. 32.

¹¹⁷ Worp, 1977; see also *P.Oxy.* 3: 639 with an *elaionoparadeisos* followed by *phuneikes* standing for *phoinokes* (ll. 12–13). In the second-century tax account *P.Mich.* 42: 357, some plots pay a “tax on orchards” alongside a “tax on the produce of olives”; one palm grove pays the tax on orchards (D, l. 8) as well. Johnson and West 1949, list several leases with mixed cultivation of olives, dates, gardens, and vineyards: *BGU* 900; *SPP* 20: 79; *P.Vindob. Boswinkel* 9; *SB* 7369, 4481, etc.

¹¹⁸ On average, olive land was worth twice the price of arable land, and palm groves and vineyards three to four times as much, although significant variations are attested; see Drexhage 1991, 127–54. Some garden lands might have consisted of dry lands that required irrigation—and *P.Lond.* V 1674 does complain of poor irrigation in Aphrodito. In the early fourth-century Mendesian nome, 81% of the Phernouphites toparchy's orchards occupied dry land (*chersoparadeisoi*). These lands included vineyards, orchards, and pastures; see Blouin 2014, 191, tab. 6.5, 217–18 with tables 7.3–5.

At some point in the 560s, an absolute peak was reached, triggering the petition *P.Lond.* 5: 1674, which complains about new increases of 2.5 carats/aroura, which led to an overall rate of 6.5 carats/aroura on arable land. We obviously have no guarantee that such a tax increase was imposed everywhere in Egypt at this time. The almost contemporary *P.Oxy.* 1: 126 (572), with an *embolē* of 63 artabas (including transportation charges) and gold payments reaching a total of 44.5 carats on 42 arouras,¹¹⁹ implies rates of 1.5 artabas/aroura and 1 carat/aroura only. Similarly, *P.Cair.Masp.* 1: 67169 (569) from Hermopolis, with its overall tax liability of 0.5 artaba/aroura and 1.25 carats/aroura, belongs to the same period.¹²⁰ This cautions against assumptions that there was any “universal formula,” although these specific cases may involve potential privileges or partial exemptions—maybe because these two documents involved a property sale or a tax transfer. In any case, by virtue of the law of large numbers, entire administrative tax units and larger areas incorporating multiple properties are more likely to be reflexive of average orders of magnitude than are specific, individual cases.

Tax rates later moved lower during the early 570s. In April 575, Tiberius II granted a tax remission equal to one year of normal taxation, to be spread over four indiction years.¹²¹ The effects of this rebate are attested at *P.Oxy.* 16: 1907 (574–582, from the Apiones accounts), where the discount applies to both the tax in grain (through an additional rebate in gold) and that in gold, with the exception of the fees paid to local officials. It also appears at *P.Petra* 1: 10 (578). If the tax rates from *P.Lond.* 5: 1674 were still in force at the time of the rebate, the basic tax yield without supplements on arable land would have decreased from 4 to 3 carats/aroura, at least provisionally, while the *embolē* rate on arable lands would have been reduced to 0.9375 (15/16ths) artabas/aroura. In *P.Oxy.* 16: 1907, the grain tax before the reduction stood at 25,372.5 artabas and the gold tax at 2,297 *solidi* 10.5 carats Alexandrian standard, incorporating fees and gratuities. The rebate of one-fourth of the grain tax is expressed in the papyrus as 735 *solidi* 6 carats, implying a conversion rate of 8.627 artabas/*solidus* Alexandrian standard. If we assume a standard 1.25–1.50 *embolē* rate, 25,372.5 artabas before rebate would imply a range of 17,000–20,000 arouras of assessed land. At 4 carats/aroura, its gold tax before rebate would have reached at least 2,800 *solidi*, which is significantly higher than the stated tax. It seems then more likely that the standard

¹¹⁹ See above n. 53 and Table 3.

¹²⁰ See above n. 54 and Table 3.

¹²¹ *Nov. Iust.* 163. See Johnson and West 1949, 287, n. 24. The *embolē* seems not to have been affected by this tax reduction, which specifically excludes the *annona*. In *P.Oxy.* 16: 1907, the grain payment remains unaffected, but as a compensation a quarter of its value is converted in gold and subtracted from the gold tax. The provinces that had suffered from the recent Persian wars benefitted from a reduction in their taxation in kind (§2).

tax rate on arable lands was 3 carats/aroura before the rebate, given that 17,000 arouras taxed at 3 carats would provide 2,125 *solidi*, a close match to the 2,297 *solidi* 10.5 carats Alexandrian standard attested in the papyrus. In this case, some tax reduction would have occurred immediately after 568/569, and Tiberius II's rebate would have led to an effective 2.25–2.50 carats/aroura tax rate during these four years through which the discount was spread.¹²²

It seems safe to assume that tax yields returned to their 550s level in the early 570s, while the additional levies of the 565–568 period would have disappeared or at least become a rarity.¹²³ In the Fayum, a late sixth- or early seventh-century receipt is consistent with a tax rate of 3 carats/aroura on several plots.¹²⁴ Then, the 24,500 *solidi* gold tax in the late sixth-century *P.Oxy.* 16: 1909 is more compatible with a 2 than a 3 carats/aroura rate on the 231,000 arouras of arable lands estimated in the combined Oxyrhynchite and Cynopolite, especially because vineyards are expected to pay gold tax at a higher rate, which would push the model figures higher:

$$\begin{aligned} 231,000 \times 2 \text{ carats} &= 19,250 \text{ solidi} \\ 231,000 \times 3 \text{ carats} &= 28,875 \text{ solidi,} \end{aligned}$$

In *P.Oxy.* 16: 2037, another late sixth-century list of rents and tax payments from the Apiones, the taxpayer owners of two plots of land made payments of 10 artabas and 0.78125 *solidus* and 7.7 artabas and 0.53125 *solidus* respectively (ll. 29 and 31). These ratios work quite well with rates close to 1.50–1.60 artabas/aroura and 2.5–3 carats/aroura as $10 / 1.60 = 6.25$ arouras and $0.78125 \text{ solidus} \times 24 / 3 = 6.25$ arouras on the first plot, and $7.7 / 1.5 = 5.13$ arouras and $0.53125 \times 24 / 2.5 = 5.1$ arouras on the second. An alternative possibility, using 1.25 artabas/aroura, leads to 8 and 6.16 arouras respectively, with gold rates of 2.34 and 2.07 carats/aroura, more compatible with 2 carats/aroura.

This might have meant a return to the 2 carats/aroura gold tax rate on arable land, attested in Aphrodito early in the sixth century, at some point in the later sixth century or early seventh century. It would mean an effective tax cut of one third on the gold tax rate, which is consistent with a statement by Theophylact that Maurice (582–602) had remitted taxes by a third.¹²⁵

A tentative but consistent chronological pattern emerges. We mention the most important papyri only and date ranges are indicative. We remain aware that some of these rates might have been specific to some nomes and might not have applied universally or to all types of properties.

¹²² One might wonder if this provides some additional explanation for the low tax yields of *P.Cair. Masp.* 1: 67169 and *P.Oxy.* 1: 126, even though they preceded the attested rebate by few years (569 and 572).

¹²³ Although a *diagraphōn* charge is attested in 573; see above n. 94.

¹²⁴ Johnson and West 1949, 258, n. 27, with *P.Lond.* I 113. 8c.

¹²⁵ Theoph. Sim. 8.3.17: Hickey 2008, 95 n. 35.

Table 14. Sixth-Century Gold Tax Rates on Arable Lands

<i>Period to which rates applied</i>	<i>Tax rate in carats per aroura of arable lands</i>	<i>Main Supporting documents</i>	<i>Location</i>	<i>Date of the papyrus</i>
525–536	2	<i>P.Bad.</i> 4: 95 <i>P.Lond.</i> 5: 1674 (old rate)	Hermopolis Aphrodito	Early 6th century 568
537–551	3	<i>P.Aphrod.Reg.</i> <i>P.Cair. Masp.</i> 3: 67287 and 1: 67058 <i>P.Cair. Masp.</i> 3: 67140	Aphrodito Aphrodito	525/526 537–551 540s
Late 550s–mid-560s	4	<i>P.Lond.</i> 5: 1674 (new rate) <i>P.Oxy.</i> 16: 1944 <i>P.Hamb.</i> 1: 56 (demosion)	Aphrodito Oxyrhynchus Aphrodito	568 6th century 567/568
Late 560s	Max. 6.5	<i>P.Cair. Masp.</i> 1: 67002 <i>P.Ross. Georg.</i> 5: 62 <i>P.Lond.</i> 5: 1686 <i>P.Lond.</i> 5: 1674 (additional charges) <i>P.Hamb.</i> 1: 56 (all taxes)	Aphrodito Aphrodito Aphrodito Aphrodito	567 6th century 565 568 567/568?
Early 570s 575 (Tiberius's rebate over 4 years)	3 2.25–2.50	<i>P.Oxy.</i> 16: 1907 Nov. Iust. 163 <i>P.Oxy.</i> 16: 1907 <i>P.Petra.</i> 1	Oxyrhynchus Constantinople Oxyrhynchus Palestine	574–582 575 574–582 578
Late 6th century	3	<i>P.Lond.</i> I: 113. 8c <i>P.Oxy.</i> 16: 2037	Arsinoite Oxyrhynchus	Late 6th–early 7th century Late 6th century
Late 6th–early 7th century	2	<i>P. Oxy.</i> 16: 1909	Oxyrhynchus	Late 6th–early 7th century

Note: The date of a papyrus does not mean it cannot provide information relating to another period, hence several cases where the same papyrus appears more than once for different periods.

Part Three: The Dynamics of a Large Estate in the Sixth Century—The Apiones Dossier

Several recent studies have improved our knowledge of the *modus operandi* of the Apiones' estate managers. If we combine this knowledge with the fiscal schedules developed in the previous section, we should be able to estimate the size of the Apiones' estate, at the same time moving away from static models in favor of a dynamic approach. This will allow us to model how agricultural surplus was shared between state, estate, and farmers. We will proceed from the assumption that rates from one nome could apply to another, at least for purposes of approximation. The consistency and compatibility of results will be checked periodically in order to assess whether or not this method proves acceptable. As we proceed, we will have to deal with some uncertainty in our numbers, which must be accepted within degrees of tolerance.

The Apiones and the Cynopolite nome

Bagnall estimated that the Oxyrhynchite and Cynopolite nomes covered 283,140 arouras (780 km²) and 39,930 arouras (110 km²) respectively.¹²⁶ His main source, Butzer, had computed an original area of 563 km² for nome XVII (Cynopolis) in Pharaonic times, 425 km² for nome XVIII (Oxyrhynchus) and 1,027 km² for nomes XV and XVI (Hermopolis). In the Late Roman period, the three nomes would have covered an equivalent combined area, but Cynopolis was much reduced in the Roman period.

P.Mich. Inv. 335v indicates that the Oxyrhynchite encompassed 202,534 arouras of land sown in grain in the mid-fourth century, which included 3,073 arouras of former vineyards and orchards used as grain land. For purposes of this assessment of sixth-century gold income, we will assume this repurposed land had returned to its original function, implying 199,461 arouras of arable for the Oxyrhynchite alone, and that overall cultivated lands remained more or less stable. With a similar ratio of cultivated area, the Cynopolite would add about 28,500 arouras of arable lands for a total of about 228,000 arouras. This estimate would seem to be confirmed by the 350,000 artabas paid as *embolē* at *P.Oxy.* 16: 1909. Given that $350,000/1.5$ (the expected *embolē* rate on arable lands) = 233,333 arouras, we arrive at a very comparable order of magnitude from a different empirically attested starting point.

We also need a workable estimate for the vineyards and orchards. In *P.Cair. Masp.* 1: 67057, orchards cover 1,600 arouras, equivalent to 3.10% of the reported Antaeopolitan taxable land. In Aphrodito, orchards amount to 11.5%,

¹²⁶ R. Bagnall 1993a, 334–35, and above n. 15, for the Cynopolite's much reduced area. Estimates have to take into account uncertainties resulting from differences in ancient Egyptian measurement units, on which see Durisch Gauthier 2002, 17 n. 152.

for the lands whose taxes are processed by the village (*kōmētika* lands).¹²⁷ Vineyards (*ampelos*) amount to 5% in Antaeopolis and 1.8% of the village's *kōmētika* lands. The land category *dendritikē*, which incorporated vineyards and orchards in Philadelphia, accounted for about 7.5% of the taxable land there in the early third century, and valley nomes probably included lesser percentages of such lands than the Fayum.¹²⁸ The proportion of lands dedicated to any given type of cultivation could shift dramatically over time. In later second century Theadelphia, the proportion of vine and garden land might have increased from 6–7% to 30% in the course of 50 years as an indirect consequence of the Antonine plague.¹²⁹ In the Delta, the percentage of land in gardens and orchards may have been as low as 0.71% and even 0.5% of all cultivated lands in some cases.¹³⁰ Estimates of 10% for vineyards and orchards combined or 8% for orchards alone have been suggested for the Oxyrhynchite.¹³¹ Such numbers are plagued by a high degree of uncertainty but do provide a sense of the order of magnitude.

We will assume that taxable cultivated lands included 2% vineyard and 8% orchard, which implies that arable constituted on average 90% of taxable lands.¹³² *P.Cair.Masp.* 1: 67057 indicates that vineyards provided 7/12ths artaba/aroura toward the *embolē*, and orchards provided nothing. Finally, at some point in the later sixth century, *P.Oxy.* 1: 127 testifies to a contribution by the Apiones to the *embolē* of at least 52,800 artabas (with the two last digits missing) from their Cynopolite branch alone.

We are now in a position to posit a system of equations. If k represents the *embolē* rate on arable lands, S_1 and S_2 the cultivated areas in the Oxyrhynchite and the Cynopolite respectively, and S_{2a} the Cynopolite cultivated area under Apiones' administrative responsibility for tax purposes, these four factors should square with the four following equations:

$$\left\{ \begin{array}{l} S_1 \text{ (in aouras)} = 199,461 / 0.90 = 221,623 \\ 52,800 \text{ (in artabas)} = kS_{2a} \cdot 0.90 + [7/12 \cdot S_{2a} \cdot 0.02] = S_{2a} [k \cdot 0.90 + 7/12 \cdot 0.02] \\ 350,000 \text{ (in artabas)} = k(S_1 + S_2) \cdot 0.90 + [7/12 \cdot (S_1 + S_2) \cdot 0.02] = (S_1 + S_2) \cdot [k \cdot 0.90 + 7/12 \cdot 0.02] \\ S_2 > S_{2a} \end{array} \right.$$

¹²⁷ Gascou 2008, 257.

¹²⁸ Bagnall 2002, 11.

¹²⁹ Hickey 2001, 63. Orchard lands constituted 18% of all private land in 216/217 at Theadelphia; see Schubert 2001, 12.

¹³⁰ Blouin 2014, 190–91 and 218, Tables 6.4 and 7.4, vs. 7.49% in Phernouphites—Table 7.3.

¹³¹ Rowlandson 1996, 17; Rathbone 1990, 125; Hickey 2001, 61–65.

¹³² The assumed proportion of vineyards is not far from Hickey 2001, 71–72, which offered median estimates for the Apiones estate of 2.8%. At the same time, explicit orchards and gardens related payments are rather rare in the Apiones' accounts; see Hickey 2001, 194–95.

If we assume $S_2 = S_{2a}$, that is, the Apiones exercised complete administrative control over the Cynopolite, then we are left with two equations and two unknown factors, k and $S_2 = S_{2a}$. We then obtain the following relationship:

$$350,000 - 52,800 = (199,461/0.90) \cdot [k \cdot 0.90 + 7/12 \cdot 0.02]$$

We can thus solve for:

$$\begin{cases} k = 1.4770 \\ S_{2a} = 39,373 \text{ arouras.}^{133} \end{cases}$$

The variable k fits with what we would expect. If S_{2a} was strictly smaller than S_2 , we would obtain mathematically a bigger S_2 . For instance, assuming that $S_{2a} = 0.8 \cdot S_2$ (that is, the Apiones' tax administrative control covered 80% of the nome), the results become $k = 1.41$, $S_2 = 51,536$ arouras and $S_{2a} = 41,228$ arouras. The issue here is that the nome's cultivated area would significantly exceed its overall estimated area of 39,930 arouras. Obviously, there is a significant margin of error with the latter figure, as Bagnall warns.¹³⁴ Nevertheless, assuming a ratio of arable lands to total area similar to that in the Oxyrhynchite, that is 199,461/283,140 arouras, the overall area of the Cynopolite would have to reach about 66,000 arouras, 65% above the estimate. Although this cannot be totally excluded, it seems a safer assumption to suggest $S_{2a} = S_2$, since this leads to more compatible orders of magnitude. In any case, the Cynopolite's total cultivated area probably represented a higher proportion of its overall area than was the case in the Oxyrhynchite, while it is reasonable to assume a somewhat larger nome than estimated.

Several underlying assumptions imply margins of error. Nevertheless, these numbers display a combination of internal cohesion and acceptable orders of magnitude. *They imply that the Apiones would have controlled the entire Cynopolite nome for purposes of tax administration*—at least by the time of *P.Oxy. 1: 127*, deemed to be late sixth century.¹³⁵

¹³³ As a rule, we will provide all the digits for integers and up to 4 decimals for numbers below 10, in order not to compound roundings with the other intrinsic uncertainties. We are well aware that our margins of error must be in the range of 10%, meaning that last digits will always be meaningless.

¹³⁴ The Nile may have moved its bed eastward and some east bank compensation from nome XVIII might have increased the nome's area, although its West Bank territory would have been shared between the Oxyrhynchite and the Hermopolite, see Bagnall 1993a, 334 n. 3, which draws on Drew-Bear 1979 and Pruneti 1981.

¹³⁵ Such an assumption may find indirect support in *P.Oxy. 16: 2040*, where the Apiones' *oikos* is the sole contributor to the bath tax for the village of Takona that had received some payments from the Cynopolite in *P.Oxy. 16: 2028*. On the date of *P.Oxy. 1: 127*, Sarris 2006, 83 n. 12 argues for 572 based on the date of *P.Oxy. 1: 126*. Besides being published with consecutive numbers by the

Embolē Rates and Transportation Fees

As to the *embolē*, several Apiones accounts report two grain measures, the *metron artaba* and the *kankellos artaba*, the first being 15% greater than the second.¹³⁶ In the undated late sixth-century *P.Oxy.* 16: 1906, the receipts and payments for four different indiction years use two units, the standard *kankellos artaba* and a *megalos kankellos artaba*, which is explicitly attested to be 14% greater. The only complete indiction year (ll. 14–21) provides 79,069 “standard” artabas for the *embolē* (l. 17) to which a “donation” (*prosphora*) of 1,780 artabas is added (l. 18) to arrive at 80,849. This is equated in the papyrus to 70,877.25 artabas in the “mega” unit (l. 20) via the formula: $70,877.25 \times 1.14 = 80,800$. This number is only 0.06% away from 80,849.¹³⁷ In *P.Oxy.* 1: 136 (ll. 27–29), the contract of an Apion estate manager (*pronoētēs*), explicitly states that he has to provide 15 additional artabas on each 100 artabas collected for the regular *embolē*.¹³⁸ McConnell suggests *pronoētai* had to put pressure on taxpayers above and beyond their fiscal obligations in order to fulfill that commitment, and that this 15% constituted part of the profits the Apiones accrued as tax farmers.¹³⁹ Although there is no reason to deny that *pronoētai* needed to generate some profit in the process of tax collection—especially because they had to purchase their position—a more straightforward explanation for the purpose of this surcharge would be to relate it to the comparable *embolē*-related transportation fees noted in the Antaeopolis and Aphrodito accounts.¹⁴⁰ The two distinct artaba measures would normalize an accounting practice that allowed the fees associated with the *embolē* to be funded through grain levies that were 15% higher than required by the basic grain tax. Neither the *pronoētai* nor the Apiones would benefit, unless they were involved with transporting *embolē* grain to Alexandria (for which

editor of *P.Oxy.* vol. 1, we see no link between both papyri. Hickey 2008, 90, suggests it is roughly contemporary with *P.Oxy.* 18: 2196v (586–587).

¹³⁶ See *P.Oxy.* 55: 3804, at l.141–42 and the editor’s comment; cf. Katzoff 1988, 165–66.

¹³⁷ Mayerson 2006 and Rea 1998, 126–29 reckon that the *kankellos artaba* is an officially designated unit used with taxation-related measurements and including all surcharges, being 14% greater than the *mega kankellos* and 15% greater than the *metron artaba*. The Apiones customarily use the *kankellos artaba* as the standard unit for their overall tax contributions: *P.Oxy.* 1: 127 (ll. 1 and 8), *P.Oxy.* 18: 2196v (sections 1 and 2), *P.Oxy.* 1: 142; 16: 1906, 1907, 1914, etc. *Prospora*i normally designate pious donations; see Hickey 2001, 140–44. The additional grain charge might have benefitted some religious institutions in Alexandria, as suggested by the editors of *P.Oxy.* 16: 1906. Generally, speaking, grain payments could employ differing local measures across Egypt, see Hardy 1931, 74–75 and n. 6. On the different artaba units, see Shelton 1977, 55–67; Bagnall 2009, 185–89.

