

The Athenian economy in the age of Demosthenes: path dependence and change

George E. Halkos · Nickolas C. Kyriazis

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Abstract In this paper, we formulate for the first time the Persian–Athenian conflict of the fifth century as a signaling game. A specific approach to path dependence and regime change is presented. Following the successful outcome for Athens, it was transformed into a seapower. This again resulted in the fourth century into an unparalleled change of the Athenian economy, which shows a number of characteristics that makes us call it the first “modern” economy. We analyze the sectorial structure of the Athenian economy, its trade pattern, contribution to employment/GDP, tax system, banking and services and the emergence of new organization forms like private banks, joint-stock companies and offshore services.

Keywords Economic change and development · Path-dependence · Ancient Athenian economy

JEL Classification K00 · N00 · N01 · N13

1 Introduction

The Ancient Athenian Democracy, being the “prototype” of a democratic state and society has raised during the last three centuries a lot of attention. Thousands of books and articles have been written over that period covering the political, historical and social aspects of Ancient Athens and this interest is very much alive today. Much less attention has been paid to economic aspects, perhaps because most authors believed that we lack sufficient information on this.

G. E. Halkos (✉) · N. C. Kyriazis
Department of Economics, University of Thessaly, Korai 43, 383 33 Volos, Greece
e-mail: halkos@econ.uth.gr

Our challenging hypothesis is that the extant fourth century sources contain sufficient information on the economy to enable us to reconstruct its major aspects and even to proceed to some first quantification of basic data. For this purpose we use both ancient and modern authors. Although recently some work has been devoted to the ancient Athenian economy (notably Cohen 1997; Amemiya 2007), we try for the first time, as far as we know, to establish the challenging claim of Athens as the first “modern” economy, where handicraft (“industry”) and services contributed more to GDP than the primary sector.

In the first part of the paper we model for the first time as far we know the Persian–Greek Athenian conflict of the beginning of the fifth century (498–449 BC) as a signaling game. Then we continue our model to analyze the transformation of Athens from a mainly land power, into a sea power, which leads to a break of path-dependence and leads into a new regime. Within this regime, new, more efficient institutions, both political and economic emerge.

Following the successful outcome of the war for Athens, as illustrated also in our model, Athens was transformed into a sea-power (from 480 BC, the date of the naval victory of Salamis to 322 BC when it was defeated by the Macedonians), with only a brief interruption after the defeat during the Peloponnesian War (404 to about 400 BC). After the re-establishment of democracy (403 BC) Athenian seapower revived and they won a big naval victory at Naxos (376 BC) against the Peloponnesians, so reestablishing Athens as the prime seapower for the next half century. Seapower transformed the Athenian economy, giving it a “modern” character.

In the second part of the paper we proceed to an analysis of the Athenian economy, underlining especially the new elements that constituted economic development and change. Our attempts at quantification should not be taken as exact figures, but rather as orders of possible magnitude, illustrating crucial aspects of the Athenian economy, and as a simple “methodological agenda” that permits some measure of estimation. This could be refined and serve as an invitation to scholars for further research of the Ancient Athenian and first “modern” economy.

2 A game theoretical modeling using signaling games

In this paper we formulate the behaviour of the two countries as a signaling game. Signaling games are dynamic games of incomplete information between two players where both the issues of updating and perfection arise. Player 1 is the sender who sends a signal. It moves first and has private information about some characteristics. Player 2 is the receiver who observes the move of the first player but does not know the type of player 1.

Following Gibbons (1992), the dynamic timing of the game of incomplete information between the sender (S) and the receiver (R) consists of a number of features. First, external event draws a type t_i for the sender (in our case Persia) from a feasible set of results (strategies) $T = \{t_1, t_2, t_3, \dots, t_J\}$ according to the probability distribution $P(t_i)$, with $P(t_i) > 0 \forall i$ and $P(t_1) + \dots + P(t_J) = 1$. Secondly, the sender observes t_i and chooses a message (invasion threat) M_j from a feasible set of

messages $M = \{M_1, M_2, M_3, \dots, M_J\}$. Thirdly, the receiver (in our case Athens) observes M_j but not t_i (sea/land) and chooses an action α_k from a feasible set of actions $A = \{\alpha_1, \alpha_2, \alpha_3, \dots, \alpha_k\}$. The payoffs are represented by $U_s(t_i, M_j, \alpha_k)$ and $U_R(t_i, M_j, \alpha_k)$.

