The Ptolemaic Economy

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Chapter 15

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PTOLEMAIC EGYPT[1]

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I. INTRODUCTION

I treat here the internal economic history of the Ptolemaic dynasty, the longest-lived of the Hellenistic successor states, leaving aside the Ptolemaic empire (relevant to the first half of the period, or roughly from 330-168 BC), the role of military conquest (its expenditure and revenue), and international trade.[2] The following can in no way stand for a synthesis. Much important work is underway, or about to appear, on various aspects of the Ptolemaic economy, and there is still considerable unpublished material, particularly written in Demotic Egyptian, which bears on the understanding of the economy. The period was remarkable in the economic history of the Mediterranean, when Greek immigrants institutions were integrated with ancient modes of production and social organization. Like the Seleucid dynasty, the Ptolemies established themselves on a Persian foundation and provided a new incentive structure for state service and private

[1] I am grateful to Roger Bagnall, Willy Clarysse, Dominic Rathbone, and Dorothy Thompson for commenting on earlier drafts. I also thank Professors Wolfgang Habermann, Olivier Picard, and Sitta von Reden for sending me their forthcoming studies. Historical background in Hölbl (1994); Huß (2001). Préaux (1939), (1978) remain important.

[2] Austin (1986). Launey (1950) 767ff. on military finance.

economic activity.[3] Egypt had been an important trade axis connecting the Mediterranean to the east and south for a millennium before the Ptolemies, but Greek immigration, the new city of Alexandria, and Greek institutions had profound effects.

Despite the relative abundance of documentation, much remains unclear or uncertain with respect to revenue and expenditure, and thus, there are severe limits to the quantification of performance.[4] Some subjective measures are possible. The building of new urban centers at Alexandria and Ptolemais, the founding of new villages (especially in the Fayyum), and the construction of new temples is one obvious measure of expansion. The most serious absence of evidence is our restricted knowledge of the Greek urban centers (Alexandria, Naukratis, Ptolemais).[5] The Fayyum is the best documented region in the third century BC, and is therefore the most thoroughly studied. Surviving documents suggest changes from the early (the first three Ptolemies) to the later Ptolemaic system, as well as differences between the intent of state institutions and the rural realities of agricultural production and taxation. At the highest level of generality, the Ptolemaic economy shows many similarities with the Seleucid (Van der Spek,

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[3] An excellent survey of Persian history in Briant (1996).

[4] Bagnall (1995).

[5] For Alexandria, Fraser (1972), esp. Chapter 4, Préaux (1978) 496-511. Recent archaeological work in Alexandria: A. Tullio et al. (1995), Empereur et al. (1998).

this volume): continuity of basic institutions, notably temples, the importance of the settlement of soldiers on the land, immigration of Greeks, with concomitant growth in new land under production, new crops, new urban areas and new fiscal institutions, resulting in increased monetization of the economy.

Here we can begin to expand the "parameters" of the post-Finley debate.[6] The central question is this: to what extent did the Ptolemaic state effect economic development, and to what extent was development driven by demographic change? Ptolemaic state formation did not merely join two economic sectors, but attempted to integrate the ancient institutional structure within a new fiscal system.[7] The interaction between Egyptian and Greek social networks should be stressed, rather than the cultural isolation of the two. For if anything, herein lies the basis of Ptolemaic economic development and constraint. Change came in economic intensification- increased urbanization, increased long-distance trade, and increased monetization, and in structure- intensified agrarian production, royal banks, and royal granaries. Along with this change came rural unrest that, on one occasion (207-186 BC), led to the secession of most of the Thebaid from the Ptolemaic state.[8] The increased presence of Greeks and their role in the

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[6] Saller (2002)

[7] On the two sectors, "ancient" and "oriental," see Finley (1999) 183.

[8] On the revolts of the period, see the summaries in McGing (1997), Manning (2003) 164-71, and the forthcoming study by Véïsse. The causes of the revolts are unclear.

bureaucratic hierarchy, in military service and in other economic activity, altered the structure of social power in terms of language (the increased use of Greek in the villages) and in terms of access to rents (i.e. income).

I emphasize the structure of the Ptolemaic economic system and its institutions rather than economic performance because our poor knowledge of the preceding Persian period, the lack of a good time series of prices (a contrast with the Seleucid economy), our only approximate knowledge of the population (and no means of knowing the fourth century BC population), the absence of Alexandria and Ptolemais in the documentary record, and uncertainty about overall capture of revenue by the state leaves too many uncertainties. The following is clear: there was an increased urbanism (e.g. the important new Greek *poleis* of Alexandria and Ptolemais, and probably an expansion of the nome metropoleis), an increase in trade, and a concentration of wealth among the elite in new urban centers. The foundation and growth of urban centers, the development of roads out to the Red Sea, and the reclamation of new land in the Fayyum, are enough to suggest that the early Ptolemaic period experienced aggregate economic growth, and the increased farming of wheat (at least in some areas) resulted in greater agricultural productivity. Per capita growth was probably restricted by old institutional structures, the limited application of new technology and investment in human capital, although it does appear that there was an increase in literacy rates, at least in Greek (encouraged by taxation policy),

and a consequent increase in the use of writing.[9] The last two centuries, however, were marked by dynastic disputes, rural uprisings and flight from the land that must have affected state revenues as well as agricultural productivity and overall economic performance.

II. AGRICULTURE

(a) Agricultural production

As in other pre-modern economies, agricultural production was the basis of private wealth and the principal source of revenue for the state. Egypt was one of the richest and most densely populated states in the Mediterranean for most of its ancient history. Both of these features were a product of the Nile, its annual flood, and the resulting productivity of the soil.[10] The location and distance between regional centers, linked together by communication along the river, the basin irrigation system, the annual agricultural cycle of flood, sowing and harvesting, the maintenance of the irrigation canals and dikes- what Braudel called the "fixity of the geographical setting"[11]- was the single most important factor in ancient Egyptian socio-economic and political history which the Ptolemies could hardly

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[9] Thompson (1994).

[10] "Normal" yields in Roman period Oxyrhynchus were about 1:10, but could be considerably higher elsewhere. See Rowlandson (1996) 247-52, with a discussion of the factors that affected productivity.

[11] Braudel (1969[1980]) 31.

have changed. But Egypt, although more uniform in its geography than Seleucid Asia, was neither a fixed nor a uniform environment. There were three "eco-zones" in Egypt (the Delta, the Fayyum, the Nile valley) not including the western oases, and variability of water, the organization of agricultural production and to some extent economic institutions varied across these three regions.[12]

The agricultural year was based on the annual rhythm of flooding, sowing and harvesting **(FIGURE 1).** The flood began to be seen at Aswan, in June and reached Memphis a month later. Throughout July, August, September and into October, most fields were flooded and little agricultural work was possible.[13] When water from the flood had reached the desirable level, the dikes were released and water was let into the flood basins, which were sub-divided into smaller plots of four or five acres along the main canals. The water was kept on the fields for forty to sixty days and then drained off through canals. Farmers often had to work fast because there was a short plowing season before the soil would become too dry. The fields were then sown. The progress of the flood each year reinforced regional differences and posed specific problems for the central government. The height of the flood determined the annual agriculture output. It was a delicate matter for the state and for the farmers. The pattern of holding

[12] Butzer (1976).

[13] Thompson (1999a), Appendix C for a composite yearly schedule of maintenance activity in the third century BC Fayyum.

scattered plots reduced risk, and local organization of the irrigation network was the natural result of the virtually flat (1:12,000) gradient of the Egyptian Nile river valley.[14]

Irrigation of the fields followed for the most part the ancient pattern of basin irrigation with gravity-fed feeder and drainage canals. Such a system, following the natural rhythm of the Nile flood and recession, allowed one crop per year. Orchards and vineyards were perennially irrigated.