¹³⁸ Johnson and West 1949, 58–62; Gascou 2008, 139–41.

¹³⁹ McConnell 2013, 57–62, 68–70, 78 and 87.

¹⁴⁰ See above “Aphrodito and the *embolē*’s transportation fees.” The *logos navarchios* charge settled in gold in Antaeopolis was worth almost exactly 15% of the *embolē*.

there is no evidence), or were able to retain part of this fee, or levy more grain than reported. Our model 1.4770 *embolē* rate is indeed not very far from a 1.25 standard rate on arable plus 15% transportation fees and possibly some additional surcharges; it is also very close to $1.25 + 18\% = 1.4750$, a ratio we had previously encountered in Aphrodito and Antaeopolis.¹⁴¹

Returning to *P.Oxy.* 16: 1906, cash fees were shipped to Alexandria along with the grain: 172 *solidi* Alexandrian standard (l. 21), which is very close in value to the 1,780 artabas of *prospora* added at l. 18, each being worth 2.25% of the *embolē*. Overall, 14% in grain had been added to a shipment to which a 2.25% charge in gold had also been incorporated. Again, this is very comparable with the transportation fee structure highlighted in Aphrodito and Antaeopolis. This points to interrelated practices across Egypt, even if the mediums of payments and the technical terms varied locally. Other Apiones accounts display explicit shipping fees paid in cash in *solidi* Alexandrian standard and linked to grain shipments denominated in *kankellos artaba*: for instance 11.15 *solidi* for an *embolē* shipment of 1,485.25 artabas (*P.Oxy.* 1: 142, ll.7–10); 1.2604 *solidi* for an *embolē* shipment of 192.5 + fractions artabas (*P.Oxy.* 55: 3804, col vii l. 150); 5.33 *solidi* for 800 artabas (*P.Oxy.* 16: 1913, col. iv ll. 61–62); 16.33 *solidi* for 2,025.25 artabas (*P.Oxy.* 16: 1912 col. viii l. 120, with fragmentary charges l. 121); 55.5 *solidi* per 10,000 artabas (*P.Oxy.* 1: 127, ll. 3 and 9); almost 27.75 *solidi* for 3,585.25 artabas (*P.Oxy.* 20: 2195, col. viii ll. 130–31). The fees are worth about 8.5%, 7.5%, 7.5%, 9%, 6.25% and 9% of the grain cargoes respectively with a 12:1 conversion rate between artabas and *solidi*, implying various payment splits between cash and grain across the Apiones estates.¹⁴² Fees of 14–15% paid in grain and 2.5–8% in cash remain compatible with the overall fees in the region of 18–20% in the Antaeopolite.

The Apiones' Gardens

The tax assessed in gold over the combined Oxyrhynchite and Cynopolite nomes is reported to have been 24,500 *solidi* in the late sixth-century *P.Oxy.* 16: 1909. We will assume that by this point the rate had returned to the original 2 carats/aroura Aphrodito yield on arable lands and to the gold countervalue of 8 carats + $5 \frac{2}{3}$ artabas/aroura = 20 carats/aroura on vineyards

¹⁴¹ See above, nn. 112, 113 and 115.

¹⁴² Hardy 1931, 52, n. 5 suggested the Apiones may have been responsible for the transport as far as Alexandria only. In *P.Oxy.* 16: 2022, freight fees of about 10% seem to have been added to grain quantities whose value is commuted into gold. In *P.Oxy.* 16: 2026, charges of 20% and 15% are added to grain shipments.

from *P.Lond.* 5: 1674.¹⁴³ The question remains, however, was this the actual amount collected in cash in the Oxyrhynchite and Cynopolite nomes, or was it instead a proportional amount sent to imperial *fiscus*, after deductions for local fees and expenses? In Aphrodito, the sums actually sent to the imperial authorities averaged 83% of the gross receipts in the 545–550 period, implying that a proportion of the tax proceeds was retained locally.¹⁴⁴ The same observation applies to Antaeopolis, where *P.Cair.Masp.* 1: 67057 shows that about 1,260 *solidi* in tax proceeds are spent on local expenses, representing almost 13% of the gross cash receipts, and probably more in standard years since significant arrears of the *kanonika* had been levied. Consequently, the 24,500 *solidi* at *P.Oxy.* 16: 1909, obviously a rounded figure, did not represent the gold tax levied in the combined Oxyrhynchite and Cynopolite nomes, but a net amount forwarded to the imperial treasurers after various deductions had been made.

As Rea, the editor of *P.Oxy* 55, and McConnell have pointed out, the Apiones *pronoētai* must have appropriated a proportion of the cash they collected, otherwise there would have been little incentive to take on a position entailing a meager salary and the payment of significant compensations to the estate owners¹⁴⁵—12 *solidi* are reported at *P.Oxy.* 1: 136 (l. 30). It has been suggested that estate managers collected a fee of about 2 carats per *solidus*, equivalent to 8.33%, on the cash totals they collected. Others have suggested that the differences between public and private standard *solidi*, which range from 17 to 32 percent, may have been conversion fees collected as compensation by the *pronoētai*.¹⁴⁶ It is impossible to know to what extent these spreads exceeded the actual overvaluation of copper coinage as well as losses arising from underweight coinage. If we assume a true net profit of about 2 carats per *solidus*, and we apply this to the 16–20 estate managers thought to have been operative at any given time,¹⁴⁷ with the Apiones' overall gold income in the range of 14,000–18,000 *solidi* at *P.Oxy.* 16: 1918v and 18: 2196v, each *pronoētēs* would have earned on average close to 100 *solidi*, which is more than enough to compensate for the above mentioned fee of 12 *solidi*. The taxpayers will ultimately have borne this cost on top of their actual tax debt, so it should not impact our overall estimates.

The Apiones estate itself also probably netted some surplus income as it took advantage of its position as intermediary of the imperial state's fiscal

¹⁴³ See above nn. 70 and 72.

¹⁴⁴ Zuckerman 2004, 188.

¹⁴⁵ Rea 1988, concerning *P.Oxy.* 55: 3804 n. 154 and McConnell 2013, 68–70.

¹⁴⁶ West and Johnson 1944, 61, n. 66 ; Zuckerman 2004, 71–78.

¹⁴⁷ Hickey 2001, 69 with *P.Oxy.* 16: 2032. See also Ruffini 2008, 107.

requirements as a tax farmer. The fact they tended to send rounded amounts to the imperial *fiscus* hints at the existence of some margin.¹⁴⁸ At a minimum the Apiones—like the village of Aphrodito—somehow had to provide compensations and salaries to some of the personnel who handled the tax- and rent-levying process. In *P.Oxy.* 55: 3804, the *pronoētēs* receives 24 artabas and 2 *solidi* 5 carats, a group of superintendents combined get 5.73 *solidi* (col. vii), and several other payments go to other administrative personnel through the account. Comparable figures going to local officials and operatives can be found in some of the Aphrodito and Antaeopolis expense records.¹⁴⁹ Estimating the gross margin of the estate as tax farmer remains elusive, but as a working hypothesis we will use the Aphrodito average ratio of 83% between the sums actually sent to the *fiscus* and the amounts levied by the *oikos*'s managers.¹⁵⁰

If we continue to assume that vineyards and orchards constituted 2% and 8% respectively of taxable lands, the following function in carats should obtain:

$$24,500 \cdot 24 = 0.83 \cdot [(S_1 + S_2) \cdot 2 \cdot 0.9 + (S_1 + S_2) \cdot 20 \cdot 0.02 + (S_1 + S_2) \cdot g \cdot 0.08],$$

As above, $S_1 = 221,623$ and $S_2 = 39,373$ arouras, with tax rates on arable and vineyards amounting to 2 carats/aroura and 20 carats/aroura respectively. If g stands for the unknown average tax rate on gardens and orchards., the numerical result is $g = 6.4$ carats/aroura, within the range of our previous estimates based on figures from Antaeopolis and Aphrodito.¹⁵¹

The Villages Whose Tax Payments Were Managed by the Apiones

The independent villages under the indirect tax umbrella of the Apiones in the combined Oxyrhynchite–Cynopolite nomes paid a contribution of at least 53,490 and at most 53,499 artabas around the year 586/587. This most likely represented the fulfillment of their *embolē* requirements.¹⁵² When attempting to derive a figure for the taxable lands belonging to the category of “village”

¹⁴⁸ 6,917 *solidi* in the Alexandrian standard in *P.Oxy.* 16: 1918v work out to a little over 6,484 *solidi*, with the 6.25% discount between both units (see above nn. 26 and 38), which is almost exactly 90 pounds of gold. In *P.Oxy.* 1: 144, a payment of 2,205 *solidi* is sent by the estate, equated to 2,160 *solidi* pure gold standard (see above n. 26), which is exactly 30 pounds of gold; cf. McConnell 2013, 99 and Ruffini 2008, 105–106.

¹⁴⁹ *P.Aphrod. Reg.*, ll. 648–667.

¹⁵⁰ See above n. 144.

¹⁵¹ See above, the section “Orchards Should Not Be Ignored”.

¹⁵² *P.Oxy.* 18: 2196v, col. i.

(V_1) we assume: 1) vineyards paid their *embolē* using the same rates as in *P.Cair.Masp.* 1: 67057, i.e., 7/12th; 2) orchards provided no *embolē*; 3) tax rates on arable land inclusive of transportation fees equaled our model 1.4770 arabas/aroura; 4) Oxyrhynchite–Cynopolite land consisted of 90% arable and 2% vineyards. On this basis the following equation obtains:

$$V_1 \cdot (1.4770 \cdot 0.9 + 7/12\text{th} \cdot 0.02) = 53,495$$

Thus $V_1 = 39,893$ arouras.

Flax, fodder, dates, or oil cultivation could increase this area further, although some of these cultivationos may have been incorporated into the orchards category. Flax represented a fair proportion of the crop grown in private tenancy agreements in the fourth-century Oxyrhynchite.¹⁵³ Although there is no evidence that the Apiones' estate produced flax meant for the *vestis militaris* system of requisition, it might have contributed significantly to the cash income for some of the Apiones *prostasiai*.¹⁵⁴ Similarly, the cultivation of fodder did not match the Apiones' needs, implying it remained fairly marginal.¹⁵⁵ Pasture lands must have belonged to the *oikos*, but these untaxed lands are not even registered in Aphrodito. It is likely that tax schedules like *P.Cair.Masp.* 1: 67057, which catalog only arable lands, vineyards, and orchards, mask other forms of production (flax, fodder, etc.). Whether these were untaxed, were taxed as arable, orchards or vineyards, or followed some separate taxation scheme we cannot say with any certainty.¹⁵⁶ By relating revenues in gold and

¹⁵³ On the types of cultivations on Apiones' lands, see Hickey 2012a, 29–38. Regarding flax in the Dioscorus archive, see *P.Cair. Masp.* 1: 67116 (547/548). For the fourth-century Oxyrhynchite, see Rowlandson 1996, 237. Oxyrhynchus produced clothing for export in the third century as well; see Van Minnen 1986.

¹⁵⁴ Hickey 2001, 197–99 and 2012, 34–6.

¹⁵⁵ Hickey 2001, 192–94 and 80–3.

¹⁵⁶ Gasco 2008, 263, n. 119. The case of oil may testify to such mechanisms. Distribution of oil as a component of the *annona militaris* is well attested in the Apiones documentation. Oil presses do provide cash rents, although rents in kind are rare, and as such oil appears only as an expense in the surviving *pronoētai* synthetic accounts; see Hickey 2001, 195–96 and 2012a, 32–33, with *P.Oxy.* 58: 3958, ll. 27–28. Similarly, *pronoētai* accounts do not display any income in wine, as only cash and grain belong to the income side of these accounts; see Hickey 2012a, 63. Wine income and distribution in kind are attested by several schedules, for example *P.Oxy.* 16: 1916v; 27: 2480; 58: 3960; *PSI* 8: 953, cf. Hickey 2012a, 90–141 and 163–64. Barley and meat were provided to the soldiers as part of the estate fiscal obligations: *P.Oxy.* 16: 2010; 2013; 2014. Wine, barley, oil, and fodder followed specific accounting and taxation schedules, not reported in comprehensive documents like *P.Oxy.* 16: 1918v and 18: 2196v. It has even been suggested that the estate managers' accounts of the Apiones casually provided converted figures in cash instead of actual receipts in kind, hence the rarity of mentions of barley (although it appears sometimes as income, as for example at *P.Oxy.* 18: 2195, l. 73), and the absence of income from vegetables, dates, or figs in the *pronoētai* accounts; cf. Hickey 2001, 56–57 and 191–95, with *P.Oxy.* 18:

grain to land areas, we do not take account of the potential peculiarity of marginal cash entries like the *synteleia kephalēs*.¹⁵⁷ However, for purposes of this analysis, the three categories of arable, vineyards, and orchards seem to cover the vast majority of agricultural production and income.

In ca. 542, Oxyrhynchite villages whose taxes were processed through the Apiones paid a gold tax of 5,685.45 *solidi* on the Alexandrian standard (*P.Oxy.* 16: 1918v). Since this account was written after the first tax increase in Aphrodito, which occurred prior to 537 (if we assume the increase was not limited to the Antaeopolite), they would have been taxed at 3 carats/aroura on arable lands, about 21.5 carats/aroura on vineyards, and a tentative 8 carats/aroura on orchards—increased from the 6.4 carats we had estimated for the Apiones estate using modeling.¹⁵⁸ We will apply the same rate for effective tax yield estimated for Aphrodito during the period 545–550, that is 83% of the cash collected was rendered to the fisc.¹⁵⁹ The projected taxable area of the villages at *P.Oxy.* 18: 2196v (V_2) must then comply with the following equation in carats (taking into account a 6.25% discount to convert Alexandrian standard *solidi* into imperial *solidi*, as per above nn. 26 and 38):

$$V_2 \cdot (3 \cdot 0.9 + 21.5 \cdot 0.02 + 8 \cdot 0.08) \cdot 0.83 = 5685.45 \cdot 24 \cdot 0.9375$$

Thus $V_2 = 40,882$ arouras.

This means that V_1 and V_2 differ by 2.5%.

This is a remarkable result given that both figures derive from computations conducted on two different papyri separated by more than 40 years and dealing with different taxes whose rates were estimated independently from

2195, l. 73. Payments in kind were credited against gold tax dues at supposedly market prices, even if abuses were frequent (*CJ* 10.27.1; 10.27.2.5; *Proc. Anec.* 23.11–14). However, as the *oikos* had to purchase wine and fodder, we have a sense that these numbers remained small in comparison to the overall estate size, highlighting an almost autarcic balance; see Hickey 2012, 141–45. The median estimate of the vineyards needed to support wine distributions by the *oikos* stands around 245 arouras and would not have exceeded 872 arouras at most; see Hickey 2001, 65–70. This means that the numbers we will find if we examine only gold and wheat figures—namely area and profitability—will underestimate the underlying scale of production of the *oikos* to some limited extent and as such its overall area. However, since accounts in kind were generally balanced, it will not impact our estimate of profitability. The fact that some rents may incorporate leases on buildings and equipment on the land (see Mazza 2001, 113) or sales of different products like wood for irrigation equipment (*P.Oxy.* 55: 3805, l. 102) will actually play in the other direction, by reducing the area needed to generate such gross earnings. We assume this impact to be marginal at the scale of the entire *oikos*.

¹⁵⁷ See above nn. 85 and 88. All the *synteleia kephalēs* entries reach at best less than 1.5% of the the consolidated income figure in gold in *P.Oxy.* 55: 3804.

¹⁵⁸ See above n. 151.

¹⁵⁹ See above nn. 144 and 150.

one another, using contemporary papyri from another nome. It means that villages paying their tax dues through the Apiones' bureaucracy would have enjoyed a combined stable taxable value over that time span, implying relative stability for each village's taxable lands—something we would expect—as well as stability with respect to the list of villages reporting to the Apiones for tax purposes.

Each of our assumptions involves a degree of uncertainty, knowing which we do not aim at absolute figures but rather orders of magnitude. Regardless, the closeness of these two modeled results obtained through independent sources and estimated yields, provides support for the prevalence of Egypt-wide tax schedules. Otherwise there would have been little chance for Antaeopolite rates from different taxes applied to the Oxyrhynchite in two separate periods to provide acceptable and compatible orders of magnitude. Obviously this does not represent absolute proof, but it does offer a sense of plausibility. Finally, this does not mean that similar taxes bearing identical names applied all across Egypt with comparable rates. Regional and local diversity was obvious. Nevertheless, comprehensive schedules at a macro level were probably applied by the imperial authorities. Diversity was permitted within a system aiming at a certain degree of uniformity.¹⁶⁰

These results of these models presented thus far can be summarized as follows:

- Oxyrhynchite taxable cultivated area (late sixth century): 221,623 arouras
- Cynopolite taxable cultivated area (late sixth century): 39,373 arouras
- Combined taxable cultivated area of both nomes: 260,996 arouras
- Composite *embolē* rate: 1.4770 artabas/aroura
- Apiones' administrative control over the Cynopolite (late sixth century): 100%
- Cultivated area of villages in the combined Oxyrhynchite–Cynopolite calculated on the basis of their *embolē* contribution (ca. 586–587): 39,893 arouras

¹⁶⁰ At *P. Lond.* 5: 1674 (ll. 30–34), the petitioners claim that the low original yield on arable of 2 carats/aroura—applied to the entire Antaeopolite—stemmed from the relative poverty of their lands. This may be pure rhetoric, or it may imply that other nomes had paid a higher average tax rate during that period. Regarding uniform tax rates applied over Egypt, see especially Carrié 1993, where a late fourth-century military tax schedule originating from Constantinople that applied to the entire East explains the arithmetic behind *P. Oxy.* 16: 1905, and Gasco and Worp 1984, which shows two of the fourth-century military taxes maintaining a stable ratio, albeit with some limited regional variations.

- Cultivated area of villages in the combined Oxyrhynchite–Cynopolite calculated on the basis of their gold tax contribution (*ca.* 542): 40,882 arouras

The Area Administered by the Apiones for Tax Purposes

We have estimated the cultivated area of the Cynopolite and the area under the category of villages in the Apiones fiscal accounts for both nomes. The overall size of the lands owned or managed by the Apiones directly for tax purposes must now be addressed in this section. Jones had combined the Apiones' grain *embolē*, figures for which are furnished by *P.Oxy.* 1: 127, with the grain tax rate from *P.Cair. Masp.*1: 67057 to obtain a "high mark" evaluation of the combined Apiones estates in both nomes of 112,000 arouras.¹⁶¹ Hickey reached a much lower figure of approximately 21,000 arouras based on the knowledge that the Apiones controlled about 600 arouras of vineyards and that these constituted about 2.8% of the total landholdings under their administrative control.¹⁶²

Although the rationale behind Hickey's overall approach is perfectly sound and convincing, his margins of uncertainty are enormous. He reaches his estimate of 600 arouras of vineyards using fragmentary accounts and extrapolating a number for the approximately 20 *prostasiai* controlled by the Apiones, which he does using the proportion of vineyards known from six different *prostasia* accounts. This results in an extremely wide range: 245–1,172 arouras. Moreover, the 90 arouras of vineyards used as the base estimate for the proportion of vineyards providing cash rents to the Apiones represent a number extrapolated from a combined rent of slightly over 260 *solidi* assembled from figures in 21 papyri, including two where the rent is missing. Hickey assumes the rental rate itself was 3 *solidi* per aroura on the basis of a single reference at *P.Oxy.* 16: 1915 (l. 6), his reference number 6. But his reference number 7 (l. 22) provides a much lower rent of 10 *solidi* on 30 arouras—nine-fold lower than 3 *solidi*/aroura. Using it would lead to 780 instead of 90 arouras as a base for further projected estimates. However, Hickey's choice to reject his reference number 7 as an outlier was certainly correct, since rents in kind customarily provided around 150 *diplo*/aroura, and the 8-*sextarii dip-loun* was valued at about 30/*solidus*, leading to an equivalent gross yield of 5 *solidi*/aroura, compatible with 3 *solidi*/aroura plus wages.¹⁶³ Nevertheless,

¹⁶¹ Jones 1986 (1964) 784; cf. Sarris 2006, 85.

¹⁶² See above Table 2, l. 5 and nn. 35–6.

¹⁶³ Hickey 2001, 65–74; 208–11, Table 2.1, 84, 255–6, Table B.3; 2012a, 135. Hickey 2012a, 58 notes that the *apotakton chōrion*, rents invariably paid by communities of farmers that he convincingly links to rents for vineland, are generally divisible by three.

600 arouras are only an average within a range whose upper limit is four times its lower limit, leaving an extremely high degree of uncertainty. Provided the assumption that 2.8% of the Apiones' estates was under vines is in the correct order of magnitude, the 21,000 arouras total he extrapolates from his 600 arouras figure could have ranged as high as 45,000 and as low as 12,000 arouras. Moreover, since a larger area (arable lands) is extrapolated from a smaller area (vineyards), any margin of error with respect to the postulated 2.8% figure is amplified—if the proper multiplier were 4%, the total area of cultivation would reach only 15,000 arouras, and if vineyards were 1%, this would result in an estimate of 60,000 or even as high as 117,000 arouras. Our own models do acknowledge that proportions under vines or orchards could vary, but the impact of this variability is marginal since we start with estimates of the main body of arable lands using taxation revenues, and add vinelands and orchards only at the end, thereby deleveraging the margin of error.