A pure strategy for the sender is a function $M(t_i)$. This specifies the message to be chosen for each type that nature might draw (in the form say of a shock) and a pure strategy for the receiver is a function $a(M_j)$. This in turn specifies the action to be chosen for each message that may be sent by the sender. The sender has two pooling strategies (sending the message) and two separating strategies (sending different messages). The sender plays M_1 if nature draws t_1 or t_2 and plays M_2 if nature draws t_1 or t_2 . In the case of separating strategies the sender plays M_1 if nature draws t_1 and M_2 if nature draws t_2 or plays M_2 if nature draws t_1 and M_1 if nature draws t_2 .

After observing any message M_j from the feasible set M , the receiver must have a belief about which types could have sent M_j . If we define this belief by the probability distribution $\mu(t_i|M_j)$ where $\mu(t_i|M_j) \geq 0$ for each t_i in T , yields

$$\sum_{t_i \in T} \mu(t_i|M_j) = 1$$

Then for each M_j in M , the receiver action $\alpha^*(M_j)$ must maximize the receiver's expected utility, given the belief $\mu(t_i|M_j)$ about which types could have sent M_j . That is $\alpha^*(M_j)$ solves

$$\max_{\alpha_k \in A} \sum_{t_i \in T} \mu(t_i|M_j) U_R(t_i, M_j, \alpha_k)$$

This requirement implies that the sender's strategy is optimal given the receiver's strategy (Gibbons 1992).

It follows that for each t_i in T , the sender's message $M^*(t_i)$ must maximize the sender's utility given the receiver's strategy $\alpha^*(M_j)$. That is, $M^*(t_i)$ solves

$$\max_{M_j \in M} U_S(t_i, M_j, \alpha^*(M_j))$$

If we denote as T_j the set of types that send the message M_j given the sender's strategy $M^*(t_i)$, then for each M_j in M , if there exists t_i in T such that $M^*(t_i) = M_j$, then the receiver's belief at the information set which corresponds to M_j must follow from the Bayes' rule and the sender's strategy¹:

$$\mu(t_i/M_j) = \frac{P(t_i)}{\sum_{t_i \in T_i} P(t_i)}$$

If we generalize our analysis to the so-called multi-stage games with observed actions and incomplete information then each player i have a type θ_i in a finite set Θ_i . The prior distribution p is given by the product of marginals. That is,

¹ A pure strategy perfect Bayesian Equilibrium in a signaling game is a pair of strategies $M^*(t_i)$ and $\alpha^*(M_j)$ and a belief $\mu(t_i|M_j)$ which satisfies all the above requirements (Gibbons 1992). According to if the sender's strategy is pooling or separating, we call the equilibrium as pooling or separating, respectively.

$$\pi(\theta) = \prod_{i=1}^I P_i(\theta_i)$$

where $p_i(\theta_i)$ is that player i 's probability equals to θ_i and assuming that $\theta \equiv (\theta_1, \theta_2, \theta_3, \dots, \theta_I)$. The game is played in periods $t = 0, 1, 2, \dots, T$ with players choosing at the same time an action revealed at the end of the period.

Additionally we impose the restriction that the strategies (S_1, S_2, \dots) lead to Bayesian Nash equilibrium not just for the global game but also for the games which start in each time period t after every history h^t . To make these subsequent games true games we specify the players' expectations in the beginning of each subsequent game. In this case we denote player i 's conditional probability that his opponent's types is θ_{-i} by $\mu_i(\theta_{-i}|\theta_i, h^t)$ and we assume that it is valid $\forall \theta, \forall t$ and $\forall h^t$ all types of player i have same beliefs.

$$\mu_i(\theta_{-i}|\theta_i, h^t) = \prod_{j \neq i} \mu_i(\theta_j|h^t)$$

Using Bayes' rule we may upgrade beliefs from t to $t + 1$ (Fudenberg and Tirole 1993) as

$$\mu_j(\theta_j|h^t, a^t) = \frac{\mu_j(\theta_j|h^t)S_j(a^t|h^t, \theta_j)}{\sum_{\hat{\theta}_j} \mu_i(\hat{\theta}_j|h^t)S_j(a^t|h^t, \hat{\theta}_j)}$$