Planting decisions were also determined by the condition of each field. Outside of large estates of the third century BC (below), agricultural production was probably in most places conducted by small-scale cultivators. The state, in the case of flax for example, promoted production at a specified amount, but production and distribution were largely private affairs.[15] On royal land (probably a higher percentage in the Fayyum), the state provided the seed. The main crops in ancient Egypt were barley, sown on drier land, emmer, and flax on the wettest land, with grain crops taking up about half of the available fields and producing one crop per year. Where possible, fodder crops or lentils were grown in the Summer months.[16] Fenugreek and pulses could also be grown in the basins, while

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[14] On the decentralized nature of land management, Butzer (1999) 382, Bonneau (1993). For the gradient of the Nile, see Butzer (1976) 47.

[15] Thompson (1988) 51.

[16] Butzer (1976) 50.

vegetables were generally grown in garden plots, and palm trees were cultivated on the higher-lying levees as well as in walled gardens. Rotating fields every other year with legumes, more typical of the Fayyum because the Nile silt did not reach the fields there, replenished the soil with Nitrogen, although historically the fertility of the soil allowed the planting of grain in the basins two years in five on average.[17] It is not easy to discern a system on the basis of the normally short-term horizon of the evidence, and in any case there was regional and inter-annual variability. A two-field system operated at least in some areas of Egypt, while in other cases a three-field system (cereal for two years followed by legumes or a fodder crop) prevailed.[18]

During the Ptolemaic period, there was a significant shift to wheat (*triticum durum*) and wine production and consumption. The shift from emmer to durum wheat, the latter being the preferred grain of the Greek immigrants, was more the result of a natural shift in crops caused by forced demand for wheat and not the result of Ptolemaic state direction, although there was a connection

[17] So Williams (1992) 1113. See the comments by Baer (1971) with comparison to Girard's account in the *Description de l'Égypte* and later nineteenth century data.

[18] Crawford (1971) 116-17, with Schnebel (1925) 218-39.

between wheat production and royal land.[19] There may have been some efficiency gains in the amount of labor required to harvest wheat, a factor that has not been considered in either rural productivity or in the growth of Alexandria.[20] Wine production, although like wheat not entirely new with the Ptolemies, was intensified and, by the second century BC, grew to impressive levels.[21] The new Greek population dominated viticulture, at least in the Fayyum—half of the production being in the hands of kleruchs, who had a tax advantage. Viticulture was a major part of the Greek household and export economy in the Fayyum but Egyptian temples also received revenue from their vineyards.[22] There was some experimentation with new crops and livestock, documented principally in the third century BC Zenon archive.[23] In some cases, the experimentation built on pre-Ptolemaic trends.[24]

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[19] On wheat, see Nesbitt and Samuel (1995). On the shift, see Thompson (1984), (1999b), Sallares (1991) 370-72, Van Minnen (2001). The shift to durum wheat production is dramatically illustrated in P. Petr. III 75 (235 BC) cited by Thompson (1999b) 129.

[20] Nesbitt and Samuel (1995), cf. Samuel (1984) 197, n. 22,

[21] Rostovtzeff (1922) 93-103, Clarysse and Vandorpe (1997), Thompson (1999b).

[22] Clarysse and Vandorpe (1997).

[23] Orrieux (1983), 1985.

[24] Thompson (1988) 39-46.

III. URBANIZATION AND POPULATION

No figures survive on pre-Ptolemaic population, although most scholars assume population growth under the Ptolemies largely due to immigration into new urban centers. The usually accepted estimate for the first century BC, including the city of Alexandria, lies between 3.5 and 4.5 million (cf. Rathbone, this volume), on a theoretical maximum agricultural base of nine million *arouras* (1 aroura = ca. two-thirds of an American acre, or 2756 m^2; the total is 24, 793 KM^2), roughly comparable to Egypt at the beginning of the nineteenth century AD.[25] Greeks comprised roughly 10% of the population.

The growth of Alexandria and the reclamation of the Fayyum were without question the two most impressive developments of the period. The city of Alexandria, occupied by 311 BC, was the first "urban giant" in the Mediterranean.[26] The centralization of political power there, the rent-seeking behavior of the Greek elites, and its role as a trading center all played their part in

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[25] Population estimates: Rathbone (1990) 109-15; Scheidel (2001). Estimates based on documents are usually lower: Clarysse (2003) 21 estimates a total population of 2.8 million on the basis of burial records from Edfu. The estimate of seven million by Turner (1984) 167 is too high. The total arable and total cropped area would have fluctuated, and was no doubt considerably less than this maximum. The figure comes from a temple (Edfu) text, but it should not be dismissed outright.

[26] Ades and Glaeser (1995). Scheidel (forthcoming) offers some advance on modeling urban growth in Alexandria.

concentrating a population of around 200, 000 by the middle of the third century BC. We know very little about the grain supply to the city. It seems likely that market exchange, as in Memphis, played an important role. By the early Roman period the city had grown to perhaps 500, 000.[27]

The ancient capital city of Memphis, an important political center since the unification of the Egyptian state ca. 3000 BC, remained a vital economic center of manufacture, distribution and shipping under the Ptolemies.[28] The size of the city was something on the order of 50-60, 000.[29]

The reclamation of land and the settlement of new populations in the Fayyum and in the Herakleopolite and Oxyrhynchite nomes was surely one of the great accomplishments of the early Ptolemaic state. New land in the Fayyum was perhaps trebled (the exact amount of new land is debated). Ptolemaic expansion was centered in the Fayyum for two main reasons: (1) it was possible to reclaim land there, (2) it directly projected state power on new land and new settlements.[30] The new land was continually in danger of returning to marsh. Expansion onto new land allowed the Ptolemies to establish, as it were, new rules, and direct management of the land, although the process was a combination of the state and

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[27] Delia (1988), Rathbone (1990) 120, Scheidel (2001).

[28] Thompson (1988).

[29] The lower estimate of Thompson (1988) 32-5, cf. Rathbone (1990) 141, n. 41.

[30] Rathbone (1996), (1997).

private initiative. The amount of royal land in the area was probably higher than elsewhere, and it became a kind of "showcase" of state power (density of banks, military population is notable).[31] Fayyum villages are believed, on average, to have been larger than those in the Nile valley, and the census registers suggest a total population in the Fayyum of between 85, 000 and 100, 000 in the mid-third century BC.[32]

The most important center in the Thebaid was Ptolemais, the new southern administrative center founded by Ptolemy I. Strabo (17.1.42) states that it was not less than the size of Memphis, and Akhmim (Panopolis), in the same area, may also have been a town of considerable size. In both cases, lack of real information limits our ability to quantify. Greeks from throughout the Greek world, and other groups, continued to be settled there for some time after its foundation.[33] Greeks came in smaller numbers to Thebes, a city of very roughly 50,000.[34] Despite their smaller numbers, it is clear that Greeks settled throughout Egypt, and that they dominated the new towns and in the nome capitals. New garrison towns were established, and kleruchs were also settled in the Thebaid, especially in the second

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[31] Rathbone (1990).

[32] Clarysse and Thompson (forthcoming).

[33] Plaumann (1910) 3, *SEG* XX 665 discussed in Fraser (1960), a Roman copy dated to the second century AD.

[34] Clarysse (1995).

century BC. Old land tenure patterns, and temples, remained important in the south.