Hickey also offers an alternate approach to calculating the Apiones' holdings by using their overall grain receipts. The results fall on the lower end of a range between 18,000–22,000 arouras of arable lands.¹⁶⁴ But this is no safer, since it assumes that all grain lands paid their rent entirely in kind. In reality, mixed or cash rents were applied to arable lands, while a clear majority of the Apiones' arable lands paid their rental income in cash or in both cash and grain.¹⁶⁵ For this reason, any attempt to guess the size of the Apiones'

¹⁶⁴ Hickey 2008, 90–91.

¹⁶⁵ Among the surviving evidence for late Roman Oxyrhynchite land leases, *PSI* 1: 77 (551) and *P.Berl. Zill.* 7 stipulate mixed rents on grain and cash for arable lands. More generally, among a list of 198 leases of all land types from fourth- to seventh-century Egypt, 26 concern arable land paying mixed or cash-only rents, the overall proportion being probably higher as some contracts are incomplete; see Herrmann 1958, 274–90. Cash rents on grain lands are not unknown for earlier periods either, even if most arable lands alternated grain and cash rents following a grain–fodder/grain–vegetables rotation system; cf. Rowlandson 1996, 236–47, with 244–45 and n. 121–22. Among the Apiones' accounts, *P.Oxy.* 16: 1915 displays a mixture of arable lands and vineyards (ll. 14–15 and 24–25) whose rents are paid entirely in gold. A clear majority of Apiones individual rents in the *pronoētai* rent rolls do incorporate cash components or cash only, and there is little doubt that most of them pertained to arable lands. In *P. Oxy.* 55: 3804, 84 entries are denominated in cash without further mention; 14 display a grain–cash combination, 1 provides only just grain, 10 concern other land-types or objects, including vineyards and orchards. There are more mixed cash–grain payments in *P.Oxy.* 16: 2037; see Mazza 2001, 116–17. Cash rents dominate the entries in *P. Oxy.* 55: 3805 as well. Most of them must concern arable lands, since other types of cultivations are often made explicit: orchards and gardens in *P.Oxy.* 16: 1913 ll. 4, 7, 22, 69 and 15–16; 55: 3805, ll. 89–90; palm trees in *P.Oxy.* 55: 3804, ll. 46, 60, and 158, etc.: Mazza 2001, 111–14. This allowed the *pronoētai* of the Apiones to fulfill their obligations in providing as much gold income as possible to their masters while getting close to balancing their grain accounts locally as often as possible; see McConnell 2013, 63–67.

arable lands using rental income in artabas alone is doomed from start since it neglects the gold component of income.¹⁶⁶

In fact, Hickey himself correctly acknowledged this impact in his original dissertation. After finding that wine-related income would not exceed about 900 *solidi* out of a total cash income of about 13,000 *solidi*, Hickey had come to the conclusion that the balance of the house's income derived from "flax land (significant, I suspect), or land bearing other crops (as a rule, gardens and orchards, but *also arable land* during this period)."¹⁶⁷ Indeed, this finds strong support from the fact the Apiones' *embolē* exceeds 80% of their consolidated grain income,¹⁶⁸ a result that could not have been achieved without local arable lands providing cash rents to the estate.

In order to verify these observations, we will test a "minimalist" scenario in which the Apiones' arable lands paid their rents in grain entirely through a 50% share-cropping agreement. In *P.Oxy.* 1: 127, the Apiones paid 140,618 artabas in *embolē* split between the Oxyrhynchite and the Cynopolite. Subtracting the villages' contribution of 53,000 artabas (actually rounded from a figure between 53,490 and 53,499 artabas) from this total, Hickey arrived at 87,618 artabas (rounded from 87,119–87,129) for the Apiones' *embolē* excluding the amount paid by the villages.¹⁶⁹ Splitting the actual figure down the middle, we arrive at 87,125 artabas.

According to *P.Oxy.* 18: 2196v, the Apiones' overall grain receivables (*lemmata dia pronoeton*) amounted to 108,816.5 artabas, with arable lands owned by the Apiones paying a rent of about 5.5 artabas/aroura, while lands they did not own would pay their grain tax at a rounded 1.5 artabas/aroura.¹⁷⁰

If we call x the area that belongs to the Apiones proper and y the area owned by others who nevertheless paid their tax dues through the Apiones, the following function would describe the quantity of grain paid to the Apiones:

¹⁶⁶ See Johnson and West 1949, 55 n. 36 or Mazza 2001, 81.

¹⁶⁷ Hickey 2001, 201 (italics mine).

¹⁶⁸ Hickey 2008, 90 noticed this very high proportion with respect to the Apiones' overall grain receivables and suggested that they might have commuted some of their gold tax into grain. We find this extremely unlikely, as the general tendency in the later sixth century was the opposite. The authorities required more and more gold at the expense of grain; see Zuckerman 2004, 217 and n. 261 with John of Nikiu, *Chron.*, 95. In *P.Oxy.* 16: 1909, all the grain had been adaerated into gold. Finally, the Apiones gold tax payment in *P.Oxy.* 18: 2196v is almost twice the figure in *P.Oxy.* 16: 1918v. It would be difficult to combine both assumptions that the Apiones had commuted a significant proportion of their gold tax into grain *and* paid an enormously higher gold tax at the same time, especially since the villages' gold tax shows no such surge.

¹⁶⁹ Grain yield from Hickey 2008, 90.

¹⁷⁰ Not all the lands paying their dues to the Apiones' *pronoētai* belonged to the Apiones, on which see above n. 29. A 5.5 artabas/aroura rate is suggested by Hickey 2008, 91, from Rathbone 1991, 243 and 2007, 703–4.

$$5.5x + 1.5y = 108,816.5$$

On the *embolē* side, the combined total paid by both types of properties should be described:

$$1.5(x + y) = 87,125$$

Combining these equations results in an improbably low $x = 5,423$ arouras. This confirms that an important proportion of the Apiones' income from arable lands had to be paid in cash.

Armed with this knowledge, we must now reexamine the Apiones' contributions in grain and gold in order to reach estimates of the estate's size—or, more accurately, the size of the lands directly managed by the estate for tax purposes (S_{a_2}). We have just noted that the combined *embolē* yield of all properties managed by the Apiones was 87,125 artabas in the late 580s. If we retain the standard yields and percentages used above (arable lands constitute 90% of taxable land and pay an *embolē* rate of 1.4770 artabas/aroura; vineyards constitute 2% of taxable land and pay an *embolē* rate of 7/12th artabas/aroura), the equation for S_{a_2} in 586–587 is:

$$1.4770 \cdot 0.9 \cdot S_{a_2} + 7/12\text{th} \cdot 0.02 \cdot S_{a_2} = 87,125$$

$$\text{Thus } S_{a_2} = 64,972 \text{ arouras}$$

Including the 39,893 arouras of village lands settling their *embolē* through the Apiones, the *oikos* would have been responsible for 104,865 arouras in total. Assuming a 100% tax control over the Cynopolite, whose cultivated lands had been estimated at 39,373 arouras, about 65,492 arouras in the Oxyrhynchite alone would have fallen, directly or indirectly, under the Apiones' tax control. Given that the estimated taxable area of this nome is 221,623 arouras, the Apiones would have been responsible for almost 30% of its *embolē* in the late 580s and for a higher percentage for the two nomes combined—40%. The only major issue with this estimate is that we combine figures from an undated account (*P.Oxy.* 1: 127) and a dated one (*P.Oxy.* 18: 2196v), as did Hickey. While Hickey's careful paleographical examination suggests chronological proximity between the two, the small but significant differences displayed by the *embolē* accounts from *P.Oxy.* 16: 1906 serves as a reminder that we are working only with estimates, albeit within acceptable orders of magnitude.¹⁷¹

¹⁷¹ *P.Oxy.* 16: 1906 is undated, and it cannot be proven that it concerned the Apiones, although the size of its shipments seems to suggest so. Its only complete indiction year (ll. 14–21) provides

In *P.Oxy.* 16: 2040 (566/567), the *oikos* paid 30% of a public bath contribution,¹⁷² and a rough proportion of one-third seems generally consistent with the Apiones fiscal obligations in both nomes over much of the century.¹⁷³ This would seem generally to support our results, although the argument can only be carried so far: in *P.Oxy.* 16: 2020 from the 580s, an account of fiscal contributions in barley, the Apiones provided only 76.5 artabas out of 15,688 artabas on behalf of a single taxpayer.¹⁷⁴

The gold accounts in *P.Oxy.* 16: 1918v provide a straightforward piece of information: in the early 540s the estate contributed a gold tax of 6,917.73 *solidi* on the Alexandrian standard, excluding the villages' accounts. Using the same 83% ratio between collected and effectively contributed cash,¹⁷⁵ the Apiones would have collected about 8,333 *solidi* in order to contribute 6,917 *solidi*, which would translate to about 7,810 *solidi* imperial standard effectively levied.

With estimated rates of 3 carats/aroura for arable land, 21.5 for vineland, and 8 for orchards at this date,¹⁷⁶ the taxable area managed by the Apiones in the 540s (S_{a1}) can be expressed by the following equation in carats:

$$7,810 \cdot 24 = S_{a1} \cdot ([3 \cdot 0.9] + [21.5 \cdot 0.02] + [8 \cdot 0.08])$$

Therefore $S_{a1} = 49,719$ arouras (to be compared with $S_{a2} = 64,972$ arouras in the late 580s).

P.Oxy. 18: 2196v provides gold receipts and tax payments from ca. 586–587 that can be compared to those of *P.Oxy.* 16: 1918v of the early 540s, a unique opportunity to assess what may have changed between both dates. The estate's gold gross income increases from 14,325.1875 to 18,519.99 *solidi* Alexandrian standard,¹⁷⁷ a rise of 29.3%, while the gold tax payment roughly

wheat receivables of 98,321 in the mega-unit, hence 112,086 artabas—very close to the 108,816.5 artabas in *P.Oxy.* 18: 2196v and an *embolē* of 79,069 + 1,780 = 80,849 artabas, 7.7% lower than the 87,618 artabas. If this account pertained to the Apiones—as such numbers suggest—they would have enjoyed a gross surplus of 31,237 artabas that year instead of the 21,692 calculated using *P.Oxy.* 1: 127 and 16: 2196v.

¹⁷² See above n. 24.

¹⁷³ Gascou 2008, 168–69.

¹⁷⁴ West and Johnson 1944, 54–55 and Gascou 2008, 170–71.

¹⁷⁵ See above nn. 144 and 150.

¹⁷⁶ See above n. 158.

¹⁷⁷ All these amounts follow the Alexandrian standard with the possible exception of the *analōmata* in specie of the estate, although the private standard mention may have been crossed out; see Hickey 2008, 93. Generally speaking, individual receipts and *pronoētai* accounts are denominated in *solidi* private standards, while more global accounts use consistently the Alexandrian standard: Rea 1998, notes on *P.Oxy.* 55: 3805, and Hickey 2008, 92 n. 23. The issue of the exact conversion rate between both standards does not matter here, as all our estimated numbers use global Apiones accounts.

doubles, from 6,917.73 to 13,541.875 *solidi*, while the villages' account remains stable within a range of -2.7% to +14.8%. The disproportionate rise in the gold tax has to involve some degree of adaeration of the grain tax, as Hickey has suggested.¹⁷⁸ We will return to this question.

For now, we can tabulate the following estimated figures (Table 15):

Table 15. The Areas under Apiones' Management

<i>Area under Apiones' direct fiscal management— from gold tax (540–542)</i>	<i>Area under Apiones' direct fiscal management— from grain tax (586–587)</i>	<i>Implied growth</i>	<i>Villages' taxable area from gold tax (540–542)</i>	<i>Villages' taxable area from grain tax (586–587)</i>	<i>Difference in percentage</i>
49,719	64,972	+30.7%	40,882	39,893	-2.4%
Apiones' gross gold receipts	Apiones' gross gold receipts		Villages' gold contribution	Villages' gold contribution range (late 580s)	
14,325.1875	18,520	+29.3%	5,685.5	5,527–6,526	-2.8%– +14.8%
Apiones' payments of the gold tax	Apiones' payments of the gold tax		Area under Apiones' overall tax management including villages (early 540s)	Area under Apiones' overall tax management, including villages (late 580s)	
6,917.73	13,541.875	+95.8%	90,601	104,865	+15.7%
Apiones' net after tax gold income (540–542)	Same (586–587)				
7,407.46	4,978.11	-32.8%			

Note: Numbers found in the papyri are rendered in bold. All other numbers are estimates or computations.

¹⁷⁸ Hickey 2008, 94–95. *P.Oxy.* 16: 2020 and 2023 provide solid evidence that grain could be adaerated in the sixth-century Oxyrhynchite.

Most of these numbers are orders of magnitude, not exact figures. Differences of a few percentage points are not meaningful when taking into account the compounded margins of uncertainty arising from the hypotheses and choices underlying these computations. With these caveats in mind, it is abundantly clear that the numbers highlight a broad compatibility between *P.Oxy.* 16: 1918v, *P.Oxy.* 1: 127, and *P.Oxy.* 18: 2196v on the one hand and the Aphrodito and Antaeopolis grain and gold tax rates on the other. It is particularly striking that the estimated growth of the Apiones' estates calculated on the basis of their *embolē* contribution fits so neatly with the growth pattern detectable in their gold receivables.

We are now prepared to make a few larger observations:

- The Apiones appear to have slowly but steadily increased the size of their estates, confirming what has been suggested by several previous studies on the topic.¹⁷⁹ This growth would have been more moderate than sometimes believed, but still noteworthy: about 30% over 45 years is equivalent to a compounded annual average of 0.58%. Their earlier 22% share in *P. Mich.* 15: 737 may suggest an almost two-fold increase over a century.¹⁸⁰
- Our estimate of 50,000 to 65,000 arouras under the Apiones' direct tax responsibility falls somewhere between Hickey's estimated 20,000–25,000 arouras and Jones's 112,000, although all estimates still incorporate independent owners without whose lands the actual size of the Apiones' holdings would have been lower.
- The Apiones' income in gold seems to have grown in line with the size of the properties they ran. This raises the question of the lack of long-term productivity gains achieved by the estate¹⁸¹ as well as the likely immutability of their rental arrangements.¹⁸²
- Their net income in cash collapsed (Table 15, last line, columns 1 and 2). The most likely explanation for this disproportionate

¹⁷⁹ See Hickey 2008, 99 and n. 55.

¹⁸⁰ See above n. 23.

¹⁸¹ The Apiones dossier records productivity-related investments, including the irrigation tools of *P. Oxy.* 16: 1911 cols. vii–viii; see Mazza 1998, 169 and 172; and waterwheels in *P.Oxy.* 1: 137; 16: 2035; 18: 2197 and 19: 2244; see Mazza 2001, 120–122; cf. Tacona 1998, 128–29. Regarding water wheels on other large private estates, see Banaji 2001, 135, with *P.Oxy.* 34: 2724 (469) and 1899 (476). On dependent labor and irrigated lands, see Haug, 2014. The expected lifetime for a new waterwheel axle ranged between 5 and 7 years: *P.Oxy.* 16: 1988 and 1: 137. In Aphrodito, waterwheel carpenters provide two-thirds of the gold tax paid by artisans in 525/526; see C. Zuckerman 2004, 225. The widespread diffusion of the waterwheels dates to the third century; see Rathbone 2007, 701, n. 16 and Hickey 2008, 99–100 and n. 61.

¹⁸² Hence the most likely explanation for the absence of actual leases linked to the Apiones, three to four in total; see McConnell 2013, 28–30.

increase in gold contributions must be a partial adaeeration of the grain tax.

- One cannot handle such a dossier without a sense of its chronological dynamics. Properties grew and disappeared. By the end of the sixth century, the Apiones processed the *embolē* for the entire Cynopolite. Provided the estate where Christodora of Cynopolis owned a third share at the beginning of the sixth century was located in the Cynopolite (*P.Oxy.* 16: 2026), it would have most likely disappeared by the end of the century.¹⁸³ A significant proportion of the Apiones' possessions in that nome might have derived from the absorption of that single property.

This organic growth does not seem to have been engineered at the expense of the villages for which they processed tax payments since the area under that category does not show any sign of decrease. Although we cannot rule out limited changes within the list of contributing villages,¹⁸⁴ their accounts' overall stability implies a strong degree of continuity.

All of this supports of a scenario of a technologically stagnant *oikos* that grew more as a result of incorporating other significant properties, possibly including imperial estates, than by following a piecemeal strategy of absorbing small farms.¹⁸⁵

¹⁸³ See above n. 21.

¹⁸⁴ *P. Oxy.* 16: 1918v provides the village names. *P. Oxy.* 18: 2196v does not. I owe this information to Todd Hickey, pending his forthcoming edition of the latter papyrus. This confirms Bagnall 2008, 190, on Aphrodito, where a person of senatorial status and a relatively egalitarian village of small landowners coexisted as part of a stable equilibrium. In the same vein, see Rowlandson 2007, 217: "The presence of the Apion House had not extinguished its vitality or reduced its population to a collection of servile laborers"; Bowman 1985, 155: "It is difficult to find any clear indication in the registers that the very wealthy were systematically absorbing the holdings of the less prosperous landowners to a more marked degree than earlier . . . if the prime evidence for the development of the 'Byzantine large estate' can be found in the fourth century, it will not come from the Hermopolite land-lists."

¹⁸⁵ This would seem to be confirmed by the stability of the estate's structure as attested in the accounts of receivables produced by the same administrative unit over a span of 9 years, even if the numbers they record are ideal targets; see *P.Oxy.* 16: 1911 (556/557) and 55 3804 (565/566), whose consolidated figures are summarized in Banaji 2001, 223 table 2; their very limited differences are discussed by McConnell 2013, 64 and 88. Other pieces of evidence point in the same direction: in *P.Oxy.* 16: 1899 (476), a place named Piaa belongs to a grandee named Flavius Alexander; the same place resurfaces a century later in one of the Apiones' accounts (*P.Oxy.* 16: 1912). See also the case of the *dikaion* Kephala, probably the former property of a Kephala, whose name appears in no less than seven distinct *prostasiai* of the Apiones, suggesting an original property of significant size, cf. Hickey 2012a, 59–60 and nn. 110–11. Nor can the *dikaion* Diogenous involve a small owner, to judge by the size of the loan on which he defaults, 80 *solidi* (*P.Oxy.* 63: 4397, dated 545). His former estate's contributions exceed a countervalue of 70 *solidi* in *P.Oxy.* 55: 3804, and they appear in no less than three other Apiones' accounts; see Mazza 2001, 135, n. 246. Such occurrences do not preclude the effective absorption of smaller entities, and some of the *dikaion* entries in *P.Oxy.* 55: 3804 are small—although they are generally larger

The Apiones: A House of Privilege?

Another possible scenario involves tax privileges. *P.Oxy.* 1: 144 (580) suggests an annual tax liability in gold of 6,480 *solidi*, or 6,912 *solidi* on the Alexandrian standard.¹⁸⁶ This is similar to the early gold contribution in *P.Oxy.* 16: 1918v from the 540s, which amounted to 6,917.73 *solidi* on the Alexandrian standard. This implies fundamental stability in the tax revenues provided by the Apiones. The area under the Apiones' tax responsibility could not have expanded much between the 540s and 580s. Otherwise their tax schedule would have reflected the growth in their capacity to generate revenue.¹⁸⁷ Is it possible that the Apiones' estate did not grow between 580 and 586–587 either?

If that were the case, the 64,972 arouras estimated through the *embolē* contributed in 586–587 would have remained in some fixed relationship with a 6,480 *solidi* gold tax throughout the ca. 540–590 period. If we assume 83% of gross receipts were effectively forwarded to the central government, the amount levied in gold would have to have reached about 7,810 *solidi*. The composite tax rate in gold would have been almost 2.90 carats/aroura. This

than the average tenancy plot. One property (which might have been purchased from the village of Herakleion, cf. *P.Oxy.* 19: 2243a, l. 11 with Sarris 2006, 35 n. 50) contributes 18 *solidi*, well above the average. Finally, the Apiones' fortune might have started with the acquisition of the estate of a fifth-century curial named Theon; see Azzarello 2006, 212, n. 12. This points to the relative paucity of isolated acquisitions of small properties. This could imply that selling and buying properties was not an easy process, although the high turnover in land ownership documented by the Hermopolite land registers points rather in the opposite direction; see Bowman 1985. Most likely, large owners focused on other large properties. A comparable observation may be drawn from the Hermopolite account *P.Bad.* 4: 95, where the single acquisition of the *georgion tou Onianiskou* brings in over 47 *solidi* of additional cash income and increases the property's overall cash income by 27% between indiction 8 and 9, quite a substantial amount; see Schnebel 1928, 36; Hickey 2007, 304 n. 123. Large landowners would still have been in a position to manage and thereby acquire a growing proportion of public lands, through the process of *emphyteusis*, widely documented by late Roman legal sources. This would be particularly true for the Apiones, who most probably climbed the social ladder from Strategius I's position as administrator of imperial estates in the nome; see Palme 2014, 19–21; Azzarello 2012, 58–65; Hickey 2012a, 9 and 81. *P.Oxy.* 16: 1915 may serve as a witness to this ongoing process; see Gasco 2008, 150–54; cf. Azzarello 2012, 97–101, who suggests that the Apiones might have acquired it from the *domus divina* between 560 and 565, based on *PSI* 3: 196 and 197.