With a strategy S and beliefs μ satisfying the previous mentioned conditions the strategies from h^t and with a continuation of knowledge is Bayesian equilibrium of the subsequent game. What is expected to happen is that

$$u_i(S|h^t, \theta_i, \mu(\cdot|h^t)) \geq u_i((S'_i, S_{-i})|h^t, \theta_i, \mu(\cdot|h^t))$$

In our case we have two players (Athens and Persia). Only country 1 (Persia) takes an action with the action space having two elements: 'aggression (invade)' and 'non-aggression (not invade)'. Player 2 (Athens) has two reactions: defense by sea i.e. building a fleet, or by land, i.e. not building a fleet. The former reaction results to a defeat while the latter to a victory. Country 1 has one of two potential types: 'rational' or 'aggressive'. A rational type for country 1 makes D_1 when it invades and P_1 when it does not invade ($D_1 > P_1$). Let P (respectively $1 - P$) denotes the prior probability that Persians are rational (respectively aggressive).

In stage two, only Athens chooses an action α_2 . This action can take two forms: continuous war or not. If Athens continues the war, it obtains payoff D_2 if Persia is rational and P_2 if it is aggressive. Persia gets D_1 if Athens continues war and M_1 if Athens stops war. If Athens stops the war it obtains payoff 0 in terms of peace. The idea is that, unless it is not aggressive, Persians will not fight in the second period, because there is no point to building or keeping a reputation at the end. This gives the payoff matrix of the first period of the game, where the numbers are chosen so as to illustrate fictitious welfare gains and losses for each combination of strategic choices.

Payoff matrix, period 1

		Persia’s strategy	
		Agression	Non-agression
Athens’ strategy	Defense sea	Survival –100, 100	Peace 50, 50
	Defense land	Breakdown 100, –100	Peace 50, 50

In the case that Persia does not attack, i.e. chooses the non-aggression strategy, we have the outcome that we call Peace, which corresponds to the Nash non-cooperative solution of the game. If Persia chooses aggression then Athens has two alternative strategies: to fight either on land or on the sea by building a fleet. The outcome of the strategy ‘defense-land’, we assume to be negative for Athens, i.e. Athens is conquered or destroyed and ceases to be an independent country. This outcome is called ‘Breakdown’. If Athens chooses to build a fleet and fight by sea, then it is victorious and we have the outcome for Athens, which we call ‘Survival’. In the matrix, the first payoff is for Persia, and the second for Athens.

What is important for the game, is, that the ‘Peace’ outcome is deemed to be inferior to the aggression and war outcome for the Persian decision maker, the king Xerxes, if he considers, as he really did, that he would win. This leads him to adopt the strategy ‘aggression’. Athens, expecting Persia to attack, calculates her chances of survival according to the two strategies available and chooses, as a Stackelberg follower player, the better of the two, which is to build a fleet and fight by sea. This is exactly what happened in reality. Athens’s political leader, Themistocles, convinced the Athenians to vote in 482 BC, his Naval Law, that led to the construction, in two consecutive years, of 200 new warships, i.e. about two thirds of the total available to the Greeks at Salamis. The turn to the sea and war continuation is a continuous game that permits the Athenian decision makers to calculate their individual welfare and see that $w_{it}^N > w_{it}^R$, i.e. the welfare of individual i , at time period t , is greater under the new regime (N) than under the old one (R). Institutional change begins and the probability of remaining on a new path increases with each step, making return to old regime impossible. Figure 1 illustrates the creation of new institutions due to increased knowledge as justified below.

Now, having won in the first phase of the game, the roles of the players are inverted. Athens becomes the leader of the game, which continues as depicted in the payoff matrices of periods 2 and 3. In the second period, Athens has two strategies, aggression, i.e. to counter-attack Persia, and non-aggression, while Persia is left with only one, defense, which simplifies the game. If Athens perceives the gains from aggression and war to be superior to those of peace, it will choose this strategy, as it actually did. In a democratic society where all citizens voted directly for issues like the continuation of war, or in favor of peace, the necessary condition for Athens to choose war is that the majority of voters must estimate their personal welfare in the war situation as being superior to their welfare situation if they choose peace, i.e.