IV. THE PTOLEMAIC STATE, ECONOMIC DEVELOPMENT, AND THE STOCK OF KNOWLEDGE

The Ptolemaic period was, in many respects, a continuation of Saite and Persian (650 -332 BC) control of Egypt, and fell in the middle of an important historical transition in Egypt marked by increased long-distance trade and focus on the eastern Mediterranean. Any measurement of per capita and aggregate economic growth should be taken, therefore, between about 600 BC and 100 AD. The major difference with the preceding Persian rule was political, in that the Ptolemies re-established a dynasty in order to rule Egypt as a territorial state rather than as part of an imperial system, notwithstanding the third century Ptolemaic empire in the Aegean. The decline in the use of Demotic Egyptian as a language of contract in this period is a notable result of the use of Greek as the administrative language.[35]

The Ptolemaic state has often been regarded as highly centralized, usually conjuring up the image of a despotic ruler who commanded the economy, and all those within the state. But we draw a distinction here between "centralized" and "bureaucratic," and between the direct revenue of the king, and the revenue of the state. State revenues were no doubt impressive by ancient standards, but there were limits on the degree to which economic production could ever be centralized

(i.e. planned, or commanded from the center), given the nature of the Nile valley, the distances between center and periphery, and the nature of irrigation, which dictated local control and placed the emphasis on local knowledge of agricultural conditions.

In Rostovtzeff's view, the Ptolemies continued the tradition of ownership of the land by the king and the compulsory labor system, the "twin pillars" of an Oriental state."[36] All land was either "royal land," directly managed by the king, or was "conceded" to others to work, but which could be taken back by the king as he desired. Many scholars have assumed an erosion of state power over land from the third to the second and first centuries BC.[37] But the theory of the devolution of royal power on the land rests on two false assumptions. The first is that the king claimed all of the land in Egypt by royal right. This idea was supported by the land terminology used in official documents that divided the land into two large classes, royal land, which was directly controlled by the crown, and conceded land. The fiscal terminology, however, somewhat different in the south, reflects neither the maintenance of traditional land-holding patterns in the Thebaid nor the limited intervention there. A recently studied text confirms

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[35] Manning (2003) 173-77.

[36] Rostovtzeff (1941) 271.

[37] Lewis (1986) 33. Taubenschlag (1955) 235. Cf. Husson and Valbelle (1992) 260-61.

the widespread private holding of land in the south, although the taxation of the land compares to that of royal land in the Fayyum.[38]

Despite Hellenistic advances and the impressive scientific output in Alexandria, productivity was probably only marginally improved by new technology.[39] Much has been made of the new technologies of the period, but as far as evidence permits, the use of new machines was rather limited in the Egyptian countryside before Roman times.[40] The waterwheel and the Archimedean screw, certainly attested for the first time in the Ptolemaic period, intensified local irrigation possibilities, mainly in orchards and vineyards, although, like double cropping, the use of these machines was probably limited before the Roman period.[41]

New technology it seems, whether it was machines, or the alphabetization of census registers, were slow to reach the countryside.[42] Some advancement in irrigation machines in the period, and perhaps a greater use of draft animals, may have had some impact on agricultural productivity on marginal land and in

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[38] Christensen (2003).

[39] On Alexandrian science, see Fraser (1972). Cf. Préaux (1966).

[40] Wilson (2002), Lewis (1997). On the relationship of technology to economic development in the ancient world, see Schneider in this volume.

[41] Samuel (1983) 58; Rowlandson (1996) 20. See Rathbone, this volume, n. XX.

[42] Alphabet: Clarysse and Thompson (forthcoming) Chapter 3.

gardens.[43] The introduction of iron into Egypt for agricultural implements and other devices, is documented in the Zenon archive although its use does not appear to have been widespread.[44] Irrigation in the Fayyum was not limited to water-lifting machines, the ancient basin irrigation system (relying on the annual flood of the river) was also used in there. Taxation of the land was, therefore, more important than new technological improvement in Ptolemaic productivity. Hellenistic building technology was important in the construction of new villages in the Fayyum.

V. INSTITUTIONS AND TAXATION

I treat in this section money and prices, the taxation system, the role of social status and state revenue. Ptolemaic institutions were a mixture of old and new. The taxation policy above all gradually shifted emphasis away from traditional Egyptian social hierarchies toward the new realities of urban, Greek life. Change was often slow, but Ptolemaic fiscal institutions made a great impact. The legal system, if we can call it that, coordinated the traditions of Egyptian law, as well as the law of other communities, Greek being the most important. The parallel court system that determined jurisdiction of adjudication by the language of the document is clearly seen in a later Ptolemaic decree (P. Tebt. 5, 118 BC). The ancient system of property rights, inheritance, and contracting was left largely

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[43] Bonneau (1993) 106.

[44] Rostovtzeff (1941) 362-63, 1197.

intact but, like the Egyptian temples, these institutions were gradually incorporated into the state system through the medium of the Greek language. Regional variation in land tenure is an important element in the history of Ptolemaic development and may have had long-term consequences. The effects of "Greek" law on Egyptian institutions was far less than was the later effect of Roman law. Major fiscal changes occurred under Ptolemy II Philadelphus (monetary reform, establishment of banks, the monetization of the taxation regime), demonstrated by an increase in the number of papyri and ostraca dated to his reign.

Despite the changes, Egyptian temples, with their endowments in land, people and livestock, remained vital. Temples historically played several key economic roles-centralization of information, documentation, land management and grain storage being among the most important. Their land endowments, which allowed temples to sustain the cycle of divine offerings/payments to the priests and support staff, continued, as did their right to collect revenues from their land, including vineyards and gardens. In some aspects, the Ptolemies subordinated traditional temple privileges to the new regime. A lump sum payment to temples (*syntaxis*) may have served to subordinate the traditional economic role of temples, although this is not altogether clear.[45] What is clearer is

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[45] Thompson (1988) 110-12, Maresch ??.

that the royal banks and royal granaries into which tax payments were made displaced a traditional economic function of temples.[46]

(a) Money and prices

The price of commodities, and the role and circulation of coinage are the most problematic area of the Ptolemaic economy, and much work remains to be done.[47] Some considerable advances in the understanding of Ptolemaic coinage have been recently.[48] It is clear that Ptolemaic taxation policy, and the creation of banks, that required some taxes to be collected, or at least calculated, in terms of money played key roles in monetization.[49] There may have been a regional difference in the process, influenced by where Greeks settled. On the basis of the scanty evidence, commodity prices appear to have remained relatively stable.[50] New fiscal measures were taken in the production, manufacture and sale of key items such as flax, salt, beer, and for certain oil crops. Here the Ptolemaic state utilized competitive bids and labor contracts that fixed workers in a specific place over the length of the contract, often supplied raw materials and tools, and granted state

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[46] On banks, see Bogaert (1994), idem (2001), von Reden (forthcoming).

[47] Prices for land in Cadell (1994), prices for wheat in Cadell and Le Rider (1997).

[48] A good summary is available in Hazzard (1995). Important new studies are forthcoming by von Reden; Picard (2004), Burkhalter and Picard (2004).

[49] Cf. Rathbone (1989), von Reden (forthcoming).

[50] Land prices: Samuel (1984), Cadell (1994). Cf. Baer (1962).

licenses for the sale of the finished product (the so-called Ptolemaic "monopolies," although they scarcely were). The aim here, as throughout the Ptolemaic fiscal system, was to secure labor, and to produce predictable income for the state.[51]

There was in the third century BC a tri-metallic coin system, although gold was hardly circulated. Silver coinage was used for large payments in Alexandria and other urban areas, while bronze was used for the smaller transactions in the countryside.[52] The silver and bronze coins were linked through a fixed exchange mechanism, adjusted at the end of the third century BC. The taxation policy of the Ptolemies that required some payments be made in coin, and the control of "monopoly" industries, accelerated the circulation of coin (bronze) throughout Egypt.