¹⁸⁶ Johnson and West 1949, 274 n. 22, and 287 n. 25; Hendy 1985, 351; see above n. 26.

¹⁸⁷ Fiscal shares were clearly subject to revisions. *P.Oxy.* 16: 2039 (562/563) assigned to the Apiones *oikos* a $\frac{1}{3} \frac{1}{8} \frac{1}{96}$ (= $\frac{45}{96}$) participation rate with respect to providing policemen to the city, from an initial $\frac{1}{3} \frac{1}{96}$ (= $\frac{33}{96}$) assessment; see Gasco 2008, 166 n. 254 and 183, n. 337; Azzarello 2006. However, lump sums did not have to be revised for each marginal transaction and the estate might well have grown, albeit at a rate low enough not to trigger an upward revision of its tax schedule. Some properties of Diogenous were, for instance, absorbed after 545 as a result of a default on an 80 *solidi* loan, see above n. 185.

is compatible with a 2 carats/aroura tax rate on arable land if we account for higher yields on vineyards and orchards. In this case, the Apiones would have enjoyed a lower tax rate than the villages of the Oxyrhynchite, Antaeopolis, and Aphrodito, which were taxed at 3 carats in the 540s and early 550s (see above Table 14). This scenario assumes the combination of an almost complete stability of the Apiones' estate together with a privileged tax regime. If we accept its terms, the significant increase of the gold gross income by 29% from 14,325 to 18,520 *solidi* between the early 540s and the late 580s would have been exclusively achieved through a combination of favorable alterations to the grain/cash ratio of the Apiones' lease contracts and through growth in productivity.

Overall, however, this scenario seems unlikely, on multiple grounds. First of all, a composite tax rate close to 3 carats/aroura when arable lands pay 2 carats would imply a very high proportion of vineyards paying 20 carats—a quick calculation would indicate the need for 4% vineyards and 6% orchards under this hypothetical scenario. Since Hickey has argued convincingly that the Apiones are unlikely to have had much more than 1,000 arouras in vines, and since $1,000/64,972 = 1.5\%$, the only way to achieve a 2.9 carats/aroura rate with so few vineyards would be to increase the proportion of orchards to almost 20%, an unlikely outcome given the rarity with which fruits and gardens are attested in the Apiones accounts. In order to achieve a growth of 29% in their gold income with a stable estate size, the Apiones would have had to engineer productivity growth of 29% in a little over 40 years, which amounts to an annualized 0.6% growth rate. This level of growth would have to have been quite uneven given that it does not show up at all within the estate's accounts represented by *P.Oxy.* 16: 1911 and 55: 3804, which report almost identical individual and comprehensive proceeds for the estate despite being separated by nine years (556–557 and 565–566). Some other parts of the estate would have had to reach higher growth rates, possibly around 1% annualized, quite a high rate when one compares growth rates typical of ancient economies, the alternative hypothesis being a shift from grain to gold within their lease structure.¹⁸⁸ However, the Apiones tended to

¹⁸⁸ The fastest growth rate measured for any sub-period of pre-modern Italy peaked at +0.27% per annum between 1348 and 1400 as Europe was engaged in a rapid recovery following the black plague. England's annualized growth rate in the same period reached 0.63%. But the English annualized average growth between 1280 and 1700 stood at +0.19%. Source: *The Maddison-Project*, <http://www.ggd.net/maddison/maddison-project/home.htm>, 2013 version. A specific estate could outstrip such typical growth yields if undergoing some form of recovery after a bleak period. It seems unlikely the Apiones' estate would qualify, as it contained a highly dispersed sample of small to medium-sized properties spread all across the nome; see Ruffini 2008, 127–38. As such the *oikos* must have reflected

enjoy stable rental cash flows over time, at both a micro and a macro level.¹⁸⁹ The surviving leases for this period generally stipulated fixed rents in cash, another factor playing against substantial increases in rental income.¹⁹⁰ Another problem with this scenario is the reported increase from 6,900 to 13,500 *solidi* of the tax paid in gold between the 540–580 period and 586–587. Following Hickey, only a partial adaeeration of the *embolē* could have explained such an increase, especially with a stable estate size. The difference between 13,500 and 6,900 is 6,600 *solidi*, which would imply the adaeeration would have affected about 80,000 artabas at 12 artabas per *solidus*. This is about as much as the entire Apiones *embolē*, while the almost contemporary *P.Oxy.* 1: 127 testifies about the continuing importance of that taxation component.

Finally, income growth combined with significant tax privileges in an otherwise low-growth pre-modern agricultural economy would have led to a notable expansion of the estate, as independent landholders would have flocked to or been coerced into the advantageous status of being tenants of the Apiones and enjoying the benefits of their investment capacity and fiscal patronage.¹⁹¹ This hypothesis stands in direct contradiction with the underlying given of this scenario, that is, the overall stability of the Apiones' estate. These are the main reasons why the enjoyment of explicitly lower tax rates by the Apiones represents an unlikely scenario.¹⁹²

Adaeeration and the Apiones

The disproportionate 95.8% increase of the *oikos*'s gold contribution gives every indication of representing a shift in the overall taxation structure of the estate, for the estate itself must have grown by a much slower rate, which we estimated to be close to 30%. This large of a jump in the gold payment cannot be explained by a tax increase, especially since the villages' payment

average regional growth. With respect to a potential shift toward more gold, surviving *pronoētai*'s accounts do not display such a trend. On the contrary, the accounts from the period 576–590 display a rather higher artabas/*solidi* ratio: McConnell 2013, 77, tab. 1, ll. 5–6 col. viii.

¹⁸⁹ See above n. 185.

¹⁹⁰ Herrmann 1958, 274.

¹⁹¹ With *P.Oxy.* 16: 2055, the Apiones dossier provides a list of tenants fleeing the Apiones estate in order to settle on imperial lands, suggesting that the latter may have enjoyed a better fiscal status. On the tax privileges of the *domus divina*, see Delmaire 1989, 684–88. In 535, *Nov. Iust.* 38 attempts to prevent curials from benefitting from the privileges of the *res privata*. It is no surprise that Dioscorus of Aphrodito had sought imperial patronage: Maspero 1916, 35–7.

¹⁹² It confirms that largest landowners, like imperial or ecclesiastical estates, did not normally benefit from any formal exemption from the main land tax; see Gasco 2008, 158, with special reference to *CJ* 10.9.8 (410).

in gold increased by at most 14.8% between the 540s and the 580s. The only solution would seem to be a reshuffling of the different components of the tax payment structure—through some level of adaeration of the grain tax.

No Apiones grain tax payment at all is recorded at *P.Oxy.* 18: 2196v, begging the question of whether this represents a complete adaeration of their *embolē*.¹⁹³ However, this does not work numerically. The *oikos*' overall grain tax responsibility (including villages) reached 140,618 artabas at some point during the later sixth century (*P.Oxy.* 1: 127). Its complete adaeration would have increased the gold payment by about 12,500 *solidi* Alexandrian standard, yet the total gold tax increase shared between the *oikos* and the villages falls in a range between 6,465 and 7,465 *solidi*.¹⁹⁴ Alternatively, the lack of grain tax contributions in *P.Oxy.* 18: 2196v could imply that only the Apiones' direct *embolē* had been adaerated entirely that year, while the villagers would have provided grain. But we have already rejected this scenario as highly unlikely. A hypothesis positing partial adaeration for both the Apiones and the villages works better. Indeed, the lack of any grain contribution in *P.Oxy.* 18: 2196v does not imply that no grain was paid at all for tax purposes. Each *pronoētēs* of the Apiones probably sent his local surplus in grain separately to meet the *embolē*'s requirements, which would explain why there is no evidence of grain passed to a higher-level administrator in the Apiones' accounts, even though the grain accounts of the individual *pronoētai* tend to be balanced.¹⁹⁵

The following models attempt a reconstruction of adaeration regimes using the the 10:1 ratio between artabas and *solidi* found in *P.Oxy.* 16: 1909, our only explicit nome-wide adaeration document.

We compare the expected tax proceeds based on the Apiones' estate growth with the actual gold payment. The comparison is facilitated by the likelihood that both periods—the 540s and the 580s—would have enjoyed similar tax rates (Table 14, above). The final figure, 32%, is obtained by dividing the unexplained increase of the gold tax by the entire *embolē*'s equivalent value in gold in order to estimate the proportion that could have been adaerated.

The most likely assumption numerically is an adaeration rate of one third.

¹⁹³ Hickey 2008, 94–95.

¹⁹⁴ The Apiones' managers pay 13,451 instead of 6,917 *solidi*, and the villages between 5,527 and 6,526 instead of 5,685 *solidi*; see above Table 15, l. 6 col. i and ii; l. 4 col. iv and v.

¹⁹⁵ McConnell 2013, 54–57; Hickey 2008, 90 with n. 14. The variability of the *embolē* in some of those accounts may have resulted from partial sales for gold as illustrated by the difference between 192.5 artabas at *P.Oxy.* 55: 3804, l. 149 and the implied 74 artabas in its sister account *P.Oxy.* 16: 1911; cf. McConnell 2013, 63–67; Rea 1988, 131. See also *P.Oxy.* 16: 1911, ll. 208–9 and *P.Oxy.* 16: 1914, ll. 4–7 with Hickey 2012a, 110–11.

Table 16. Potential Partial Adaeration of the Overall *Embolē*

	540s (from P.Oxy. 16: 1918v)	580s (from P.Oxy. 18: 2196v)	Difference	In percent
Apiones actual gold tax payment (<i>solidi</i>)	6,917.7	13,541.9	6,624.2	95.8%
Apiones' estate estimated area (arouras)	49,719.0	64,972.0	15,253.0	30.7%
Apiones' estimated gold tax with stable tax rate	6,917.7	9,039.9	2,122.2	30.7%
Unexplained increase of the Apiones' gold tax (<i>solidi</i>)			4,501.9	65.1%
		In artabas	Adaerated value in gold (<i>solidi</i>)	Ratio (Unexplained increase) / (Adaerated <i>embolē</i>)
Embolē for Apiones + villages from P.Oxy. 1: 127 (artabas)		140,618.5	14,061.9	32.0%

Note: We compare the expected tax growth originating from the estate growth with the actual figure. This comparison is made possible by the fact the gold tax rate was most likely the same in the 540s and the 580s. The final figure, 38.4%, is obtained by dividing the unexplained portion of the gold tax increase by the overall Apiones + villages *embolē*'s adaerated value.

Adaeratio and the Apiones 'unwanted' grain surplus

Assuming a one-third adaeration hypothesis at the time of P.Oxy. 18: 2196v (586–587), two scenarios could have applied. First, villagers and Apiones' estate managers could have been responsible, each at their own levels, for providing the additional gold, while selling their grain surplus in order to fund the additional cash levies. A second possibility would have consisted in demanding the usual tax dues from all actors involved and then disposing of the consolidated grain surplus in a more centralized fashion. In P.Oxy. 18: 2196v, as previously seen, the villages paid to the Apiones an *embolē* of 53,490–53,499 artabas. If this had resulted from an adaeration of one-third, the villages' original grain liability would have reached about 80,000 artabas before adaeration. In exchange for having ca. 53,500 instead of

80,000 artabas to provide, their gold contribution would have been increased by about $(80,000 - 53,500) / (10 \text{ or } 12)$, resulting in an order of magnitude of 2,200–2,600 more *solidi*. However, their overall reported gold contribution in *P.Oxy.* 18: 2196v was included in a 5,527–6,526 *solidi* range. This would suggest that their normal gold tax—without adaeration—would have been worth about 3,000 to 4,000 *solidi*. As a 80,000 artabas *embolē* and a 3,000–4,000 *solidi* gold tax are incompatible with whatever known combination of attested tax rates for the sixth century we may use, we can reject a scenario in which the villages would have sold their surplus grain before sending their net *embolē* contribution to the Apiones.

The more likely scenario is that the Apiones processed the entire adaeration both for their own and for the village accounts under their supervision. *P.Oxy.* 1: 127 provides a complete *embolē* contribution of 140,618 artabas. Under a one-third adaeration hypothesis, only about 93,650 artabas would have been effectively shipped at the time of *P.Oxy.* 18: 2196v, provided the *embolē* yield remained stable between both accounts. With 108,816 artabas of gross income recorded for the estate property and 53,495 artabas from the villages at *P.Oxy.* 18: 2196v, we arrive at a total of 162,313 + fractions for the total grain receivables of estate plus villages. Usually, the Apiones would have had to deal with a surplus of $162,313 - 140,618 = \text{ca. } 21,700$ artabas. Subtracting instead 93,650 artabas of grain shipped as *embolē*, we arrive at a balance of about 68,661 artabas that would have remained with the Apiones. Interestingly, that amount is larger than the ca. 53,500 artabas villages' contribution. In other words, if the Apiones had been able to resell whatever the villages were contributing, the impact on each *pronoētēs* would have been minimal. Since grain payments inside the *oikos* were normally decentralized, with most *pronoētai* providing their surplus grain to the *embolē*,¹⁹⁶ this simple procedure would have allowed the Apiones to avoid the excessively careful accounting required to avoid too little or too much grain from being delivered or sold by each *pronoētēs*.

The undated *P.Oxy.* 16: 2023 may provide us with some clues about this process. It documents wheat sales by a boatman in indictions 5 to 9. 115,576 artabas were sold over the course of the first four indictions, an average of 28,894 artabas/indiction, yet the amount collected in indiction five was 33,372 artabas.¹⁹⁷ Such transactions might represent the sales of some of the adaerated grain, the boatman acting as an agent or intermediary between the *oikos* and other institutions or merchants handling the next phase of the process, transporting and re-selling that wheat in Alexandria or beyond. The first

¹⁹⁶ Banaji 2001, 223 Table 2; McConnell 2013, 54–5.

¹⁹⁷ Mayerson 2009b.

four years' average, 28,894 artabas, represent 54% of the ca. 53,500 artabas contribution of the villages alone. The indiction 5 amount, 33,372 artabas, reaches almost exactly two-thirds. If, as seems likely, these transactions were connected to the Apiones, the boatman might well have been centralizing part of the villages' contribution. Another even more tempting option is to relate the four-year average, 28,894 artabas, to one-third of the 87,215 artabas *embolē* of the Apiones alone, which would be 29,072 artabas. This near match would imply a straight disposal of the Apiones direct surpluses, even as it would confirm the one-third adaeration estimate from Table 16 (above). As 586/587 was a tenth indiction, *P. Oxy.* 16: 2023 and 18: 2196v may actually be almost contemporary.¹⁹⁸

The Apiones' Profit Equation

We may be now in a position to suggest an evaluation of the Apiones' overall net surplus at the time of *P.Oxy.* 18: 2196v. The Apiones estate enjoyed a 4,978.11 *solidi* Alexandrian standard cash surplus,¹⁹⁹ to which about 60,000 artabas of surplus grain would have been added.²⁰⁰ These two amounts, converted to gold value and retariffed at the imperial standard, represented around 9,500 *solidi*. This is about half of the figure of 20,000 used by Jones.²⁰¹ If we assume about 65,000 arouras under the direct fiscal management of the Apiones, their net income after all taxes and expenses would have reached about 0.15 *solidi*/aroura (3.6 carats/aroura).

But the Apiones' *pronoētai* did not send their entire gold rental income to the Apiones' bankers. They spent substantial amounts on salaries, equipment, various subsidies, charitable gifts, and other local expenses. The surviving *pronoētai* accounts providing overall gross income and related local expenses in gold are *P.Oxy.* 16: 1911; 55: 3804 (from the same administrative unit); 16: 1914; and 16: 2195. Their respective operating expense ratios stand at 21.6%, 25.9%, 16.3% and 27.9%, averaging 23%.²⁰² In *P.Oxy.* 18: 2196v, Section 1, it is clear that local expenses in grain, *embolē* included, were not taken into account in this consolidated estate-wide account, which provided target grain receipts only. If Section 3, which deals with the gold income, operated along

¹⁹⁸ Partial adaerations occurred frequently under Arab rule, as displayed by *P.Lips.* 103; cf. Rémondon 1965, 421–22.

¹⁹⁹ See above Table 15, l. 8 col. ii.

²⁰⁰ ca. 55,500 artabas provided by the villages and few limited surpluses at individual *pronoētai*'s level.

²⁰¹ Jones 1986 (1964), 784.

²⁰² Computed using Banaji 2001, 223, tab. 2. In *P.Bad.* 4: 95, although the account's structure and schedule are not strictly comparable, expenses on irrigation, improvements, and wages reach 24.69% and 26.35% of gross income respectively for indictions 10 and 11; cf. Schnebel 1928, 44.

Table 17. Net Cash Surplus, Assuming the Accounts Deal with Gross Receipts

	540s	580s
Gross cash income	14,325.2	18,520.0
Estimated local expenses	3,294.8	4,259.6
Pre-tax net cash income	11,030.4	14,260.4
Gold tax	6,917.7	13,541.9
Net cash income	4,112.7	718.5

similar principles, it would have been concerned neither with local expenses nor with centrally paid tax payments. In this case, *P.Oxy.* 18: 2196v, generally speaking, would have cataloged gross receipts in grain and cash and not net payments after local expenses had been deducted by the *pronoētai*. Thus, to obtain the Apiones' net cash balance, we have to reduce their gross cash receipts by the average of 23%, which reduces the Apiones' cash available balance significantly.

Although we cannot reach absolute certainty that *P.Oxy.* 18: 2196v records gross instead of net cash receipts, this reading seems more likely. The total number of *prostasiai* reached as high as 20 at most and probably stood at 16 at the time of *P.Oxy.* 16: 2032 in 540/541.²⁰³ We have 6 extant *proneotai* accounts on the income side, covering 5 *prostasiai*, dating from 556 to 590. Their cash + grain gross income converted in *solidi* averaged just under 800 *solidi*.²⁰⁴ For the 3 *prostasiai* with complete income and expense accounts, the average net income in grain plus cash falls to 325 *solidi*. Sixteen such units would have provided the *oikos* with a *ca.* 12,800 *solidi* gross income (16 × 800) in cash + grain, and twenty with 16,000 *solidi*. The contemporary *P.Oxy.* 16: 1918v (540–542) provided a figure for only the Apiones' cash income of 14,325 *solidi*. The grain income is missing, but could be estimated from grain receipts at *P.Oxy.* 18: 2196v (586–587), amounting to 108,816.5 artabas. We would use the *oikos*' respective estimated area at both dates—49,719 and 64,972 arouras—and assume grain receivables grew proportionally to its size. Applying this method, grain gross receipts in 540–542 would have reached about 83,000 artabas (*i.e.*, 108,816.5 × 64,972/49,719). Once converted into gold, this grain income would add about 7,000 *solidi* to the 14,325 *solidi* from *P.Oxy.* 16: 1918v, leading to a total figure in the region

²⁰³ Ruffini 2008, 107. Hardy 1931, 82 had estimated 20. Regarding the papyrus's date, see Maresch 1994, 98, n. 2.

²⁰⁴ McConnell 2013, 75–7 and table 1.

of 21,000 *solidi*. If this had represented a net amount, after deduction of all local expenses, it seems hard to correlate it with 16 or 20 administrative subdivisions whose individual gross income averaged 800 *solidi* and net income averaged less than 50% of that amount.

With barely 1,000 *solidi* of net cash flow, and about 60,000 artabas of grain surplus that the estate could sell deriving from an area of about 65,000 arouras under their fiscal management, the Apiones would have retained annually less than 0.1 *solidus*/aroura, or about 2.2 carats/aroura. This seems very low, but one should not forget that some lands not belonging to the Apiones were included in that total. Moreover, the Apiones could, of course, have shipped and sold at a profit their adaerated grain. The Egyptian conversion rate between grain and gold was most likely lower than its price outside Egypt, especially in times of food crises.²⁰⁵ The conversion of Egypt's grain into gold had led to discontent and food shortage in Constantinople during Maurice's reign.²⁰⁶ True, existing Apiones' archives do not document large scale market sales of grain explicitly, although the *oikos* was not an autarkic entity economically segregated from its environment.²⁰⁷ In that respect, it is certainly possible that the boatman's large grain transactions in *P.Oxy.* 16: 2023 represent just the evidence we are seeking for such grain sales.²⁰⁸ However, the only price quoted in the papyrus, 12 artabas per *solidus* private standard, assesses grain even lower than the 10:1 adaeration rate from *P.Oxy.* 16: 1909, implying that the Apiones (if that grain did originate from their estate) would not have secured any significant margin when selling their grain surplus. From it we can draw the inference that the Apiones' strategy did not involve long-distance shipment and sales but rather local transactions, confirming an aversion to market exposure noticed by Hickey even with their handling of a highly marketable product like wine.²⁰⁹

Even in these conditions, the Apiones were in a far better position than small landowners to carry out the market operations needed to generate gold,

²⁰⁵ Commutation rates and prices in Egypt fluctuated between 8–16 artabas per *solidus*. This is equivalent to 26–52 *modii* per *solidus* and compatible with the 40 *modii* per *solidus* used in 445 at *Nov. Val.* 13.4 for the commutation of grain *annona* into gold in Africa. It is also used explicitly in Egypt a century later in 541 (*P.Cair.Masp.* 3: 67320, l. 10). During shortages, prices reached two to six-fold as much in cities like Rome, Edessa, Antioch, Crimea or Thessaloniki; see Morrisson 1989, 252 Table 4 and 257.

²⁰⁶ On financial hardship and food shortage in Constantinople under the reign of Maurice; see Whitby 2000, 100. Maurice's decision to have the army spend the winter of 602/603 north of the Danube, most likely to avoid having to divert too much grain, could be indicative of the consequences of high rates of Egyptian grain adaeration; see Carrié 2003a, 120.

²⁰⁷ Mazza 2001, 163–64.

²⁰⁸ See above nn. 197–98.

²⁰⁹ Hickey 2001, 199–200.

much as tax collectors succeeded in turning copper into gold more adroitly than individual taxpayers. Dioscorus complains about the very low grain prices obtained by Aphrodito's farmers trying to secure needed cash: 36 artabas of wheat and 60 artabas of barley per *solidus*.²¹⁰ Even if these instances may not have reflected normal years, they represent only one-third of the price paid at *P.Oxy.* 16: 2023. The fact that the Apiones handled the commutation of most of their grain surplus into gold would have shielded landholders from the consequences of fluctuating market prices, forced sales, and usurious lending practices. This may to some extent have generated a mutually profitable symbiotic relationship between smaller independent landowners and lessees, on the one hand, and powerful families like the Apiones, on the other. These grain sales would have been of strategic importance since the *oikos* was barely able to sustain the rising pressure on its gold income exerted by the demands of state taxation. This development necessarily pitted the Apiones' interests against those of the imperial state, with its policy of increasing its revenues in gold at the expense of payments in kind.

If we consider this partial adaeration scheme as a step towards implementing full adaeration of the sort exemplified by *P.Oxy.* 16: 1909, the Apiones would at some point have had to deal with the conversion into gold of the entire *embolē* they managed—140,618 artabas, or about 11,700 *solidi*. This would have exceeded by far the Apiones' structural gold surplus. They would not have had many good options at their disposal: they could have transferred the task of commuting grain into gold to base-level taxpayers, extracted more gold from their tenants, sold their surplus locally, or engaged in long-distance trade. One way or another, they would eventually have needed cash advances and they might have had to rely on bankers for that purpose. The attested rise of a class of bankers by the end of Justinian's reign might be understood in light of the financial stress created by the state's increasing hunger for gold.²¹¹ Further research on the *embolator*, the local official charged with rendering service in connection with various gold taxes, as well as other officials of the provincial treasuries, may be beneficial: in several accounts, an *embolator* is seen taking limited grain balances off the hands of a *pronoētes*.²¹² Could this process have developed on a much larger scale as the state began to insist more and more on the adaeration of grain into gold?

²¹⁰ *P.Lond.* 5: 1674, ll. 85–86.

²¹¹ On the 562 bankers' plot: Joh. Mal. p. 493; Theoph. a.m. 6055. In the mid-sixth century, the banker Iulianus Argentarius notably financed San Apollinare in Classe and San Vitale (for 26,000 *solidi*) in Ravenna. More generally, see Barnish 1985. Justinian had regulated interest rates early in his reign, in 528: *CJ* IV, 32, 26, 2 and Carrié 2003b, 274–76.

²¹² P. Mayerson 2009a.

The Size of the Apiones Estate between the 540s and the 580s

The area under the Apiones' direct tax-management included a certain number of independent smaller landowners.²¹³ Its gross composite income before taxes and local expenses were paid reached 108,816.5 artabas and 18,520 *solidi* Alexandrian standard at the time of *P.Oxy.* 18: 2196v. This included a mixture of rents (rent + tax) for the lands it owned outright, and individual tax payments for the other independent holders.

Another uncertainty is the relative proportion of cash and grain in rents on arable land. This cannot be determined based on the rent rolls preserved by the Apiones documentation since the nature of the lands paying rents is rarely made explicit, and lease contracts are almost completely absent from the Apiones archives. Hickey's working hypothesis assumes a gross rental rate of 5.5 artabas/aroura.²¹⁴

This figure seems higher than the contemporary Aphrodito evidence, where leases on irrigated arable lands point to a somewhat lower range of 4.2–5.0 artabas/aroura.²¹⁵ Several fourth-century Oxyrhynchite accounts indicate higher rates of between 6 and 8 artabas/aroura.²¹⁶ An earlier fifth-century rent incorporating a *mechanē* on an Apiones plot provides 82.5 artabas of grain and several artabas of vegetables for a land area of 19.5 arouras, indicating a rate of at least 4.25 artabas/aroura.²¹⁷ *P.Oxy.* 18: 2195 (l. 37) involves a plot of 9 arouras rented for 31.5 artabas and 2.25 *solidi* (equivalent to about 6 artabas/aroura), and another of 3 arouras (ll. 95–96) rented for a little over 11.5 artabas, equivalent to a little under 4 artabas/aroura, with the model lease *SB* 20: 15027 providing 0.5 *solidus*/aroura.²¹⁸ Other leases on unspecified categories of land provide cash or mixed cash and grain rents in an equivalent range of 4 to 5 artabas/aroura, probably on arable cultivation.²¹⁹

²¹³ Hickey 2008, 80 n. 9.

²¹⁴ Hickey 2008, 91 and n. 16, based on Rathbone 1991, 243 and 2007, 703–4.

²¹⁵ As argued by Lemaire forthcoming.

²¹⁶ Mazza 2007, 443–45 with *P.Col.* 8: 238 = *P.Princ.* 3: 136.

²¹⁷ *P.Oxy.* 63: 4390.

²¹⁸ Johnson and West 1949, 53–54; Mazza 2001, 81. It may be objected that cash components went for the irrigation machinery since *mechanē* can designate both the irrigation equipment itself and the parcel of land it irrigates; cf. *P.Oxy.* 55: 3803, introduction; Hickey 2012b, 304. But the incidence of a *mechanē* does not seem to alter rent structures as far as we can judge from the extant rent rolls. In Aphrodito, it simply leads to higher average rents: 4.2 to 5 artabas/aroura, as compared to. 2 to 3 artabas/aroura, with tenants usually paying the tax; see Lemaire forthcoming 39–40 and n. 71, table 3. For rents close to 5 artabas/aroura, see Jones 1986 (1964), 1333, n. 90.

²¹⁹ A lease dated 639 in Herakleia stipulates a rent of 4 *solidi* minus 23 carats on 8 arouras; see P. J. Sijpesteijn 1994. *CPR* 24: 26 records a mixed rent of 22 artabas and 31 carats on a plot of 9 arouras; in *P. Lond.* 3: 1036 and *P. Oxy.* 8: 1126, we encounter rates of 13.5 and 13 carats/aroura.

In sum, Hickey's 5.5 artabas/aroura, although a reasonable working figure, probably remains on the high side of expectations. For this reason, we will use a slightly more conservative rent ratio of 5 artabas/aroura.

The next question we must confront is the contentious question of *autourgia* lands—those managed directly by the Apiones using wage laborers. They normally provided agricultural staples instead of cash rents, and their workers required salaries and seed, while pieces of equipment were provided to them on credit.²²⁰ Sarris argues that *autourgia* lands were responsible for most of the *oikos*' net profitability.²²¹ Hickey had noticed a strong correlation between *enapographoi georgoi*, irrigated lands, and fodder cultivation.²²² In a convincing demonstration, McConnell points to the strong relationship between the *autourgia* lands, the production of fodder, and the maintenance of animals used for the operation of irrigation machines.²²³ If McConnell is correct, as he seems to be, it would be unlikely that *autourgia* lands provided the *oikos* with a substantial agricultural surplus: this type of land was mostly dedicated to a supporting role, the production of animal fodder. Moreover, there is evidence that the Apiones had to purchase fodder all the way from Hermopolis, as if the Oxyrhynchite had been chronically short of it.²²⁴

The main problem is to figure out how these lands were incorporated into comprehensive accounts like *P.Oxy.* 18: 2196v. McConnell claims that the Apiones did not collect any tax from these lands, which would explain why they are “mostly absent from the collection portions of the accounts.”²²⁵ Their absence does not, however, mean that they were not taxed: arrears on both *autourgic* and *non-autourgic* lands appear at *P.Oxy.* 16: 1918. This would imply they were incorporated into the regular *pronoētai* accounts.²²⁶ The issue here is that fodder lands do not appear as a specific taxable land category in the Antaeopolite documentation. They could thus belong either to the class of arable lands or to orchards. Fodder had been an important taxable item before the military *annona* was generally (though not universally) *adaerated*,²²⁷ as testified in Antaeopolis. There, orchard lands represented just

However, a rent figure close to 0.4/0.5 *solidus*/aroura does not guarantee the land is arable. *P.Oxy.* 16: 1912, ll. 137–39 attests to a newly planted vineyard paying 0.373 *solidus*/aroura.

²²⁰ *P. Oxy.* 16: 1988, 1989, 1990 and 1991; 70: 4788 and 4797, especially with Mazza 2001, 129–34 for the impact on *pronoētai* accounts. *Enapographoi gēorgoi* are attested as wage laborers on *autourgia* lands, which does not mean both concepts were intrinsically connected; see Haug 2014.

²²¹ Sarris 2006, 33–34.

²²² Hickey 2001, 100–7 and 192–94; 2008, 97, n. 45; 2012, 149–50.

²²³ McConnell 2013, 42–48

²²⁴ Hickey 2001, 192–194.

²²⁵ McConnell 2013, 45, n. 110.

²²⁶ Hickey 2008, 97, n. 45; 2012, 150 n. 25, with *P.Oxy.* 18: 1918r, ll. 26–27.

²²⁷ For taxation in kind see above nn. 42 and 156.

over 3% of the taxable lands. Finally, a fourth-century account provides cash rents on fodder lots at a rate of slightly over 0.5 *solidus*/aroura, which is not too far from arable rates.²²⁸ It seems more sensible then to allocate them to the category of arable lands.²²⁹ In *P. Oxy.* 16: 1918r, *autourgia* lands are responsible for 15% of the overall arrears, which provides a sense of their overall share.²³⁰ They would have been liable to taxation as arable lands without contributing to the estate's visible income in grain and gold since they were used to produce fodder for irrigation animals. Consequently, we need to remove an unknown percentage of *autourgia* lands from those Apiones' lands deemed "arable" for tax purposes in order to assess the *oikos*'s income in grain.

Finally, based on existing albeit limited evidence, we use 3 *solidi* and 1 *solidus* per aroura respectively for vineyards and orchards' average rents.²³¹ Our numerical factors for the Apiones estates are thus the following in 586–587:

- Taxable area: 64,972 arouras (see above, Table 15, l. 2 col. ii)
- Arable lands productive of grain and gold (deducting the *autourgia*): 64,972 • [0.9—A] arouras, where A is the overall percentage of *autourgia* lands to be deducted from arable lands
- Grain gross income: 108,816.5 artabas (*P. Oxy.* 18: 2196v, see page 315)
- Gold gross income: 18,520 *solidi* (*P. Oxy.* 18: 2196v, see page 316)

If we assume this entire taxable area was under the ownership of the Apiones, the following function obtains:

$$108,816.5 = 5 \cdot p \cdot 64,972 \cdot (0.9 - A) \text{ (where } p \text{ is the aggregated average proportion of arable rents paid in grain).}$$

If 90% of total taxable land was arable (*autourgia* included), 2% vineyards, and 8% orchards, and we assume a 12:1 conversion rate between grain and gold, the following function obtains:

$$18,520 = 64,972 \cdot [(0.9 - A) \cdot 5 \cdot (1 - p)] / 12 + [0.02 \cdot 3] + [0.08 \cdot 1]$$

The results are: $A = 21.7\%$ and $p = 0.4903$.

²²⁸ *P. Col.* 8: 238 = *P. Princ.* 3: 136, ll. 1–2, etc.

²²⁹ On fiscal fodder in the Antaeopolite, see Gasco 2008, 327–31.

²³⁰ Hickey 2012a, 150, n. 25.

²³¹ On vineyards, see above n. 163. On orchards, 1 *solidus* is close to the average between *P. Oxy.* 55: 3805 (ll. 89–90), a one-aroura *pomariou* plot paying a rent of one *solidus* 12.25 carats and *P. Oxy.* 19: 2243a (590, ll. 53–58), with a gross rent of 7 *solidi* on the private standard for 9 arouras of cultivated orchards.

We know nevertheless that the Apiones did not own all the land for whose taxes their *pronoētai* were responsible.²³² Several entries among their accounts are deemed *idias gēs* and indicate that these taxpayers were paying their own tax for lands they owned.²³³ Moreover, some properties are at times characterized neither as ktematic nor *idias gēs*, which could imply some degree of uncertainty as to actual ownership.²³⁴ Finally, if we admit that the 15% of arrears in payments recorded in *P.Oxy.* 18: 1918r represents the most unbiased available median estimate for the percentage of land under *autourgia*,²³⁵ this type of land should represent 19.67% of all arable lands,²³⁶ which is very close to our estimate of 21.7%. We will round this to 20% of arable.

We will call *D* the area directly owned by the Apiones and *I* the lands for which they acted as intermediaries, with $D + I = 64,972$ arouras. In the '*T*' lands, the Apiones would collect the *embolē* and the gold tax. We will use our usual rates for that period: 1.4770 artabas/aroura (*embolē* rate on arable), 7/12th artaba/aroura (*embolē* rate on vineyards), 3, 21.5, and 8 carats/aroura (gold tax on arable, vineyards, orchards), with the 90%, 2%, 8% distribution between arable, vineyards and orchards. We do not apply the *autourgia* discount to the non-Apiones lands.

The introduction of a new variable, *I*, implies different values for *p* and *A* compared to our previous estimates. This complicates the equations a little further, since we now have four unknown factors—*p*, *A*, *D*, and *I*—and only three equations, implying one degree of freedom. As a working hypothesis, we will compute *D* and *I* under the restrictive hypothesis that *A* (*autourgia* lands) = 0.20 (20%) of all arable lands, hence a 0.80 correcting factor. Finally, the non-Apiones tax contributions need to be converted into Alexandrian standard by dividing the cash amounts by 0.9375.

With these assumptions in place, we arrive at the following system:

²³² See above n. 29.

²³³ Mazza 2001, 115 and n. 201, 118 and n. 209, with 5 individual occurrences in total; to this list should be added *P.Oxy.* 16: 2019, l. 20, with a tax payment on public land. Interestingly, some individual tenants or hamlets, possibly *adscripti coloni*, are attested in paying their tax dues to the Apiones; see Mazza 2001, 128–29, with *P.Oxy.* 52: 4350 and 4351. One hypothesis could be that the Apiones were responsible for collecting the tax dues from *coloni* who were not their direct tenants, otherwise they would have offered a rent payment incorporating the tax component. On the colonate as a tax status: Carrié 1983. However, as far as our computations are concerned, it changes little whether individuals paid taxes through the Apiones as independent landowners or tenants from lands that did not belong to the Apiones.

²³⁴ Hickey 2012a, 50–51 and 39; Hardy 1931, 53

²³⁵ See above n. 230.

²³⁶ 15% of an income derived from a land mix with 90% of arable, 2% of vineyards, and 8% of orchards producing respectively 0.5, 3, and 1 solidus/aroura is strictly equivalent to 19.67% of the income from arable lands alone.

$D + I = 64,972$ arouras.

$108,816.5$ artabas = $[5 \cdot p \cdot D \cdot (0.9 \cdot 0.80)] + [(1.4770 \cdot 0.9 + 7/12 \cdot 0.02) \cdot I]$

$18,520$ *solidi* = $[(5 \cdot (1-p) \cdot (0.9 \cdot 0.80) / 12) + (0.02 \cdot 3) + (0.08 \cdot 1)] \cdot D + [(0.9 \cdot 3 + 0.02 \cdot 21.5 + 0.08 \cdot 8) / 24] / 0.9375 \cdot I$

The results are:

D (estimated land under Apiones' direct control) = 58,752 arouras

I (estimated independently owned land under Apiones' tax control) = 6,220 arouras

P (estimated proportion of arable rents paid in grain) = 0.475

The factor $p = 0.475$ implies an almost even average split between cash and grain as far as the Apiones' arable lands are concerned, with 47.5% of arable rents paid in grain and 52.5% in cash. Overall, grain averages almost 34% of the yield value in the surviving *pronoētai* accounts and reaches 38% in *P.Oxy.* 18: 2196v.²³⁷ These orders of magnitude are consistent, since a drop from 47.5% to 34–38% represents a 20–25% relative decrease, which is to be expected considering that the 10% of Apiones' lands that were most productive were not arable but vineyards and orchards, which provided little to no grain as rent.

The significantly positive value of I confirms Gascou's and Hickey's theses (further explored by McConnell) that the Apiones acted as tax farmers and subsumed properties they did not own under their administrative control. The proportion of such properties, about 10%, seems fair: among the extent rent rolls and their hundreds of entries, only a handful are clearly identifiable as private independent properties. However, one needs to keep in mind that several of our underlying assumptions are still subject to significant margins of error: examples include the estimates of 5 artabas/aroura on arable lands, and that 20% of arable lands under *autourgia*. The figure I is very sensitive to these two factors. Table 18 gives a tangible representation of the variability of I when we alter these input factors.

Because *we know* the Apiones estate accounts *do* include some non-Apiones properties, our equations support an average rental rate on arable lands higher than in Aphrodito. Using a rate below 4.8 artabas/aroura results in a negative number for the artabas produced on non-Apiones lands—obviously

²³⁷ Surviving *pronoētai* accounts include *P.Oxy.* 16: 1914, 1911, 1912; 55: 3804; 18: 2195 and 19: 2243a, taken from McConnell 2013, 77, tab. 1. *P.Oxy.* 16: 1911 and 55: 3804 both concern the same administrative unit in 557 and 566, so they are counted once. We use 12:1 as a conversion price for wheat into gold instead of 10:1 in McConnell.

Table 18. Non-Apiones Lands Whose Taxes are Managed by the Apiones' *pronoētai*, as a Function of the *autourgia* Percentage in Arable Lands and the Gross Rental Rate on Arable Lands

Autourgia as a proportion of Apiones arable lands	20%	20%	20%	15%	10%
Average rental rate on arable lands (artabas/aroura)	5.5	5	4.7	5.5	5.5
Estimated non-Apiones lands (artabas)	15,463	6,220	-1,190	20,295	24,267
Estimated Apiones lands (artabas)	49,509	58,752	66,162	44,677	40,705

an impossibility. At the same time, lower *autourgia* proportions lead to unrealistically high estimates for these non-Apiones lands. A rental rate of 5 artabas/aroura and an amount of arable in *autourgia* of 20% seems like the most consistent input factors (column iii).

As long as the proportion of non-Apiones lands remained stable, the Apiones estate would have covered about 44,959 arouras in the early 540s. A 2% proportion in vineyards leads respectively to 1,175 and 994 arouras in the 580s and in the 540s, higher than T. Hickey's median estimate but still lower than the 1,250 arouras ceiling he suggests.²³⁸ This reinforces the sense that the estate had not developed a specific investment policy geared towards more highly productive lands than the 2% Oxyrhynchite's expected average. This stands in notable contrast with the 5% proportion in the Antaeopolite and even more with the likely 24% from the much smaller Theodora estate in the Hermopolite.²³⁹

Agricultural Surplus, Rent, and Tax on the Apiones Estates

Reaching an approximate estimate of the Apiones' overall budget at the time of *P. Oxy. 18: 2196v* in 586–587 over both nomes is now within our reach. This can be done using previously established orders of magnitude and working inputs. Our underlying assumptions are that the *oikos* owned 58,751 arouras of taxable lands, with arable lands, vineyards, and orchards in respective proportions of 90% (of which 20%, the *autourgia*, does not produce visible

²³⁸ Hickey 2001, 70–74 and 2012a, 153, n. 51.

²³⁹ Hickey 2007, 303, n. 113 and 114, with comments about *P.Bad.* 4: 95 in Table 3 above.

grain or gold income), 2%, and 8%. Arable rents were set at 5 artabas/aroura, with an almost even 47.50%–52.50% split between grain and cash. We keep the assumption borrowed from the Aphrodito evidence that the *oikos*, as a tax farmer, transferred only 83% of the taxes it collected on its own lands to the state, with the remainder having been retained to cover expenses linked to the tax collection process, which itself probably yielded some net margin. The median rents (with their tax component incorporated) on vineyards and orchards were set at 3 and 1 *solidi*/aroura respectively. We will also assume that no natural grain surplus remained after covering grain expenses and consigning the regular *embolē* (absent adaeration), but that 23% of the gross cash proceeds were used locally to cover wages, donations, allocations, maintenance expenses, capital investments, and purchases. Grain is converted into gold at a 12 artabas/*solidus* Alexandrian standard. We assume no adaeration at all since this was theoretically neutral as long as the *oikos* was able to sell its surplus grain at a price at least equal to the official adaeration rate. We convert tax yields into Alexandrian standard by dividing by 0.9375 (Table 19).