The Egyptian rural economy was long used to monetized exchange (usually reckoned in grain against fixed values), and grain and wine continued to be used as such into the Roman period.[53] The social impact of monetization on the countryside may have been fairly minimal given the predominance of grain production and taxation in kind on these crops, and, while it is clear that the

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[51] Turner (1984) 151-53, von Reden (forthcoming). P. Rev. is the key document.

[52] Von Reden (forthcoming).

[53] Wine: Clarysse and Vandorpe (1997). For temple vineyards, see the notice of an unpublished papyrus in Zauzich (1991) 9, to be published by Maren Schentuleit.

Ptolemies were increasingly interested in generated revenue in coin, the continued use of grain as a medium of taxation limited Ptolemaic ability to monetize completely the rural economy.[54] Contract wage labor, in the agricultural sphere as well as for short-term building projects, canal building and the like, was common, payment, daily or monthly, being done in kind as well as cash.[55]

The paucity of price data preserved in the papyri is a serious barrier to understanding the long-term performance of the Ptolemaic economy. References to items in the papyri can be frustratingly obscure, small items such as hoes are rarely given values, we are not always sure whether a price is reckoned in silver or bronze, and there are significant gaps in our information (e.g. for the price of wheat from the mid-third century BC to 209 BC).[56] The data derived from penalty clauses in contracts can mislead. The explanation for the long-term history of commodity prices is exacerbated by our lack of knowledge about the amount of money in circulation and the velocity of circulation.[57] The supposed price inflation that occurred in the reign of Ptolemy IV Philopator has received extensive comment and various explanations.[58] Earlier analyses have focused on

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[54] Samuel (1984), Rowlandson (2001) 149.

[55] Treated well by von Reden (forthcoming).

[56] Samuel (1984). For the gap in wheat prices, see Cadell & Le Rider 1997.

[57] Bagnall (1999).

[58] Reekmans (1951), Maresch (1996), Cadell & Le Rider (1997), Bagnall (1999).

the reduction in precious metal of the silver coins, in a new bookkeeping system, or in a reduction of the weight of the bronze drachma and the consequent increase in the value of coin in circulation.[59] Much of the so-called price inflation, however, is derived not from a single new bronze accounting standard but from multiple re-tariffings of the bronze coins against silver and gold.[60] An independent bronze standard was introduced at the end of the third century BC.

(b) Taxation and state development

The complex Ptolemaic taxation system is still not perfectly understood in many of its details.[61] It was a flexible system, varied regionally, and paid for the local bureaucracy. The Ptolemies inherited a tributary economic system in which, in theory, the state was the household (*oikos*) of the king. The demotic ostraca from Upper Egypt provide important evidence that local fiscal structure under the early Ptolemies was a continuation of the old tributary system, and that the local Egyptian scribes, and the temple estate infrastructure that supported them, were incorporated into the Ptolemaic system of royal banks and granaries. But the texts also show that the economic relationship between temples and the Ptolemies was less direct in the third century BC, and the increase in the number of tax receipts in the period after the Theban revolt suggests stronger administrative control or a

[59] Reekmans (1951).

[60] Bagnall (1999) 198; von Reden (forthcoming).

[61] Préaux (1939) provides an index with the wide array of taxes.

change in practice.[62] The land measurement receipts, again for the moment confined to the Thebaid, might suggest that these texts served to protect individual tax-payers by clearly establishing their obligations in writing. While many of these ostraca come from a restricted group of people, and therefore information regarding agricultural tax administration in early Thebes is limited, there is a wide array of tax receipts, including salt tax receipts, which suggests that the issuance of tax receipts was common across a range of taxes.[63]

Outside of the important temple of Ptah at Memphis, and a few in the Delta (the temple of Neith at Sais), major new temples were built in the southern Egyptian Nile in the Thebaid.[64] It was here, beginning with the temple of the god Hours at Edfu in 237 BC, that several new temples were built, probably supported in large part by local financing. Temples seem to have also funded cult activities from their own lands, as they did earlier.

The one place in Egypt that was susceptible to reclamation and intensification on a significant scale was in the Fayyum depression, a state of affairs coinciding very likely with the fact that prior claims to land in the valley made taking over such land politically difficult. Other areas (the eastern Delta and the region around Alexandria) were also developed or received renewed attention,

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[62] For the demotic receipts, Kaplony-Heckel (2000), Muhs (1996).

[63] Muhs (1996) 2.

[64] On Memphis, see Thompson (1988).

and there were new settlements in the Herakleopolite and Oxyrhynchite nomes.[65] This expansion of the Fayyum was probably already underway in the reign of Ptolemy I Soter, although once again the lack of documentary evidence for his reign limits certitude.[66] To be sure, the documentary evidence of reclamation and settlement is extensive for the reign of Ptolemy II, who visited the area on at least two occasions.[67]

Ptolemaic expansion in the Fayyum was a massive project, accomplished probably by restricting the flow of water into the Fayyum at a regulator at Lahun, thereby lowering the level of Lake Moeris. New canals were also dug.[68] This, along with the building of Alexandria and the southern capital Ptolemais, were the largest public works projects of the Ptolemaic state. The state's ability here to coordinate the work, the supplies, the men and the donkeys is quite impressive. The size of the projects, both in reclaiming land and in maintaining the existing

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[65] On the Delta, see Davoli (2001). New Upper Egyptian foundations in the second century, Vandorpe (1995) 233; Kramer (1997).

[66] See Thompson (1999b) 125. Cf. Diod. Sic. 18.33.

[67] PSI 4 354 (253 BC); P. Petr. II 13, 18a (253 BC, on the date see Clarysse (1980) 85; P. Petr. II 39 e 3 (247-245 BC?). The first visit may be tied to kleruchic settlement in the area. See Clarysse (1980), Idem (2000).

[68] Butzer (1976) 36-38. The exact processes involved in the reclamation project, and the pre-Ptolemaic reclamation, are still contested. See briefly Rathbone (1990) 111-14; Idem (1996) 52.

canal networks, as Thompson has pointed out, was enormous.[69] One document mentions a proposal to organize a work force of 15,000 men to work on embankments of an "island," to be funded from the harvest of emmer.[70] The size of the labor force, it has been estimated, was sufficient for the sixty days' work covering a large portion of the Fayyum. Whether the proposed project was ever carried out we do not know, but it reveals, at a minimum, the ambition of some men in these early years of development.[71] Correspondence addressed to nomarchs in the mid-third century BC (listing more than 4,000 tools, including axes, plowshares and rope) certainly conforms to similar ambitions, and many texts suggest massive and successful coordination.[72] The supply of tools by the state, and the requisition of the labor force culled from each of the nomarchies (the original development areas in the Fayyum), shows the direct involvement of the *dioikêtês* and the role of regional officials. One has the strong impression here that the work was directed by ambitious men like Apollonios (see below), who were given land grants to develop, and by other officials and soldiers with an incentive to succeed. The apparently state-supplied tools, the requisition of labor, and the payment of wages were largely traditional in the Egyptian countryside.

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[69] Thompson (1999a) 112.

[70] Clarysse (1988), Thompson (1999a) 112-13.

[71] On the labor estimates, Thompson (1999a) 112.

[72] P. Petr. III 49, Clarysse (1997) 70-72.