This table calls for comment. First of all, the gross figures in grain and gold are close to but lower than the overall 108,816 artabas and 18,520 *solidi* reported at *P. Oxy.* 18: 2196v. The difference can be accounted for by the fact that the Apiones accounts have been disentangled from the non-Apiones properties integrated into those accounts for tax purposes. The Apiones net profit stands at 0.09 *solidus*/aroura, or 2.16 carats/aroura Alexandrian standard.²⁴⁰ This is barely above the lowest regional tax rate in gold on arable lands of 2 carats/aroura. As we have assumed that a grain surplus does not factor into the Apiones' profit equation, this level may underestimate the actual profit given that local managers did keep some limited grain overages.

In the years without adaeration, the normal quantity of grain left with the Apiones estate might have been approximately represented by the balance

²⁴⁰ Such low rates of return could be confirmed by *P.Oxy.* 18: 2195. An *embolē* payment of 3,585.25 artabas (l. 130) could point toward an area of about 2,470 arouras. The net cash surplus is worth a little less than 227 *solidi*, while there was an actual grain deficit before 735 artabas were transferred from another account, leading to a 200 artabas grain surplus (from Johnson and West 1949, 53 and 61 and Banaji 2001, 223, tab. 2). The net earnings would be worth 0.09 *solidus*/aroura. The same computation with the earlier *P.Oxy.* 1: 142 and 143 (534–535, see Mazza 2001, 140), which records a 229 *solidi* cash surplus and 1,485.25 artabas of *embolē*, points rather to 0.19 *solidus*/aroura. In both cases, the gold tax had not been settled yet. In *P.Oxy.* 63: 4397 (545), a farm of 16.5 arouras of irrigated arable lands is provided as a guarantee for a loan of 80 *solidi* with a rate of 0.5% per month: Carrié 2003b, 272–3. The land's income was supposed to provide for the interest payments, which suggests an after-tax income of 0.29 *solidus*/aroura. This seems significantly higher than our Apiones estimate. However, computations from single administrative units, although tempting, should be resisted. Each of them could have incorporated higher or lower proportions of vineyards or orchards, while accounting transfers could be made between *prostasiai* in the Apiones cases.

Table 19. The Apiones' Economic Surplus at the Time of P.Oxy. 18. 2196v (586/587 CE)

	Area (<i>arouras</i>)	Grain income (<i>artabas</i>)	Gold income (solidi)	Embole (<i>artabas</i>)	Local expenses in grain	Local expenses in gold	Gold tax	Net surplus in grain	Net surplus in gold (solidi)
Arable lands	52,875.9	100,464.2	9,253.3	78,097.7			5,851.6		
of which <i>autourgia</i>	10,575.2	0.0	0.0						
Vineyards	1,175.0	0.0	3,525.1	685.4			931.9		
Orchards	4,700.1	0.0	4,700.1				1,387.0		
Total	58,751.0	100,464.2	17,478.4	78,783.1	21,681.1	4,020.0	8,170.6	0.0	5,287.8

between the 162,313 artabas gross receivables from *P.Oxy.* 18: 2196v and the 140,618 artabas contributed as *embolē* in *P.Oxy.* 1: 127. This amounts to a little over 22,000 artabas, potentially confirmed by the ca. 31,000 artabas grain surplus from *P.Oxy.* 16: 1906,²⁴¹ provided this account belonged to the Apiones. If the Apiones had employed between 20 and 25 *pronoētai* by 586–587,²⁴² a ca. 22,000 artabas surplus would imply about 1,000 artabas per *prostasia*. This seems high when compared with the evidence, since the accounts of individual *pronoētai* leave very limited grain surpluses after deductions for local expenses: 11.25 artabas in *P.Oxy.* 16: 1914; none in *P.Oxy.* 55: 3804; 199.75 artabas in *P.Oxy.* 18: 2195; 423.25 artabas in *P.Oxy.* 16: 1912 (the largest available figure). However, the 22,000 artabas estimate obtained by comparing *P.Oxy.* 18: 2196v with *P.Oxy.* 1: 127 does not provide a grain net surplus after all expenses, but only a disposable surplus after the *embolē*. This needs to be compared not with grain receivables, from which other expenses like wages, seed, or various allowances had been deducted, but with local earnings, from which only the *embolē* is subtracted. Three of these local accounts do provide an explicit figure for individual *embolē*: *P.Oxy.* 55: 3804, 16: 1912; and 18: 2195. Their average grain receivables minus *embolē* are worth 1,318 artabas, a figure not incompatible with 1,000 artabas per *prostasia*.²⁴³

However, the Apiones did not enjoy such a level of grain surplus, as their other local expenses often led to almost zero local balances. One may assume they were used locally at a later stage, while sales of trivial amounts are attested.²⁴⁴ The fact that there is no attestating of intra-*oikos* grain transfers or grain shipments to some central management structure (even though “a centralized transportation corps” was probably operated by the *oikos*²⁴⁵) suggests the validity of assuming that the very limited local grain surpluses should not be factored into estimates of the *oikos*’s overall profitability.

²⁴¹ See above nn. 137 and 171.

²⁴² On the 16–20 estimated number of *pronoētai* in 540, see above n. 203. To that range we apply the ca. 30% growth that the estate would have enjoyed between 540–542 and 586–587 (above, Table 16), hence a new range of likely 20–25. This is lower than McConnell 2013, 77, estimate at 38 *prostasiai*, because he overestimates the estate’s growth between both dates by comparing the income figure in cash + grain from *P.Oxy.* 18: 2196v with the cash only income figure from *P.Oxy.* 16: 1918v.

²⁴³ This does not mean each administrative unit settled its own *embolē* liability. In *P.Oxy.* 55: 3804 (l. 149), the *embolē* payment is stated as 192.7 artabas. If this had represented its entire grain liability, one would expect an area of about 125–150 arouras. However, the accounts show gross receivables of 647 *solidi* and 1,535 artabas, pointing to a significantly larger area. It is clear that some of its *embolē* had been paid by other *prostasiai*. Similarly, in *P.Oxy.* 18: 2195, a local grain deficit is compensated by a surplus from a neighboring unit; see Johnson and West 1949, 53 and 61.

²⁴⁴ Hickey 2012a, 29; Hardy 1931, 100.

²⁴⁵ T. Hickey 2008, 97, n. 45 ; see as well above n. 32.

The *embolē* paid by the Apiones from their own estates would have reached 78,783 artabas. In addition, they would have paid 8,341 artabas for the 6,220 arouras whose tax accounts they managed without claiming ownership of the land. Finally, there were 53,495 artabas in contributions from the villages. The total of these three figures, 140,574 artabas, is almost the same as the 140,618 artabas from *P.Oxy.* 1: 127. There is obviously some circularity here since we used that same papyrus to estimate the size of the Apiones' estates in 586–587. At a minimum this proves that our calculations have been implemented coherently. An adaeration of one-third of this total represents 3,900 *solidi*, which would have reduced the net gold surplus before grain sales to 1,387 *solidi*. This is significantly higher than the 718.5 *solidi* computed in Table 17 (col. iii l. 6, above). Interestingly, if we set 10.25 artabas per *solidus* as the adaeration rate used by the imperial authorities, this would drive back this estimated surplus from 1,387 to 720 *solidi*, almost the same figure as in Table 17. 10.25 artabas per *solidus* is very close to the adaeration rate in *P.Oxy.* 16: 1909—10 artabas per *solidus*. If 12 artabas/*solidus* was the most frequent conversion rate used by the Apiones, it would have stood as comparatively advantageous to their tenants, even in Alexandrian standards, sending cash instead of grain as rents, and may therefore have been used as a management tool by the Apiones to lure tenants into cash rents on grainlands.²⁴⁶ Regardless, since most of the cash surplus would have been wiped out by a comprehensive adaeration of one-third of *embolē* tax, pending disposal of the surplus grain, any higher adaeration rate would have left the Apiones with a net negative cash position prior to selling their surplus grain, confirming what we had already noted after Table 17 (above).

The Apiones as (Non)Entrepreneurs

The Apiones did not engage in long-distance trade, did not aim at generating large wine surpluses, and built an almost autarkic estate characterized by a low net rate of return. Although the model described here does not indicate that they failed to invest time and effort into the management of their properties,²⁴⁷ it certainly balances a model like that advocated by Rathbone, favoring an effectively involved owner like the Appianus attested in the

²⁴⁶ This is an area where tax collectors (including the Apiones) would potentially have been in a position to extract a margin by using an unfavorable rate, a practice denounced in *Nov. Iust.* 128 (545). Conversion prices close to 10 artabas/*solidus* are attested in the Apiones dossier: see above n. 72.

²⁴⁷ Apion II occasionally visited his property: *P.Oxy.* 16: 1913, l. 59–60; Hardy 1931, 34, and the investments they undertook on their estates led Jones 1986 (1964), 808 to deem the Apiones “progressive landlords.”

third-century Heroninos archive, against Kehoe's model of absentee landlords like Pliny the Younger, who was attracted by security and prestige, and generally unwilling to commit to management tasks considered below his social status.²⁴⁸ Obviously, the Apiones cannot be taken to have been representative of all Egyptian large or middling landowners. The Hermopolite estate of Theodora opted for a much higher exposure to cash crops like wine, Count Ammonios actively expanded his holdings through the acquisition of small plots in Aphrodito, rich urban families similarly owned village-registered lands, and lower down the social scale, local well-to-do villagers like Aurelius Phoibammon, Apollos, and Dioscorus of Aphrodito thrived while displaying more dynamic economic behavior.²⁴⁹

Negative externalities—high information costs; a low speed for the circulation of information; limited inter-provincial exchanges; a strong commitment to local ownership with the support of quasi-autonomous civic entities that harmed the interests of senatorial owners (witness the complaints of Symmachus); low to negative economic scale effects in a mostly agrarian economy relying almost exclusively on a human and animal workforce; difficulties encountered in building topographically contiguous large properties—all these many factors worked against productivity gains and self-sustained cumulative growth for the largest estates. At the same time, elevation on the social spectrum; political considerations; the search for security and social prestige; administrative commitments and loyalties, all hindered the effective pursuit of pure financial enrichment.

The rationale at the top of the social scale incorporated factors that smaller owners did not have to take into consideration. At some point, Apion I was entrusted with supplying the Roman army operating against Persia, and his son Strategius II became Augustal prefect in Alexandria.²⁵⁰ By the end of the sixth century, the Apiones would have been responsible for at least 2% of the entire Egyptian *embolē*.²⁵¹ Such considerations created political pressure in favor of a steady and safe production of grain, even if that meant gold income that was smaller, but apparently more secure. The peculiarity of artificial irrigation on the Apiones lands may have been part of the same effort to ensure safer returns involving much higher capital costs.²⁵² The Apiones

²⁴⁸ Rathbone 1991 and Kehoe 1992. See Bagnall 1993b review.

²⁴⁹ Hickey 2007, 304–5; Zuckerman 2004, 234–38; Mirković 2010.

²⁵⁰ Mazza 2001, 55 and 57.

²⁵¹ Calculated on the basis of the 140,618 artabas recorded at *P.Oxy.* 1: 127 and the 8 million artabas in demanded by Justinian's *Edict* 13. This obviously does not take account of properties outside the nome owned by the Apiones

²⁵² Although the increased use of mechanical irrigation was not limited to the Apiones, as confirmed by many Aphrodito or Hermopolite leases; see Lemaire forthcoming and Drew-Bear 2010.

oikos remains by far the largest documented Egyptian estate from Roman Egypt.²⁵³ It was also a senatorial estate. It may not be coincidental that its actual economic yield probably stood at the lower end of what Egyptian estates could provide their owners.

At the same time, with a net equivalent-gold income from both nomes lower than 10,000 *solidi* in normal years, even if we were to factor in their non-Oxyrhynchite and non-rural sources of income,²⁵⁴ it is hard to believe that the Apiones could have reached the level of wealth attributed by ancient literary sources to fourth- and fifth-century western aristocrats.²⁵⁵

Did the end of Justinian's reign witness a "Laffer curve" situation?

In modern economic jargon, the Laffer curve suggests the existence of an optimal rate of taxation beyond which tax revenues and the overall economic activity decrease as a result of excessive tax burden. There is no reason ancient economies were immune to such a phenomenon, as the assessment of the high-tax regime of the late 560s will show.

We are applying the highest Aphrodito model tax rates from 567/568 to the Apiones estate as in the late 580s—keeping everything else equal, and ignoring the *oikos*'s growth between the two dates. Table 20 compares three periods: 567/568 (when, we assume, the Apiones had to deal with the same tax increase documented in Aphrodito); 586/587; and 600 (after the end of Maurice's reign, on the assumption that tax rates were reduced at this point). The corresponding tax rates on arable lands are displayed by Table 14 (above).

The highest rate would have more than wiped out the Apiones' surplus. Obviously, there is no evidence that the Apiones had to deal with the same supplemental tax as in Aphrodito. But even the 4 carats regime would almost have absorbed their cash surplus.

²⁵³ Harper 2015, 51, tab. 3.4

²⁵⁴ The Apiones owned properties outside of the Oxyrhynchite (see Mazza 2001, 38–9 and 42–4) as well as rent-paying urban properties, and estates as far away as Sicily, but the Oxyrhynchite, where they began, represented their power base as well as the overwhelming source of any documentation pertaining to them.

²⁵⁵ Over 5,000 lb. of gold or almost 400,000 *solidi* according to Olympiodorus, with 120,000 *solidi* for Melania and a little lower for Symmachus. The *aurum oblativum*, the lump sum of money senators had to offer to emperors on their accessions and successive quinquennial celebrations, was tariffed at 3,000 pounds of gold per capita in Rome until the collapse of the Western Empire, and 3,000 pounds of silver in the East, fourteen times less than the western figure. This was a likely sign of the gulf that separated the great senatorial families of Rome, with their extensive Gallic and African estates (at least until the Visigothic and Vandalic invasions), from their more modest brethen of New Rome, *novi homines* from the eastern civic elite, cf. Jones 1986 (1964), 538–39, 554–55, 566–71; Hendy 1985, 201–3.

Table 20. The Apiones' Net Surplus with Three Different Tax Schedules

	<i>Gold gross income proportionally adjusted for local expenses</i>	<i>Gold tax in 567/568</i>	<i>Net gold surplus in 567/568</i>	<i>Gold tax in 586/587</i>	<i>Net gold surplus in 586/587</i>	<i>Gold tax in ca. 600</i>	<i>Net surplus in ca. 600</i>
Arable lands	7,125.0	12,678.5	567/568	5,851.6	586/587	3,901.1	
Vineyards	2,714.3	2,210.6		931.9		866.9	
Orchards	3,619.1	1,820.5		1,387.0		1,040.3	
Total	13,458.4	16,709.6	-3,251.2	8,170.6	5,287.8	5,808.3	7,650.1

Note: Arable lands are taxed following a chronologically decreasing 4, then 3, then 2 carats/aroura tax rate, with a 2.5 carats/aroura supplemental tax in 567/568, resulting in a realized rate of 6.5 carats/aroura that year. All other rates are adjusted accordingly. We do not use any adaeration.

What did the 567/568 tax regime mean for Aphrodito's small landowners? The following table (Table 21) assumes a very simplified world—all the land is leased to tenants by *kōmētika* landowners, a regime of equal share cropping is assumed, with cash-equivalent agricultural income split between lessors and lessees reaching respectively 1, 6, and 2 *solidi*/aroura on arable lands, vineyards, and orchards—we are doubling previous rental yields. 10% of the gross production needs to be put aside for seeds. The aggregated numbers are summarized by the following table.

Table 21. Aphrodito Under the 567/568 Tax Regime

	<i>Arable lands</i>	<i>Vineyards</i>	<i>Orchards</i>
Area (arouras)	3,847.3	79.5	508.8
Agricultural rent yield (<i>solidi</i> /aroura)	1.0	6.0	2.0
Estimated gross income (<i>solidi</i>)	3,847.3	477.0	1,017.5
Tax rate (carats/aroura)	6.5	25.5	10.5
Tax liability (<i>solidi</i>)	1,042.0	84.5	222.6
After tax income	2,805.3	392.5	794.9
Net income after allowance for seed	2,420.6	344.8	693.2

Note: As a simplified hypothesis, seed is worth 10% of gross yield.

Aphrodito lessees and landowners seem to have endured the high-tax regime in a better position than the Apiones, although we have not attended to certain expenses, like the need to make irrigation investments, grow fodder, and pay other production-related expenses, which applied to them just as they did to the Apiones. Of much greater importance is the fact that we are not dealing with a single estate generating a net margin, but with as many as 300 families owning this land area, with maybe just so many lessees.²⁵⁶ A net margin after tax of about 3,500 *solidi* shared between *ca.* 600 families would have fallen below their subsistence requirements, given that an individual needed about 3 *solidi* annually as a basic subsistence allowance. Obviously, some villagers owned *astika* lands outside of the scope of *P.Aphrod.Reg.* But there is little doubt that small landowners and their tenants went through

²⁵⁶ This is a self-consciously oversimplified model. Zuckerman 2004, 222–23 identified about 200 non-institutional tax payers. In addition, some of the “institutions” were small ecclesiastical foundations that fed a certain number of people not identified on the register. In Aphrodito, even if *P.Aphrod.Reg.* associates land tax in gold with owners, the tax itself was generally paid by the tenants, as displayed by most surviving leases; see Lemaire forthcoming, 39, n. 71. This has no bearing on our computations since we aggregated both layers.

a very difficult phase. It is no surprise, then, that Dioscorus of Aphrodito invested so much energy and expense and spent so much time travelling in spearheading his village's fight against the latest tax increases. For the villagers, this was a matter of life or death.

About 25 years later, the complete adaeration scheme attested in *P.Oxy.* 16: 1909 would have occurred at a time when tax yield was at its lowest. Based on a 140,618 artabas total *embolē* converted at 10 artabas/*solidus*, the cash surplus would have covered 51% of that adaeration-related cash requirement. The Apiones, under this hypothesis, would then have been able to sustain a fifty-percent adaeration scheme only. This would confirm that bankers and long-distance grain dealers must have played an increasing role, as has previously been asserted.

If we assume the Apiones had to deal with the same pressure attested in Aphrodito in 567/568, the overall stability of the *oikos*'s leases attested by the comparison between *P.Oxy.* 16: 1911 and 55: 3804 (issued nine years apart in 556/557 and 565/566 with the same list of tenants) implies that the Apiones were unwilling or unable to transfer any additional burden onto their tenants. Nor would additional growth have been a viable option. Using the numbers from Table 19, l. 6, cols. iv and vii, with a cash income of 17,478 *solidi* to which 4,020 *solidi* of local expenses had to be deduced, we find a pre-(gold) tax surplus of 5.5 carats/aroura with 58,751 arouras owned by the Apiones (still using their 586–587 estimated size). Once the state began levying 6.5 carats/aroura in Aphrodito (and possibly on the Apiones' estates as well), any additional arable land the Apiones acquired would actually have reduced the *oikos*'s net margin. We have no evidence that the same rates applied to the Apiones at that time; they might have escaped the *synteleia* or the *diagraphōn*, which in any case did not last for long. Nevertheless, the negative marginal net rate of return with which the Apiones would have had to deal with (Aphrodito certainly had to deal with it) clearly illustrates that Egypt had reached a situation of excessive taxation. There is little wonder that Justin II, Tiberius II, and Maurice, the three immediate successors to Justinian, are each attested as having taken steps to deal with public debts or tax rates.²⁵⁷ The fiscal situation at this juncture at the end of Justinian's reign was probably not sustainable.

The fascinating question of the so-called "bankers'" plot of 562 must be understood in this context. Although involvement by the traditional landowning aristocracy has not been recorded,²⁵⁸ Justin II's decision to remit unpaid tax arrears and to repay all public debts in 566 involved *magni possessores*, as

²⁵⁷ *Nov. Iust.* 148; 163; Theoph. Sim. 8.3.17.

²⁵⁸ See above n. 211.

well as *coloni*, *conductores*, and holders of emphyteutic leases.²⁵⁹ This implies widespread financial and political concerns that even reached the upper land-owning classes.

The Empire had stretched itself to its limits by overextending its geographic and military ambitions under Justinian even as the plague had impacted its labor pool. The result was that the entire agricultural surplus available to Egyptian landowners was simply siphoned away. It is thus no surprise that Justin II chose to distance himself from his predecessor in spectacular fashion as soon as he acceded to the throne, nor that large tax cuts were introduced under Tiberius II. In fact, the peak of the tax cycle documented for 565–568 may have been caused by Justin II's decision to repay public debts and pardon arrears, as the military situation was no less pressing in 568 than in 565. This could also help explain the decision to interrupt the subsidies that had formerly been provided to the Avars and Persians.