We are somewhat hampered by both the qualitative and quantitative differences of the third century BC data from the Fayyum and from Upper Egypt which limits our hopes of a testable hypothesis. Nevertheless some broad facts can be stated. In the early Ptolemaic period, land in the Fayyum was reclaimed under state direction, and new settlements of soldiers and Egyptians were established. No similar "investment" is known in the Nile valley. The Ptolemaic maintenance of an old land tenure regime in the Thebaid, where the right to convey land already existed, the granting of land to important new constituents, and the use of agents to collect taxes all combined to reduce state revenue, but it followed from the political necessity of a regime that sought legitimacy from old institutions, and loyalty from the bureaucracy and the army.[73] The traditional temple-administered estates appear to have continued, and held privately by soldiers, temple dependents and leased out to others on short-term leases.[74] The picture of regional differences in the early Ptolemaic regime is the result of historic patterns of land exploitation. The institutional survival of the temple estates, not dissimilar from the much later example of land institutions in India under the Raj, is the result of the state's desire for stability and revenue.[75] The

[73] For the problem of limited Greek access to land, and the consequent problems affecting royal revenues, Bingen (1984).

[74] Manning (2003).

[75] Banarjee and Iyer (2002).

private archives from Upper Egypt suggest, however, that soldiers became well established in the south during the second century BC.

The transmission of property, both real and rights to income from office, by written legal instruments had a long history before the Ptolemies, although most transactions probably occurred within family and social groups without written legal instrument. Such "paperless" transactions would have reduced transactions costs, but they also reflect limited market mechanisms and created more uncertainty. Family and other group holding of land alleviated the cost for the state of defining and enforcing individual property rights in land, something that we know from recorded disputes was difficult, although the state did intervene in the case of auctions of property rights (below).

Access to land and to the market in land was limited, but this does not mean that land was not potentially available. The shortage of labor applied to the land was a serious long-term problem.[76] The historically low price of land, a low multiple of the value of a year's harvest, is another indication of the limited "market alienability" of land—it was the rights to the income from land ("economic rights") rather than individualized "legal rights" to the land itself that were "owned."[77]

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[76] Samuel (1989).

[77] On the distinction between economic and legal rights, see Barzel (1997). For the price of land in ancient Egypt, Menu (1997), Baer (1962). On prices of land in the Greek papyri, Cadell (1994).

The land survey established the state's authority as well as private interest in the land. But this authority, and therefore the economic power of the state, rested on the knowledge of local officials who performed and recorded the survey. Land surveying is one the oldest state institutions in Egypt, and centralized knowledge of the exact extent of each nome, measured by its length along the Nile— in essence a theological statement of the political control of Egypt — can be traced back to the Middle Kingdom (Dynasty 12, ca. 1991-1783 BC).[78] The problem for the Ptolemaic state, as it was for other states, was to obtain accurate information each year on local agricultural production. This, once again, required (although not always obtained) both loyalty and accuracy of the village scribe and his assistants in charge of land survey and registration.[79] The survey of standing crops and the fixing of rents, of course, give the impression of accurate measurement and recording, but there are examples of figures being carried over from old records, and land being misclassified.[80]

Tax collection was facilitated by a survey of land and, for the capitation tax, a census, which although, irregularly documented, was not entirely new (Herodotus 2.177), although the social dynamics, with tax exemption and

[78] Manning (2003) 146-48.

[79] Verhoogt (1998).

[80] Crawford (1971) 20-23; Verhoogt (1998) 132, n. 121.

reduction for certain classes, added a new dimension.[81] The census could, at least in theory, serve to restrict the movement of the population, although mobility was restricted *de jure* only with respect to production in the so-called monopoly industries.[82] The labor market otherwise appears free.[83] Representatives of the Egyptian priesthoods were required to meet in Alexandria to ensure loyalty. Although we cannot track in the record how often this was done, the practice, remitted in the Rosetta decree (*OGIS* 90, 17, 196 BC), appears to have been a regular feature of the early Ptolemaic state. The collection of taxes was also moderated by several new institutions— tax farming, banks, and state granaries. It has been suggested that the tax-farming system, and the "monopolies" of key commodities (above), were introduced by the Ptolemies as a means of arbitrage between the economy in kind of the countryside and the Greek monetary economy.[84] Once again, what comes through, mainly on the reading of P. Rev., is Ptolemaic interest in predictability, stability, insulation from risk (at least in theory), and revenue capture.[85]

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[81] Clarysse and Thompson (forthcoming), Thompson (1997).

[82] Braunert (1964).

[83] Thompson (1988) 71.

[84] Bingen (1978).

[85] For P. Rev., see Grenfell and Mahaffy (1896), Préaux (1939) 65-93, Bingen (1952), (1978). On Ptolemaic intentions, see Samuel (1983).

Public bids for the right to collect a certain tax in a given year in a specific area were posted by the tax-farmers at royal banks. The actual collection of the tax, however, was performed by state agents (*logeutai*). The introduction of banks played an important role in the collection and payments of taxes.[86] Despite the fact that these are well documented for the period (1,750 papyri), it is not easy to establish connections between them and the performance of the economy. There were two types of banks-state banks and private banks. Both were licensed by the state. They formed, along with the tax farmers, the intermediary between agricultural production and state revenues, the latter concentrated on currency exchange. The granaries received payments in grain and held deposits of individual taxpayers. The state granaries were also an important means by which of the local state bureaucracy was paid.

(c) Social status

Occupation status (*ethnê*) were important factors in taxation and in tax collection as well as in the Ptolemaic legal system. The tax system favored those of "Hellenic" status, and those that supported Greek culture: e.g. teachers and athletes. Soldiers, particularly the cavalry, were vital to Ptolemaic success. The ancient social organization in which professions were organized around extended

[86] Now summarized in Bogaert (1994), idem (2001).

families was utilized by the Ptolemies to ensure cooperation in the collection of professional taxes.[87] Priests remained the nucleus of every Egyptian village elite, and they were always important in the cooperation between the central and the local economy. Lower order priesthoods (and others?) formed associations, following Hellenistic practice seen elsewhere, that among other things provided for a kind of death insurance for its members.[88] Priests often had connections with their brethren in other locations, and their correspondence is instructive with respect to their business dealings and the extent of their economic and social contacts throughout Egypt.[89]

The control and circulation of royal and temple land was also tied to families and to occupation groups, a function of both the transaction cost environment that reflect the limited development of markets and the enforcement problem (Frier and Kehoe in this volume).[90] Many of the demotic sales of land from this period were transacted between two parties having the same status title (occupation title plus the addition of the phrase "servant of god X," the local

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[87] Thompson (2001b).

[88] de Cenival (1972), Muszynsky (1977), Muhs (2001). For the Choachyte societies, Donker van Heel (1995) 24-26.

[89] See for example the series of letters of the priests of Khnum at Elephantine discussed recently in translation by Martin (1996).

[90] Cf. Shelton (1976) 118.

divinity, or military titles “men of Aswan” etc.), indicating that they were part of the same status group, attached to the same temple, or members of the same profession. In many cases this consonance probably reflects a family relationship as well. The use of status designations in contracts served as a method of identifying individuals by their occupation, and the registration of occupation was required.[91]

(d) Land tenancy

Pre-modern Asian states promoted the connection between the finances of the ruler and the holding of land.[92] Ptolemaic practice linked the holding of plots of land to state service. The military institution of giving land to soldiers in exchange for service has both Macedonian and Egyptian antecedents, and was fundamental in settling the Fayyum. The primary agricultural workers, the free Egyptian tenant farmers, comprised the majority of the population, and were not historically bound to large units of production but, rather, to annual leases of small plots, within an institutional ambit of authority. Those who held leases of royal land, the "royal farmers," were a major component of the rural population.[93] The financing of agricultural production outside of royal land is not well known, but what seems to prevail in ancient areas (i.e. Upper Egypt) is the continuation of the practice of

[91] Thompson (2001a).

[92] Chaudhuri (1990).

[93] "Well over 50%": Thompson (1988) 38.

holding/leasing of temple endowment land by priests and support staff. Slavery was not a primary means of agricultural production, although household slavery did exist among Greeks and was certainly common in the Ptolemaic period, as was the use of slaves/prisoners in the mines of the eastern desert. There was a tradition of private conveyance of land as well, at least in the south where it is clearly documented.

We have incomplete information about the distribution of land, so an overall assessment of Egypt as a whole in this period is not possible, although it seems probable that the Gini index would have been lower (i.e. a more even distribution) than in the Roman period.[94] Private land holding was known, this is particularly well documented in the south of the country, but the overall impression of the documents suggests that leasing private land was more common than purchasing, and there follows the usual expectations of disincentive to invest and sub-optimal productivity.[95] Private property rights, where they existed (e.g. on temple estates) were maintained, and de facto gains in private holding occurred in the period. An important Greek institution introduced in the third century BC was the public auction.[96] The Ptolemies used it to assign rights to farm taxes, to

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[94] Only the Kerkeosiris material from the late second century BC offers a chance for analysis. Cf. Bagnall (1992).

[95] Demotic leases: Felber (1997), Greek leases: Henning (1967).

[96] Pringsheim (1949), Manning (1999).

award contracts,[97] and as a method of assigning property rights to derelict or ownerless land. Its use in ancient areas such as the Thebaid, and also in the Fayyum on temple land shows the contrast between Ptolemaic control of ancient institutional arrangements and a more "colonial" exploitation of "royal" land. Even in new areas in which kleruchs were given plots of land, the Greek preference for urban living prompted them to lease their land and probably produced a disincentive for development.

A key to royal revenues was the tenancy on royal land leased by one or more "royal farmers."[98] Royal farmers were direct tenants of the king, the land was leased year to year with the terms adjusted to take account of fluctuating conditions. What were technically short-term grants of land became stable, and tenure could be passed to heirs. The term "royal farmer" was used in official contexts as a status designator for those men who took on leases to farm royal land.[99] It was thus not an indication of class but of status, and it was a status that was sought after, not forced upon the farmer.[100] It was then used of a wide range of men from peasants to priests, and the status provided access to both land and capital. So much so that in fact groups of men took on leases of small plots of

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[97] P. Petr. III 43(2), (ca. 245 BC).

[98] Rowlandson (1985).

[99] Rowlandson (1985) 331.

[100] *Pace* de Ste. Croix (1983) 153.

royal land simply to obtain the status designation. The range in the size of the plots of royal land were generally small, but there are documented royal leases of up to 160 *arouras*.[101] It appears that the status within the royal economic sphere carried with it certain benefits, including protection from military billets, the stipulation that royal farmers could only be brought before Greek courts, and the right to be left undisturbed during sowing and harvest time.[102] Clearly individuals with this status exploited it.[103] Recently published documents from the Fayyum, however, show that the terms of the leases of royal land could be changed frequently, that rent fluctuated with annual production, and that transfers between farmers were frequent. This suggest that the Ptolemaic system was probably much more flexible, more adaptive to rural realities of Egyptian agricultural production than Rostovzteff's view admits.[104]

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[101] P. Lille 8, 4 (third century BC). On the range, Shelton (1976) 152.

[102] Shelton (1976) 118. P. Tebt. 5 (= *Select Papyri*, vol. 2, text 210; C. Ord. Ptol. 53; [118 BC]), 221-26, Rowlandson (1985) 331.

[103] On the extent and variety of the business activity of one royal farmer, see Boswinkel and Pestman (1982), Lewis (1986) 124-39.

[104] The papyri discussed by Shelton 1976 (esp. P. Tebt. 1103, 1105, 1107) are crucial in demonstrating, for example, that the rate of cessions of royal land was as high as one-third from year to year. This contrasts sharply with Rostovtzeff (1941) 284-87. See the remarks of Rowlandson (1985) 337, Shelton (1976) 120-21, and Verhoogt (1998) 27.

The early Ptolemaic kings decided to settle soldiers on land in Egypt in order to retain a loyal fighting force available for call up when needed. At the same time, the placing of Greek soldiers in the countryside served to pacify, in theory, troublesome areas and to get marginal land under cultivation. They were given plots of land (*kleroi*) according to their rank. The 100-aroura cavalry-men were the largest group of *kleruchs* in the third century.[105] Other *kleruchs* had smaller plots of land, thirty *arouras* (infantry soldiers), twenty-five and twenty *arouras.* This class of land evolved into hereditary tenure, leaving in the main Greeks in a better position on the land than their Egyptian counterparts. The kleruchic system had a long-term impact on the land in the parts of Egypt that had a large contingent of military settlers, forming a major part of what was classed as private land in the Roman period.[106]

The gift of large estates to high officials, not new with the Ptolemies, enabled large tracts of land to be developed quickly. The land was a temporary grant by the king, called a "gift estate" (*dorea*) in the papyri, and could not be transferred privately. The ephemeral nature of tenure on this class of land shows that such estates were essentially royal land created as a means of providing revenue for the king and his circle. The land, then, was "ceded" by the king to others to use. The estate of the *dioikêtês* (the chief financial officer of the state)

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[105] Uebel (1968), Clarysse and Thompson (forthcoming).

[106] Rowlandson (1996) 45-46.

Apollonios near Philadelphia is the most famous example. This was a "model estate," or an "experimental farm"[107] that took advantage of economies of scale to exploit labor and production, as well as the private initiative and the capital of ambitious officials as well as immigrants.[108] The "gift" of land was in fact a creation of a potential revenue stream for Apollonius; it was up to his own initiative and ambition to take advantage of this potential. By all accounts, he seems to have done so, for the ten or so years that the estate is documented directly, but his involvement in the management of the estate appears to have waned after only a couple of years, if the survival of his correspondence preserved in the archive accurately reflects his involvement. The cultivation of vines, however, was both impressive and long lasting.[109]

We can also see that the size of the operation took advantage of the centralization of information. Unlike Apollonius' estate in the Memphite nome, which was composed of scattered plots of land around several villages, the estate at Philadelphia was one large parcel of land. Apollonius kept a close watch on the operations although the land was leased out and even turned over to others to

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[107] Edgar (1931) 12.

[108] Cf. Rostovtzeff (1922) 145.

[109] Thompson (1999b) 134, Clarysse and Vandorpe (1998).

manage.[110] Each year, for example, memos were sent out by Apollonius to his manager telling him what seed and what amounts were available.[111] From the records of some accounts at least, these memos were not followed particularly closely.[112] The estate seems also to have been a place where experiments could be tried, although many appear to have failed.[113] Economic activity was particularly dedicated to commercial operations in viticulture and later in oil crops.[114] The weaving industry was an important component on the Memphis estate of Apollonios, while the short-lived success of poppy cultivation on the Philadelphia estate, grown largely on marginal land, can be attributed to the decline of the these estates by the end of the third century BC.[115] Their purpose was certainly to

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[110] In the latter case, it seems that kleruchs were given land from the estate itself. See further Crawford (1973) 240-41. A group of Egyptian farmers who had come to Philadelphia from the ancient center at Heliopolis took a lease of 1,000 *arouras* within the estate. See P. Lond. VII 1954 (Philadelphia, 257 BC), Rostovtzeff (1922) 73-75; Thompson (1999b) 136.

[111] P. Cair. Zen. 59292, 420-430, cited by Crawford (1973) 236.