In this sense, neither the tone of Dioscorus's petition nor the message conveyed by Justin II's *novella* 148 would be purely rhetorical. As Bell wrote recently about Justin's intentions, "such legislation, theoretically, benefited all taxpayers. The primary beneficiaries, however, were richer landowners, of whose sufferings we are tediously reminded."²⁶⁰ The conflict between state and estates was finally resolved at the expense of Constantinople's urban populace by privileging gold income for the military over grain extraction through increased adaeeration practices, ending centuries of a tradition that had benefitted the residents of the imperial capitals. The suspension by Heraclius of the free distribution of bread in Constantinople in 619 may mark,²⁶¹ in that sense, the true ending of Antiquity and of its imperial evergetic tradition.

Agricultural diversification probably developed on a significant scale from the end of the sixth century onward as a consequence. This creates a perfect test case for Keith Hopkins "Taxes and Trade" model.²⁶² Significant non-grain overseas exports are attested outside of Egypt, something quite unusual for earlier periods. In 610–620, thirteen or more vessels from the patriarchal fleet of Alexandria carried high value produce (dried goods, silver, clothing, other objects of value) worth 34 *kentenaria* of gold (= 244,800 *solidi*) into the Adriatic. This single cargo is equivalent to about 2.5 million artabas of wheat, or almost one-third of the entire Egyptian annual *embolē* as provided by Justinian's *Edict* 13.²⁶³ On a much smaller scale, but equally worthy of

²⁵⁹ *Nov. Iust.* 148.1.

²⁶⁰ P. Bell 2013, 85.

²⁶¹ Wickham 2009, 260.

²⁶² Hopkins, 1980 and 2002.

²⁶³ Mundell Mango 2001, 95–102.

attention, was a Hermopolite wine cargo of at least 12,700 litres shipped to Constantinople in 621 or 636.²⁶⁴ On the eve of the Arab invasions, Egypt may then have enjoyed more potential for economic prosperity and integration through overseas trade and exchange than ever before.

The Disposition of Agricultural Rent

We will now evaluate the distribution of the available agricultural surplus around the years 586–587. We assume as a matter of simplification that gross rents, whether in gold, grain, or mixed species, constituted on average about 50% of harvests, and that tenants were on average compelled to retain 20% of their share as seed grain (Chart 1).²⁶⁵ We use the numerical results from Table 20.

This breakdown should be adjusted by the income and expense accounts in kind that were not represented in *P.Oxy.* 16: 1918v and 18: 2196v. As previously noticed, however, they most likely had limited impact on the overall estate's net income.²⁶⁶ But they contributed to gross agricultural production and to the Apiones' expenses. Hickey's systematic works on wine provide us with estimates for that staple, which represented the highest value item we may be missing, while focusing only on the cash accounts. To provide a sense of what we are omitting, the maximum size of those vineyards providing income in kind would have reached 872 arouras, with 400 arouras being a more likely order of magnitude. This would add at most 1.5% to our previous estimates of the *oikos*'s overall area. They would have most likely provided the 36,750 *dipla* estimated from *PSI* 8: 953 by Hickey.²⁶⁷ At 30 *diplal solidus*, this grossed 1,225 *solidi*, not an inconsequential amount, but it does not fundamentally modify our overall picture. Local expenses would have to be revised from 16.1% to 18.8%, the Apiones' share of the agricultural rent going lower from 14.6% to 14.1%. At the same time, if we assume that 400 arouras of vineyards produced wine rents in kind while paying their tax in gold, this would impact our previous models. Fortunately, the orders of magnitude remain small in comparison with our overall numbers, since 400 arouras taxed at 23 carats contributed 383 *solidi*, less than 5% of the Apiones' estimated gold tax in 586–587 (Table 20, col. v l. 5, above). Since we have other areas of uncertainty, concerning flax and oil for instance, we prefer not

²⁶⁴ Hickey 2007, 295, 40 and Banaji 2001, 18, n. 19. At about the same time, a sailor from Alexandria sold 20,000 *modii* of grain in Britain at 1 *solidus* or a quantity of tin per *modius* during a local famine: Leontius, *V. Job. El.* 9.

²⁶⁵ In the case of a 10:1 yield and a 50/50 share cropping agreement.

²⁶⁶ See above n. 156.

²⁶⁷ Hickey 2001, 65–70.

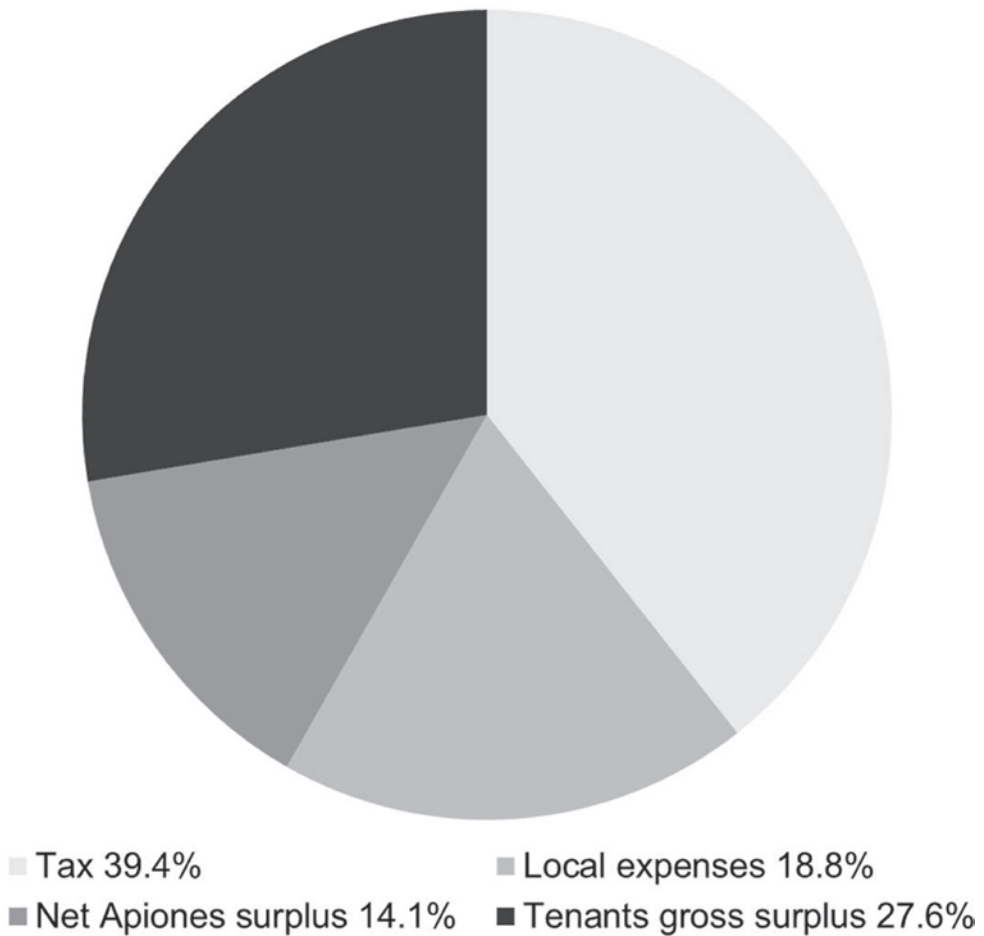


Chart 1. Breakdown of Apiones Gross Agricultural Surplus at the Time of P.Oxy. 18. 2196v (586/587)

to incorporate these impacts and instead stick to amounts in cash and grain while keeping in mind that in so doing we underestimate the Apiones' estate size and gross revenues by a possible maximum of 10%. This is a margin of uncertainty we accepted from the beginning.²⁶⁸

Based on typical sales prices of 3 to 6 *solidi* per aroura for arable lands in the sixth century,²⁶⁹ with orchards and vineyards correspondingly more expensive, the Apiones' net return of about 0.09 *solidus*/aroura would imply

²⁶⁸ As previously noted, see above n. 156.

²⁶⁹ Jones 1986 (1964), 1340 n. 117.

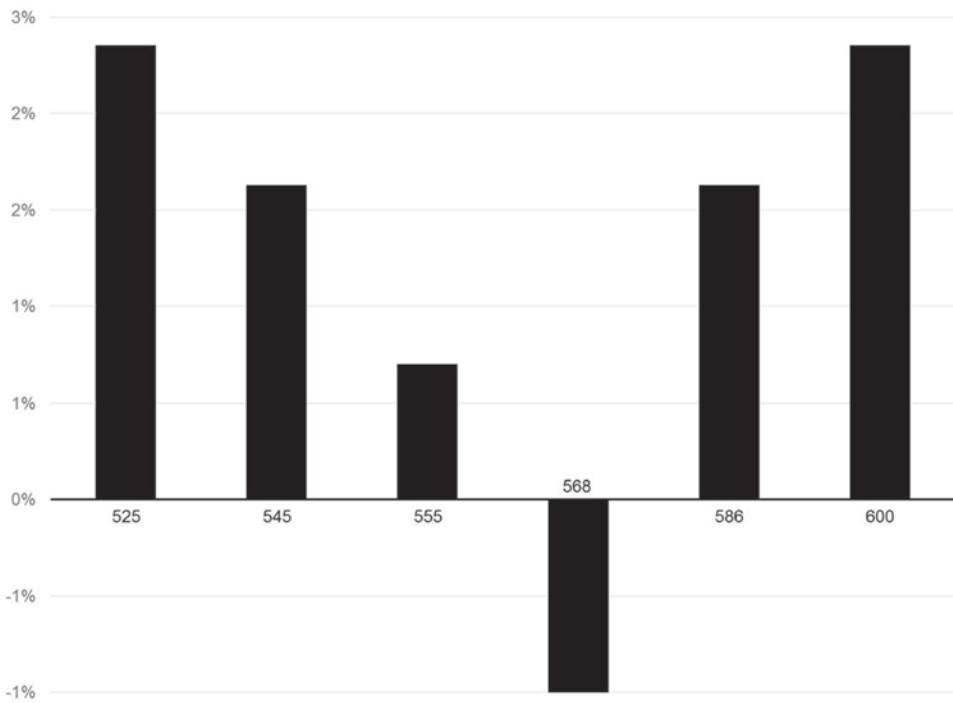


Chart 2. *Apiones' Estimated Net Return on Landed Capital between 525 and 600*

a net economic return after tax on landed capital in the area of 1.5% in the late 580s.²⁷⁰ Even under the more favorable fiscal conditions of the early and late sixth century, it could not have reached as high as 3%, interestingly just slightly below the 4% interest rates allowed by Justinian for cash lenders with a rank of *illustris* or higher.²⁷¹

Such yields may seem significantly lower than the 5% net return often assumed on Roman-era agricultural properties and the approximately 4% average return suggested by Carrié for Egypt in the later Empire.²⁷² Running a large estate involved a range of expenses that did not concern small landowners, starting with salaries paid to administrators by the Apiones to manage their scattered properties, and the substantial donations they made to various religious foundations. Although these latter expenses might be seen

²⁷⁰ Jones 1986 (1964), 822, estimated a range of 3.5–4.5% for a landowner bearing no management or donation-related costs.

²⁷¹ See above n. 211.

²⁷² Carrié 1997, combining p. 124 table 1 and p. 131 table 2.

as a way for the family to strengthen its political clout in the region, such a low net return reinforces the sense that increasing the size of a large estate in a traditional agricultural economy could generate more negative margins than economies of scale. Geographic concentration would have mitigated against some of these unfavorable factors by allowing productivity gains through more efficient resource allocation, but it does not seem that the expansion of the Apiones' overall property led to such results, as their holdings were essentially dispersed throughout the nome.²⁷³

Maintaining the Flow of Gold from Egypt in a Context of Lower Taxation

From the point of view of the imperial authorities, the increased conversion of grain tax into gold took place as overall tax rates decreased from the 570s onward. The rough synchronization of both trends ensured some degree of stability in the overall gold income of the state. Lower tax rates and higher adaeration rates were two faces of the same fiscal coin. At some point, faced with taxpayers' exhaustion, wars on all fronts, and a potentially reduced population in Constantinople itself, the state had chosen a rational strategy: preserving its cash income at the potential expense of the Constantinopolitans' food allowance. Paradoxically, the effects of the plague on Constantinople's urban population might have helped to mitigate some of the pressure on the very fiscal crisis it may have helped to provoke.²⁷⁴

Using the results of Table 15, Chart 3 posits the evolution of the tax rates in gold and grain on Egyptian arable lands, converted into gold units over the course of the sixth century, if we exclude adaeration.

Chart 4, in turn assumes a simplified scenario of one-third level of adaeration starting in the early 580s and complete adaeration from the mid-590s onward and displays tax rates in gold and grain per unit (aroura) of arable lands. *This is not to suggest that all Egyptian grain proceeds were converted into gold on a systematic basis year after year province-wide from the late sixth century onward.* If *P.Oxy.* 1: 127 postdates *P.Oxy.* 18: 2196v, this would indicate that years with and without adaeration alternated for a period. The very fact that free bread distributions in the capital were first commuted into bread sold at the subsidized price of 3 *folles* per loaf and were then ended in 619 in Constantinople as the Persians invaded Egypt proves that the province maintained a permanent role in feeding the capital, and

²⁷³ Ruffini 2008, 127–38.

²⁷⁴ On the demographic impact of the plague, see Zuckerman 2004, 207–12.

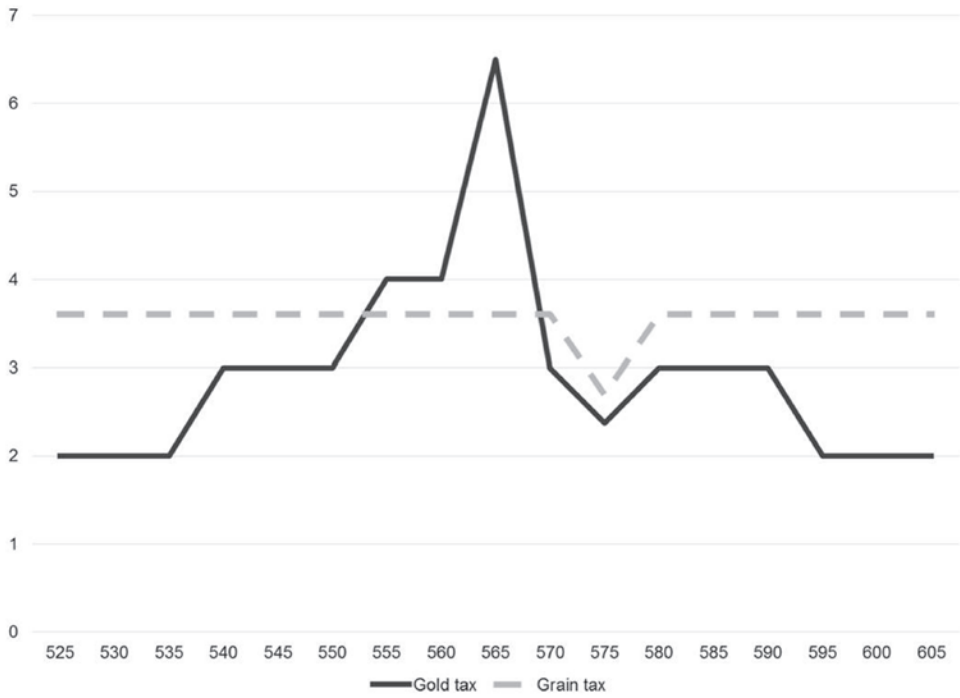


Chart 3. Proposed Egyptian Tax Rates in Gold and Grain on Arable Lands

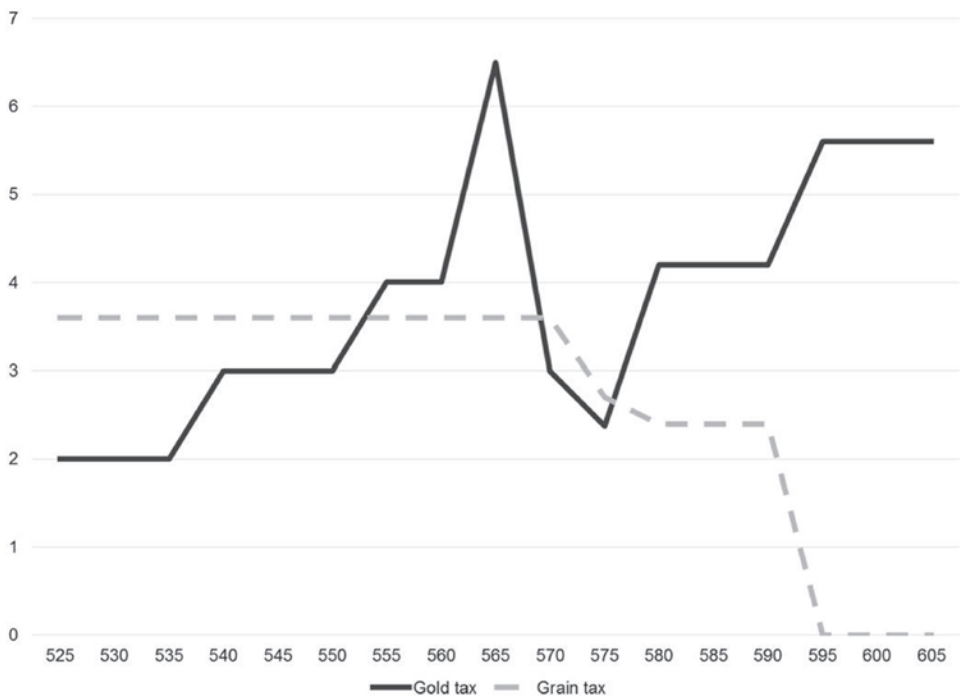


Chart 4. Gold and Grain Tax Rates on Arable Lands assuming Partial Adaeeration beginning in the 580s and Complete Adaeeration in the 590s

that the emperor's concerns were primarily financial.²⁷⁵ One suspects that a reduced population combined with the development of alternative sources of grain lessened Constantinople's reliance on Egypt from the early seventh century onward.²⁷⁶ In that sense, the simplified pattern displayed by Chart 4 must reflect the general rationale followed by the imperial authorities in the later sixth century and early seventh century, whose primary aim was to maintain the relative stability of its gold income. Adaerating grain from at least the 580s was a logical reaction to the tax cuts of the previous decade and the continuing military pressure.

The Uneven Rise and Fall of the Apiones

Since the size of the Apiones' estate probably remained stable between 540 and 580, the approximately 30% growth evidenced by *P.Oxy.* 18: 2196v in 586–587 vs. *P.Oxy.* 16: 1918v in 540–542 must have occurred over a very short period of time.²⁷⁷ This sudden change could have been linked to the complex succession of Apion II, who died between 577 and 579, as his estate was managed by a consortium of heirs until 587.²⁷⁸ This would be consistent with our previous observation that the *oikos* seemed to grow rather as a result of large-scale acquisition of other properties than through the piecemeal purchase of properties from small owners.²⁷⁹ Generally speaking, inheritances and marriages would have represented clear opportunities—and risks—in this respect.

The sense that the Apiones' *oikos* grew in a desultory fashion may be reinforced by *P. Oxy.* 16: 1906.²⁸⁰ There the first three indictions indicate an *embolē* of 79,069 artabas (without the *prospora*), followed by 110,444 artabas. Grain tax variability is attested, although a hypothetical 40% increase would be quite outside of the range of the expected. As the initial years' average grain shipment of 79,069 or 80,849 artabas (*prospora* included) approaches the *embolē* of 87,125 artabas the *oikos* would have paid at the time of *P.Oxy.* 1: 127 and 18: 2196v, it would seem to suggest an additional expansion of the Apiones estate in the late sixth century or early seventh century, possibly in 592/593.²⁸¹

²⁷⁵ *Chron. Pasch.* p. 711 (De Boor) (a. 618).

²⁷⁶ Teall 1959, 97–105.

²⁷⁷ See above under “The Apiones: A House of Privilege?” and Table 13.

²⁷⁸ Palme 1998, 295 and n. 15; Hickey 2001, 19–20; Mazza 2001, 64–68.

²⁷⁹ See above n. 185.

²⁸⁰ See above n. 171.

²⁸¹ If this is the “first indiction” mentioned in *P.Oxy.* 16: 1906 l. 25.

This growth profile, which implies an overall stability between 542 and 580, may seem not to harmonize with the repartitioning of the original attestations of toponyms in the estate records we witness over time. This process would seem to point to a steady (but declining) flow of new properties into the Apiones' sphere of management between the 560s and the 600s, and a major burst in the 540s–550s.²⁸² The contradiction may be more apparent than real. First of all, very little of our evidence deals with the period before 540. It may well be that *P.Oxy.* 16: 1918v (540–542) coincided with recent and major property acquisitions. After all, most of the Apiones' comprehensive accounts belong to the period 540–590, and one of the reasons for this may have to do with a sudden change in scale that would have pre-dated the range of our observations: as a result, new names would show up progressively during the subsequent decades in the available documentation due to its fragmented and partial nature. In addition, the surviving accounts deal with limited numbers of *pronoētai* within the overall list of potential managers and, with the exception of *P.Oxy.* 16: 1911 and 55: 3804, present us with a new sample of the Apiones' universe each time we encounter new documents moving through the period between 550–580. This phenomenon is reinforced by the very partial nature of the evidence.²⁸³ If each *prostasia* covered between 300 to 900 arouras,²⁸⁴ no more than 5,000 arouras would be “covered” by comprehensive accounts like *P.Oxy.* 16: 1911, which was at most a quarter of the *oikos*. Then a steady inflow of new toponyms is guaranteed to appear as we learn about each new area for the first time from a particular piece of evidence, while there is no reason to believe each account was the first of its kind and was not preceded by similar accounts that have been lost. We are missing eight annual accounts between *P.Oxy.* 16: 1911 and 55: 3804. How many are also absent from before and after these two dates? This creates an obvious distortion in the distribution of our data, as new names keep appearing just because the documentation becomes more abundant, although their actual entry into the Apiones estate may have occurred years if not decades earlier. If earlier accounts were to be retrieved, the charts of new toponyms might take on a different profile, with many more names in the 540s and much fewer in the 560s–580s.