[112] This is especially true in the case of over-producing what was specified and with important crops like poppy. So Crawford (1973) 245.

[113] On the experimental nature of the estate, see Orrieux (1983) 77-97. On the poppy, see Crawford 1973.

[114] On viticulture, Clarysse and Vandorpe (1997), Préaux (1947) 22-26; and for oil crops, Sandy (1989).

[115] On weaving: Wipszycka (1961) 185-89. On the cultivation of poppy: Crawford (1973) 248.

establish the state's direct control over new land, to settle new populations, to establish revenue streams for state officials, and to exact as much new revenue as possible.

(e) State revenues

Ptolemaic wealth was the subject of much literary attention, and although there is no direct testimony to the total annual revenues of the Ptolemies, the poets and the description of Kallixeinos of Rhodes of the grand procession under Ptolemy II Philadelphus must have reflected the real wealth of the early Ptolemaic kings.[116] The traditional figure for the annual internal revenue of Ptolemy II is 14,800 talents of silver and 1.5 million *artabas* of wheat.[117] The grain revenue is almost certainly too low, and was probably closer to six million *artabas* per annum, enough to feed 500,000 adults for a year.[118] The revenue in coin alone had the purchasing power of 500,000 — 700,000 man/years. Expenditures are a different

[116] Thompson (1997).

[117] Saint Jerome, *Commentary on the Book of Daniel* 11.5 (third century AD), cf. Appian, *Praef.* 10. The revenue of Egypt under Ptolemy XII Auletes, again from a literary passage, is stated to have been 12,500 talents, Strabo 17.1.13, Cicero, *Rab. Post.* 3.6. The figure of 6000 talents for the income of Auletes cited by Diod. Sic. 17.52.6 is, perhaps, more realistic.

[118] Préaux (1978) 364-65.

matter. We may assume that the finance of the military would have been a major component of taxation policy and state expenditure, as were religious festivals.[119]

Revenue from rent and taxes collected from agricultural production was the major source of internal revenue. Land was classed as either rent producing or rent-free, the latter category perhaps the "land in release" known from Greek papyri. There were two principal taxes on the land, one, the tax reckoned in kind, collected on all grain bearing land and on some fodder crops, and the other, a tax reckoned in money, called the *apomoira*, a tax of "first fruits" on vineyards and orchards.[120] The tax on vineyards and orchards was called in Greek the *apomoira*, or "portion" tax.[121] Beginning in 263 BC, also the year in which the salt tax is first attested, the revenue from the tax from kleruchic land and gift estates was earmarked for the cult of Queen Arsinoe.[122] All vineyard and orchard land was

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[119] On the military, cf. Baker (2003). For festivals, see Perpillou-Thomas (1993).

[120] Clarysse and Vandorpe (1998).

[121] Attested outside Egypt in the Persian period: Hornblower (1994) 62, discussing *Sinuri* 1, 73 (= Hornblower (1982) 365, text M5).

[122] P. Rev. cols. 36-37 (both royal decrees of year 263 BC), col. 33, 9-34 (royal decree of year 259 BC).

[123] On the differential rates, see P. Bingen 36 (second century BC, Fayyum) published by Thompson (2000). Importantly, as Thompson points out, p. 179, the annual calculation of the tax was a percentage of annual production, and not as a fixed rate per *aroura* as some have argued.

liable to the tax at the rate of one-sixth of the annual production, with a reduced rate of one-tenth for certain categories of land (e.g. vineyards in the Thebaid, kleruchic land).[123] Part of this revenue was diverted to pay for local state operations, e.g. principally for the salary of police and others.[124] The *apomoira* collected on temple land was also partially "secularized," although some revenue was retained by temples. The tax was paid in kind (levied in wine for vineyards) or in cash, at a fixed rate. By the beginning of the second century BC, the tax had to be paid in cash into a royal bank, reflecting the state's increasing emphasis on a cash economy. On orchard land, the tax was always paid in cash; fodder crops could also yielded money. Transactions and livestock were also taxed, as was traffic along the river.[125]

The basis of this land tax was the annual survey of the fields that assessed how much land was growing what type of crop. The ancient Egyptian system was thought to be based on an assessment of the land at a fixed rate of tax each year.[126] Rents in the Saite period lease contracts were assessed as a percentage of

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[124] Clarysse and Vandorpe (1998) 15, with texts cited.

[125] On customs tolls, Thompson (1988) 61-65.

[126] Within the general categories of land in P. Wilbour, for example, land was assessed at the fixed amounts of 5, 7 1/2 or 10 "sacks" per *aroura*. Such an assessment is comparable to the later P. Reinhardt, dating from the tenth century BCE. According to Vleeming (1993) 72-73, in both of these important texts, the amount of grain collected is now thought to have been the total

the yield on the land, normally at the rate of one-third of the crop.[127] A taxation regime based on a share contract would technically be the less efficient solution because it created less incentive for the tenant (since the tenant's payment amounts to an *ad valorem* tax), but it may have been more suitable in the Egyptian context because it spread risk between tenant and landowner, was one more in keeping with the inter-annual variability of the Nile regime, and better solved the imperfect information problem.[128] Here the local nature of land tenure, and the structural problems of the state, are at their clearest. Share contracts require higher enforcement costs in policing output for the central state, and would induce tenants to farm parts of several plots of land to increase income.[129] The main concern of the state was stable revenue, the assessment was undertaken at the local level by village scribes since conditions of crops and tenure varied considerably from place to place and over time. The collection of a share of the harvest certainly gave advantage to the local officials who could more easily

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production above costs (seed and labor), not simply the land tax.

[127] Hughes (1952) 22, nn. 25-26. Cf. Vleeming (1993) 73.

[128] For a good discussion share contracts in Roman land tenure, see Kehoe (1988). On share contracts and the economic analysis of the arrangement in modern settings, see Cheung (1969), Ellis (1993) 146-65; Barzel (1997) 33-54; Stiglitz (1989).

[129] Barzel (1997) 35.

disguise shares rather than fixed amounts of the harvest.[130] The crop reports were reported back to the capital so that the government could estimate its revenue. There was no central planning here. The structure itself stimulated production on kleruchic and temple land, something that we might expect given the fact that there was less government control on these classes of land. After the reorganization of the *apomoira* tax in year 22 of Ptolemy II Philadelphus, this was collected on all vineyards and orchards in Egypt. An additional flat tax, called the *eparourion*, was assessed on the size of the plot and the condition of the soil.[131]

The collection of taxes can be documented through the granary tax receipts from the Thebaid, and it is only in this region that we can be certain of the process.[132] There may well be regional differences in the methods of collection, and much primary work remains to be done on the Ptolemaic taxation system before an overall assessment is possible. Grain taxes were usually paid at state granaries in installments throughout the year after the grain harvest, and a receipt was issued and countersigned by state officials for the taxpayer. [133] This

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[130] See further Frier and Kehoe in this volume on this point.

[131] Préaux (1939) 181; Clarysse and Vandorpe (1998) 35.

[132] Packman (1968), Vandorpe (2000a), Idem (2000b).

[133] Packman (1968) 62-63; Keenan and Shelton (1976) 9. On installments for the grain tax, cf. P. Siut 10597 (Asyut, 171 BC).

method of payment applied to Upper Egypt as well as the Fayyum.[134] On the basis of the dates of the grain tax receipts, the taxes were paid after the harvest, due in full by the end of the regnal year, and transported to the royal granary by the taxpayer. This issuance of receipts, as far as we know, is a new aspect of the traditional grain tax process, and may have been designed to protect taxpayers from overzealous tax collectors. Because of the scattered survival of the receipts, it is very difficult to assess the overall revenue in any one area. Clearly though, there was a shift from the use of demotic to Greek for the issuance of receipts concomitant with the installation of Greek officials in the Thebaid after Antiochus IV's invasion in 168 BC.[135] But this shift in language was not permanent, and it is interesting to note that demotic as a "fiscal" language used in receipts emerges again in the early Roman period. On the basis of the published tax receipts from Pathyris, it seems clear that there is a correlation between tax collection and the installation of loyal state officials working in the granaries. The collection of taxes was a major problem for the state over the long term.[136]

There appears to be a regional difference between the Upper and Lower Egypt. In the former, a harvest tax was collected, in the latter a fixed land tax,

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[134] Cf. Keenan and Shelton (1976) 9.

[135] Vandorpe (2000b).

[136] Clarysse and Thompson (forthcoming) Chapter 3.

although later on a harvest tax was also collected in the north.[137] On royal land, and according to P. Haun. inv. 407 on land in the Edfu nome, the tenants paid a fixed rent (*ekphorion*) on the entire plot according to its assessed value unless it was classed as *hypologos*, in addition to a harvest tax.[138] An additional charge of one half *artaba* per *aroura* was assessed on royal land called the "crown" tax.[139] The assessment was originally charged on an ad hoc basis and was used to pay for gifts to the crown, but it evolved into a regular tax by the end of the third century BC. The total tax burden, on royal land including various small charges for transportation, re-payment of seed loans etc., approached half of the production each year.[140]

On kleruchic and temple land outside the Thebaid, a flat tax was collected on grain land. The tax was called the *artabieia* tax and was assessed at the rate of 1/2, 1 or 2 *artabas* of grain per *aroura*, whether the land was under cultivation or not. By the end of the third century BC, the grain tax in the Thebaid is documented.[141] But in the Thebaid, the tax on productive grain land held by

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[137] Vandorpe (2000a) 174-75.

[138] P. Haun. inv. 407: Christensen (2003). For royal land: Keenan and Shelton (1976) 2-9.

[139] Préaux (1939) 394-95. Royal land that was leased by temples was exempt from the tax. See further Shelton (1975).

[140] Préaux (1939) 131-33.

[141] O. Tait Bodl. I 147, 220.

temples and by individuals was collected as a percentage of the annual production. This tax in Upper Egypt was termed the *epigraphe*, or *shemu* in demotic.[142] The harvest tax was collected by the royal granary and a tax receipt was issued to the tax payer upon payment of the tax. In Upper Egypt, the time of the harvest was normally in April, and a little later, May and June, further north.[143]

A tax on transfers of property was collected by the government. This "circulation" tax, known later in Greek documents as the *enkuklion*, was a continuation of the 10% levy on property introduced in the reign of Psammetichus I.[144] Once the tax farming system was established, this transfer tax was farmed out to tax farmers, and shifted from a fixed charge to a variable rate of a percentage of the value of the property. The rate of the tax was 5% of the sales price in the mid-third century,[145] was raised to normally 10% at the end of this century, but was temporarily reduced to 5%.[146] An additional 2%, known as the *allagê*, was collected to payments made in bronze. The tax was levied against the purchaser,

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[142] Packman (1968) 70-72; Vandorpe (2000a).

[143] Schnebel (1925) 162.

[144] Malinine (1953) 56-88.

[145]Préaux (1939) 277, 332, on the variation in rates.

and was imposed not only on real sales, but also on pledges, at a lower rate, and on wills.

The taxation of person, through the so-called salt tax (documented from 263-217 BC but probably collected through the mid-second century BC), was a both source of revenue (smaller than the Roman poll-tax) and a means to enhance loyalty between the ruler and the new elite. "Hellenes" were exempt form the largely symbolic obol tax; teachers and athletes from the salt tax.[147] Some aspects of the tax (how often, how thorough, age range of liability) remain unknown. The basis of the collection of taxes on persons and livestock was the census.[148] The traditional labor service by all peasants to clear canals was maintained, but the intent of the Ptolemaic census appears to have been fiscal.[149] In addition to the capitation tax, a tax on professional occupations was collected.

VI. CONCLUSIONS

The path of economic and institutional change in the Ptolemaic period can be traced back to the Saite (650-525 BC) social and political reforms, and to Persian

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[146]Mattha (1945) 53; Préaux (1939) 333. At Pathyris, whence much of the Ptolemaic evidence for the tax is derived, 10% was again collected after 124 BC, perhaps due to the troubles in the area in the years 132-130 BC. See Pestman (1965) 61 n. 108.

[147] On the salt tax: Vleeming (1994), Thompson (1997), Clarysse and Thompson (forthcoming) Chapter 3.

[148] Rathbone (1993), Clarysse and Thompson (forthcoming).

imperial rule. Greek immigration, and the use of demotic for private contracts begin then. Ptolemaic taxation policy, which demanded some taxes be paid in coin, certainly increased the amount of revenue captured by the state. There were, however, strong structural constraints to the development of the economy. The failure to develop a private property rights regime was a barrier to development, and stands in contrast to the Roman period. The structure of the ancient property regime remained, initially at least, in areas such as the Thebaid, although over the long term it was altered by land grants to soldiers, and, to a certain extent, by the use of public auction. The taxation in kind of agricultural production on grain-bearing land limited the ability to monetize the economy.[150] There were new fiscal institutions which allowed greater capture of revenue, at least over the short term, but the continuation of ancient structures, the structure of the bureaucratic system that was developed over the course of the third century BC, and the concessions to local elites, severely limited potential for sustained *per capita* economic growth, which, after all, was not the aim of the regime.[151]

The Ptolemaic dynasty, built on Egyptian institutions, was a remarkable and important era in the economic history of the ancient world. There was much innovation in the fiscal system. Many things remain obscure. Among them: the

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[149] Préaux (1939) 395-400.

[150] Rowlandson (2001).

[151] Samuel (1983) 41.

performance of the economy over time, and the overall GDP. Older views of the role of central planning have been replaced by a richer picture of the interplay between new state fiscal aims and private incentives. Military demand played the key role in this development in terms of land settlement, monetization and, to some extent, trade (e.g. African elephants and the eastern desert roads). State direction was important, but private initiative and old institutions cannot be ignored. The promotion of "Hellenic" status in the taxation system may have exacerbated social tensions and created serious barriers to the formation of a unitary state. This should not surprise given the variable ecological system dependent on the annual flood of the Nile, and the nature of the regime itself. Agricultural technology remained at a low level of development. New irrigation technology probably increased agricultural production only at the margins, on garden and fruit tree land, and there were efforts early on to introduce new crops and new livestock. But on the whole, Rostovtzeff's view that we are dealing not so much with a "radical change" in the economy as with "its partial improvement and its systematic organization" is sound.[152] In many ways, indeed, it was a continuation of earlier pharaonic development of irrigation and agriculture, although much of the observed change came in newly developed areas and with

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[152] (1941) 1197.

Greek institutions, some of which had long-term consequences.[153] The Greek language was among the most important. Others include the state's promotion of the circulation of coinage driven by taxation policy, the cultivation of wheat, the tax farming system, and the formation of an urban "Hellenic" class. Modest gains in efficiency in scribal practice, the control of interest rates, the use of tax receipts (only in the Thebaid?) may have been offset by inefficiencies in legal institutions, agency problems (Frier and Kehoe in this volume) in the farming of taxes, and ethnic divisions that were reinforced by taxation policy. The Romans built on Ptolemaic developments, and in several areas improved economic conditions.

[153] Rathbone in this volume, and Bagnall (1993) 310-25.