²⁸² Ruffini 2008, 106 n. 54, 122, table 10 and 123 table 11.

²⁸³ Ten *prostasiai* jurisdictions are known currently, although 16–20 are likely to have existed, cf. Ruffini 2008, 107–108; Mazza 2001, 179; Hardy 1931, 82 and above n. 203.

²⁸⁴ Mazza 2001, 81. But this figure is probably too low, maybe by an order of magnitude of 50% since the Apiones enjoyed an even split between gold and grain income on arable lands; see above n. 165 and the section on “The size of the Apiones estate between the 540s and the 580s. . . .”

Looking at the period between 580–600, 13 new toponyms appear while 89 had been attested prior to 580. This may point to a 15% growth rate instead of the *ca.* 30% we estimated through our numerical models, but it should be noted that most complete *pronoetēs* accounts belong to the period 555–566, which introduces a clear bias. At the same time, 4 out of the 10 known *prostasiai* are attested for the first time in the period 580–620.²⁸⁵

Based on all the observations and numerical models presented thus far, two periods of growth stand out: one immediately before the early 540s, another immediately after 580, and possibly a third at some point in the 590s–600s.

The fall of the Apiones would present a similar discontinuous profile. Although it is much harder to assess the estate's situation after 620, it did not vanish suddenly with the disappearance of the last known family member.²⁸⁶ A series of payments connected with the indiction year 623/624 indicates 3,962 *solidi* were levied for the indiction's first payment, plus an additional 2,016 *solidi* split between the Oxythynchite and the Cynopolite, leading to an overall consolidated first payment of 5,978 *solidi*. A third payment for the same indiction amounts to 5,040 *solidi*.²⁸⁷ Although the numbers do not add up exactly, if both nomes combined had been assessed at about 6,000 *solidi* per term, i.e., 18,000 *solidi* annually, we would not be far from the 24,500 *solidi* of *P.Oxy.* 16: 1909. These payments may as such represent the bulk of both nomes' gold tax under the Persian occupation. A further hint that such an estimate cannot be too far off the mark lies with the Cynopolite's contribution, 1,008 *solidi*. This stands at 17% of the overall payments of 5,978 *solidi* for that fiscal term. In *P.Oxy.* 1: 127, the Cynopolite's contribution to the *embolē* through the Apiones' estate, at least 52,800 artabas, is worth just over 15% of both nomes' *embolē* of 350,000 artabas at *P.Oxy.* 16: 1909 at a time when the entire Cynopolite was most likely under the Apiones' tax umbrella. These are close orders of magnitude and thus suggest that the 1,008 *solidi* still represent the entire Cynopolite contribution.

The actual 2,016 *solidi* payment from *P.Oxy.* 16: 1843, once annualized, amounts to 6,048 *solidi*, almost exactly one-third of the overall nomes' liability and not too far from the approximately 6,900 *solidi* contributed

²⁸⁵ Mazza 2001, 179–87, app. 6.

²⁸⁶ Flavius Apion III probably died in 620–621 at the time of the Persian invasion. See Rea's comments on *P. Oxy.* 58: 3959, 116–17; Mazza 2001, 72–73; Hickey 2001, 12–24. The last Apiones-related attestation would date from 653 in the Arsinoite (*P.Vindob. G* 20960; see Mazza 2001, 44 (last line of the Arsinoite table) and relates to Flavius Strategius Paneuphemos, who had married a daughter of Apion II; cf. Palme 1997, 95–125.

²⁸⁷ *P.Oxy.* 16: 1843, 51: 3637 and 55: 3797. See Rea's introduction to *P. Oxy.* 51: 3637 and 55: 3797 respectively; cf. Sänger 2011, 653–65; Banaji 2006, 27–42.

by the Apiones' *oikos* in *P.Oxy.* 16: 1918v and 1: 144. It is hard to resist the temptation to associate this payment with what was left of the Apiones' estate under the Persian occupation. The 2,016 *solidi* contribution would have included whatever villages were still under the estate's management umbrella in the Oxyrhynchite as well as the Cynopolite where the *oikos* would still have had fiscal duties over the entire nome. It amounts to 33.7% of the overall payments recorded for that first tranche in that indiction year, and this could stand as a proxy for the *oikos*'s fiscal share for both nomes at that time. We had estimated that in 586–587 the Apiones' *oikos* had managed 104,867 arouras out of 260,990 total in both nomes, including villages, or 40.2% of the total land area.²⁸⁸ So the *relative* loss between 587 and 623 would have been 16%.

Based on these observations, the Apiones' estate would have been through punctuated phases of growth before starting to decline. To summarize in schematic fashion:

- Strong expansion from first attestation (439–540): Significant properties like those of Theon and Flavius Alexander are attested; the estate on which Christodora had a third interest, might have been acquired in this phase; Imperial estates administered by the Apiones from the mid-fifth century onward probably represented the original nucleus of the family's holdings.
- Stability (542–580): *P.Oxy.* 16: 1918v (540–542) and 1: 144 (580) indicate an almost identical tax assessment in gold.
- Massive increase in estate size by 30% (581–587): With the death of Apion II between 577 and 579, the estate seems to have been administered as a consortium until 587.
- Slow growth (590–619): the undated late sixth-century *P.Oxy.* I 127 and possibly *P.Oxy.* 16: 1906, which appear to belong to this phase, could imply limited growth since *P.Oxy.* 18: 2196v (586–587).
- Decline and disappearance from the sources (619–653): *P.Oxy.* 16: 1843, 51: 3637 and 55: 3797 from 623/624 under the Persian occupation imply a significant decrease; *P.Vindob.* G 20960, from the Arsinoite, the last dated papyrological attestation, dates to 653.

Interestingly, the *oikos*' growth phases seem to coincide with periods of low or decreasing taxation rather than the opposite. A more predatory strategy

²⁸⁸ See above Table 15, col. v l. 6.

on the part of the Apiones could have taken advantage of such periods of fiscal hardship to absorb small landowners who would have faced bankruptcy. This does not seem to materialize, especially as the period of high taxation in the 560s does not coincide with any measurable expansion. One likely explanation lies with the decreasing economies of scale that seem to have plagued the *grands domaines*. As a result, their actual breakeven point would have been lower than that for smaller landowners,²⁸⁹ and their capacity to grow was thus hindered by a heavier fiscal environment. This is not to pretend that poorer people were unharmed in much more fundamental fashion by higher taxes, since their survival could be at stake—an economic issue the Apiones did not have to face.

How About the Plague?

A collateral question arises concerning the effects of the Justinianic plague. One would expect some marginal lands to be abandoned as population decreased. Distant and secondary sections of irrigation canals would no longer have been properly maintained, possibly leading to higher wheat prices and lower outputs.²⁹⁰ At the same time, we would expect the number of households to have decreased, allowing large landowners to grow in size at their expense. This might help explain the Apiones' stagnant productivity, if only the estate had grown between the early 540s and 580 following the outbreak of the plague in 541/542. In fact, however, the opposite seems to have occurred, with most growth occurring outside of the period when the impact of the plague was highest between 540 and 580. Furthermore, the plague seems to be entirely missing from all the numbers, accounts, and orders of magnitude with which we have been dealing, the only hint being that the Apiones seem to be eager to retain their lessees, as if there was some scarcity of available workforce.²⁹¹ We have no easy explanation for this, although its importance cannot be denied.²⁹² As Ruffini and Papaconstantinou wrote respectively: “and yet the papyri themselves are strangely silent” and “this absence of the plague in the papyri is intriguing and cannot be dismissed by saying that the documentation is too haphazard.”²⁹³ Nor does it suffice to claim that papyri convey fossilized

²⁸⁹ See above Table 20, col. iv l. 5.

²⁹⁰ Bosch, 2005.

²⁹¹ Mazza 2001, 127–28 and 160.

²⁹² Harper 2016.

²⁹³ Ruffini 2008, 145; Papaconstantinou 2012, 202. Even the use of *loimos* in *P.Cair. Masp.* 3: 67283 I, l. 9 remains disputed as the word is partially restored while the whole context is highly rhetorical and could refer to literary *topoi* like the Athenian plague in Thucydides, Papaconstantinou 2012, 215, n. 28, with references.

information (which may at times be true): at the end of the day, the Apiones' estate and Aphrodito did pay significantly higher fiscal dues in the late 550s and again in the 560s, and how this could have been possible if population and production had collapsed remains difficult to explain. Could Middle and Upper-Egypt and more generally speaking the Nile valley have proven relatively resilient to an epidemic that struck at Pelusium first after having traveled north from Ethiopia through the Red Sea? Or was the demographic recovery that rapid in a population where life expectancy was, at any rate, very short and fertility very high? Alternatively, Egypt had been overpopulated and its production capacities were not hindered by the human losses as long as they did not reach catastrophic proportions.

Conclusion

At the outset of this research project, we had followed earlier scholarship in our conviction that the Apiones had enjoyed tax privileges which allowed them to gain a competitive edge on the small holders in their region. This was the only way to account for the growth of the gold and grain figures available through *P.Oxy.* 16: 1918v and 18: 2196v if we assumed stability in the size of the Apiones' estate between the 540s and the 580s. When it became mathematically certain that the Apiones' estate had grown, all earlier computations performed in the service of this project had to be revised. At the close of this process, we also became aware of the 2013 dissertation of McConnell, which reaches the same conclusion—that the Apiones' area of ownership and fiscal responsibility grew significantly during that period. At the same time, Fournet's new readings of the Dioscorus's archives led to some revised tax rates in the Antaeopolite.

Part One of this paper lays out the sources, which consist essentially in those tax and receivable accounts that are sufficiently complete and reliable to provide quantitative foundations for the argument. With this material in hand, we began to build a numerical model that would be compatible with the available taxation figures from Aphrodito, Antaeopolis, and possibly other areas of Egypt in Part Two. This second section owes much to the work of Zuckerman, who, following Remondon's methodology, made use of the tax rates quoted by Dioscorus in his petitions to estimate tax proceeds and compare them with the actual figures from the the Register of Aphrodito. We have attempted to extend that effort by taking account of the non-tariffed lands, by incorporating Antaeopolis, and by bringing to bear accounts from outside the nome.

We were able to confirm a rate of 1.25–1.50 artabas/aroura on arable lands was for the *embolē*, the civilian grain tax used to supply Constantinople.

Similarly, evidence was mustered to argue that the gold tax rate in Aphrodito started at 2 carats/aroura in the 520s, then grew to reached 4 carats and ultimately 6.5 carats by the late 560s during the reign of Justin II. From that high point, taxation rates decreased progressively, returning to their early sixth-century levels by the end of the century.

We also concluded that the transportation fees on the *embolē* were sometimes levied in grain, sometimes in gold, and most commonly through a mix of both. They would have amounted to an average of about 15% to 20% of the value of the grain cargoes, and would explain why official tariffs of 1.25 artabas/aroura often result in effective rates close to 1.5 artabas/aroura in the available accounts ($1.25 + 20\% = 1.5$).

Part Three deals with the evidence from the Apiones' estate and represented a much more difficult challenge. Recent publications, especially by Hickey and Mazza, as well as the dissertation of McConnell, had brought significant improvements to our understanding of the Apiones' activities in the Oxyrhynchite. However, quantitative data remains fraught: *P.Oxy.* 16: 1918v does not incorporate grain receivables and dues; *P.Oxy.* 18: 2196v accounts only for grain receipts, without expenses; *P.Oxy.* 1: 127 remains undated. Individual *pronoētēs* accounts rarely provide the types of lands making the payments, and never their size. Many other issues also threatened the reliability of numerical analyses at various levels, starting with the various currency standards used by the accounts and the rents and contributions paid in kind (wine, flax, barley, etc.), which do not appear in gold and grain accounts. *Autourgia* lands, which may not have contributed much to the estate's income in gold, would still have been liable to taxation but remain elusive. And we could add the question of how much the Apiones retained in their own purses from gross taxation proceeds as well as the unknown percentage of the lands they managed as tax agents, to name just a few unresolved variables.

Despite these handicaps, we needed to reach working hypotheses that were at the same time theoretically acceptable and mutually verifiable using numerical methods. The only way to verify that models were working as they were developed was to reconfirm numbers generated through independent operations by checking results against one another for compatibility.

First, the *embolē* figures from *P.Oxy.* 1: 127 were integrated into estimated areas of cultivation from the Oxyrhynchite and the Cynopolite nomes. These allowed us to synthesize a model grain tax rate of 1.4770. Not only did this figure match with the 1.25–1.50 artabas/aroura range calculated from the Aphrodito evidence, but it also coincided with its upper limit. This reinforces an important conclusion from Part Two, where it was argued that the use of variant artaba units by the Apiones resulted from efforts to cover a proportion of their transportation charges in grain. We then estimated

the land area in the land type category of “villages” within the Apiones’ accounts through the gold tax in the 540s and the *embolē* in the 580s. Their taxable area was able to be assessed across a span of more than 40 years through independent papyri dealing with two different taxes, which produced remarkably similar results with a differential of less than 3%. This vindicated further our initial working assumption that tax rates from the Antaeopolite could apply to other nomes as well. We then turned to the lands under direct management of the Apiones and again reached compatible results. We concluded that this area had grown by 30% between the early 540s and the late 580s, a figure that coincides almost perfectly with the increase known from their gold receivables. This clearly had important implications: even if they derived some profits from their role as tax farmers, the Apiones did not enjoy any explicit privilege as far as their standard tax rate was concerned.

After resolving further difficulties that confronted us like the *autourgia* share, we turned to the lands not owned by the Apiones, which they nevertheless managed for taxation purposes. These were calculated to amount to about 10% of the lands whose tax accounts they managed. Thus, although such lands did fall under the Apiones’ administrative control, they did not represent a high proportion of their overall management area. The estimated area owned by the Apiones in the 580s must therefore have fallen between the minimalist and the maximalist estimates of Hickey and Jones respectively, although much closer to Hickey’s order of magnitude during the 540s. As the estate’s growth during the sixth century was confirmed, it appeared that acquisitions of small properties did not play a significant role in this process. Instead, the *oikos* grew by merging with its peers, possibly through imperial protection, marriage and inheritance. Not only were we able to confirm Bagnall’s assessment that large estates and relatively egalitarian communities of small landholders coexisted, but we were also able to suggest that this social structure created stability and sustained itself throughout the sixth century.

We were then in a position to assess the Apiones estate net productivity and income. Our estimates are significantly lower than most available scholarly efforts. Under a “normal” tax regime, net returns did not reach even as high as 3%, confirming a view expressed by Gascou quite some time ago:

L’enseignement le plus sûr de nos chiffres a trait plutôt à l’évidente stagnation des revenus de la “glorieuse maison” entre 550 et la fin du VI^e siècle, sinon même à leur fléchissement, comme si le grand domaine protobyzantin ne connaissait d’autres lois de développement que la reproduction indéfinie et l’identité avec lui-même. Nous touchons à la question ardue des effets

économiques contradictoires du système domanial, structure puissante, mais sans doute peu évolutive.²⁹⁴

As it does not seem that the Apiones engaged in lucrative long-distance trade, consistent with Hickey's conclusions,²⁹⁵ sheer profit maximization would not have ranked high on their priority list. The estate produced enough wheat to satisfy its fiscal obligations, while most other products were used to support the estate's irrigation needs, workforce, and charitable gifts. Shielded against Nile flood failures by a consistent focus on irrigation, the Apiones could count on limited but steady gold cash flows. Aggregated with what they could derive from properties located elsewhere in Egypt, this income appears to have sufficed to allow the family to safely maintain its rank in the capital.

Our next step was to assess the impact of the increasingly harsh tax regime that unfolded under Justinian. For large landowners like the Apiones, profits were squeezed and they appear to have reached a situation of net negative returns under Justin II. They may even have fallen into arrears and benefited from the imperial debt relief. At the same time, the small landowners in Aphrodito would have been reduced to bare survival as increased fiscal demands in cash were compounded by bankers and traders supplying coin for unfairly priced grain. For their part, the Apiones processed the necessary sales of grain at their level rather than leaving each village or tenant to do so, an operation that reinforced their roles as patrons, even as it provided effective protection against the worst impact of the fiscal crisis.

As we move toward the end of our observation period, the state became aware that the high taxation regime implemented during the 560s was not sustainable. At the same time, military pressure did not abate. A strategic decision was taken: to move away from the traditional grain-based extraction system that had characterized Egypt since the time of Augustus. By lowering overall tax rates and converting a growing share of the grain tax into gold payments, the imperial authorities managed to maintain the overall cash flows they had traditionally obtained from Egypt while radically decreasing the intake of grain. In doing so, a clear arbitrage was engineered at the expense of the urban beneficiaries of the public annona in Constantinople. Our numerical models imply that *P.Oxy.* 18: 2196v in the late 580s represents an intermediate step between the traditional grain/cash mix attested at *P.Cair.Masp.* 1: 67057 of the early 550s and the full conversion to gold witnessed in *P.Oxy.* 16: 1909 (probably from Maurice's reign). With reduced pressure on its grain

²⁹⁴ Gascou 1972, 248.

²⁹⁵ Hickey 2012a, 141–45.

production capacities but increased demand for gold from the tax authorities, Egypt as must have been pushed toward the cultivation of cash crops even before the Arab invasion.

There are two ways to approach ancient history—as in fact so many intellectual issues: top down or bottom up. We have resolutely utilized the second. We entered this investigation with no prior assumptions about the bigger picture—tax privileges; the convergence or divergence of the interests of lower and upper social strata; the growth of the large estate at the expense of small landowners and quasi-enslaved tenants; the more or less capitalistic behavior of large owners; the efficiency and equitability of the imperial fiscal machine; the local impact of increased taxation; and so forth. Although we were aware of previous scholarly assumptions and opinions, we decided to rely only on numbers. As we started to combine these together, we had no preconceived idea of where they would lead. This method had strengths and limitations. On the positive side, our results are unbiased by assumptions and supported by quantitative data. On the negative side, they may apply only to Aphrodito and the Apiones estate or, worse still, may incorporate significant methodological errors.

The number of times we were able to satisfactorily cross-check intermediate figures resulting from different materials reduced the likelihood of major mistakes. Then, it became increasingly apparent that most of our results should not be restricted to these two dossiers. The common tax rates evidenced by Aphrodito, Antaeopolis, and the Oxyrhynchite, and their cross-application to a limited number of cases outside of these nomes, cannot be attributed to mere chance. Ancient taxation was adapted to suit local conditions, extracting wine, grain, oil, gold, soldiers, cloth, and so forth according to their availability and usefulness at any given time and place. But Roman imperial economic policies had aimed at some form of consistency and universality since the Diocletianic reforms late in the third century. If the Antaeopolite and the Oxyrhynchite operated under more or less the same system, with only limited regional variation, we should expect Egypt as a whole to conform with the norms for these two nomes. Even outside of Egypt, where conditions were more varied, the same bureaucratic apparatus operated under comparable rules with similar aims.

Nevertheless, a contrast could be made between the Apiones and what we can know of the western aristocracy in a slightly earlier period. The Apiones, although not angelic benefactors, were not ruthlessly exploitative. The family's most prominent members fought for the state, involved themselves in the religious controversies of the times at the risk of losing everything, assumed demanding administrative duties like supplying the troops with grain in a distant war, supported local institutions, provided wages,

productive capital, and protection to smaller landowners, tenants, and wage laborers, accepted delicate diplomatic missions, and possibly died on the battlefield for the Empire.²⁹⁶ The family gave a lot to the state, and obtained in return the pride of bearing high honorific titles and status. Moving lower down the social scale, Dioscorus had enough faith in the imperial institutions to commit himself to distant, dangerous, and expensive trips to the capital. Some tenants from his region may have complained or fled, but, on average, the accounts indicate a functioning and sustainable society of farmers, wage earners, lessors, communities, villages, and religious institutions living together. Overall, capital accumulation occurred but did not lead to increased capital productivity. Large estates grew, but apparently rarely at the expense of small landholders. The early Byzantine aristocracy was subject to a high-tax regime, but did not lose its fundamental loyalty towards the Empire. There is no sign of society entering the early stages of feudalization.

The Apiones and the Aphrodito dossiers offer us the most comprehensive financial microeconomic dataset from the ancient Mediterranean world has. In that sense, they are unique. We should learn from them, while attempting to keep modern ideological agendas or biases at bay. Theory should always submit to empirical findings rather than the opposite.

*American Numismatic Society and Institute
for the Study of the Ancient World
bransbourg@numismatics.org / gb1077@nyu.edu*

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²⁹⁶ Mazza 2001, 47–74; Hickey 2001, 12–24.

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