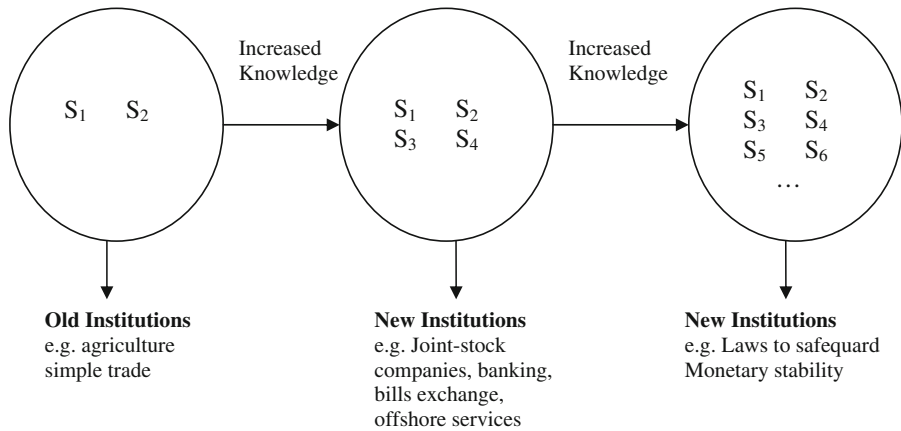


Fig. 1 Increased knowledge and the creation of new institutions

$w_i(W) > w_i(P)$ for $i = 1$ to $\frac{N+1}{2}$, where N is the total number of citizens—voters, and $\frac{n+1}{2}$ indicates that for the majority of them, individual welfare w_i in case of war (W), is superior to in the case of peace (P). This is a very important element, because it demonstrates the building of a big alliance of interests that is created by the ‘turn to the sea’ and the continuation of war. Institutional and regime changes hinge on this.

In the second period, the first payoff is for Athens, the second for Persia.

Payoff matrix, period 2

	Athens' strategy	
	Agression	Non-agression
Persia's defense	War, transition 100, -100	Peace 50, 50

The game can be continued for further periods, so long as Athens is winning and gains in welfare from war are superior to for those of peace. Peace is reached once the Athenian voters estimate that they have gained the maximum out of their war effort and they will not gain any more out of continuing the war, i.e. the condition for the majority of voters is transformed into $w_i(W) = w_i(P)$.

What is crucial here, is first that so long as war is continued, this goes hand in hand with a naval strategy, which results in two phases of regime change, due to the alliance of interests created: First, a phase of transition, from a land to a ‘naval’ regime, followed by a phase of ‘expansion’ which, as examined in the next section in more detail, combines territorial expansion with economic growth and increased welfare.

Second, this creates first the path change towards the new regime and then as the game is repeated, new path dependence along the path of the new, naval based

regime. It is already clear from the two periods of the game, that once the game is repeated, with each step-period, the ‘turn to the sea’ becomes the dominant outcome, and the probability of remaining on this path to the exclusion of others (or a return to the ‘old regime’) is reinforced. The probability of remaining on the new path increases after each round of the game.

The probability of remaining into the new path is increasing because along the new path, during each period, substantial resources are invested by the members of the society, both in tangible and intangible forms. The material resources invested are the building of the ships themselves and the infrastructure required to support them. The immaterial resources are the new “knowledge” gained in the form of new skills, e.g. to captain ships, to row them etc. and organization forms e.g. how to finance the shipbuilding program, the upkeep of the fleet (in modern terms, the logistics of the fleet) and following the transformation into a naval power, the emerging new economic and trade patterns, which necessitate organization and institutional innovations, as we will analyze in the next sections. All these represent a huge investment effort, which is transformed in sunk-costs for the next periods.

A return to the old path would represent abandoning and destroying this collective investment, which is not a rational choice. So, investment during each period along the new path strengthens path-dependence for the new naval regime.

Next let us examine in more detail the case of Athens, illustrated above.

3 The Athenian economy

Following the successful outcome of the Persian Wars, presented as a signaling game in the previous section, Athens was established as Greece’s and the Eastern Mediterranean’s foremost sea power, transformed its economic structure, giving it economic characteristics that makes it the first “modern” economy. Athenian confrontation with the Persian Empire started in 498, when Athens decided to help the Ionians in their revolt against the Persians. It continued with the defeat of the first Persian invasion at Marathon in 490 BC, and during 480–455 BC, when after defeating the Persians at Salamis and Platea, the Athenians successfully counterattacked.

We have focused in our model on the years 482–481 BC because they were the crucial years when Athenians voted for the financing of the public good defense, e.g. financing the construction of 200 new warships (Kyriazis and Zouboulakis 2004). This was the decisive step that led both to the defeat of the second Persian invasion and the development of Athens as a sea power. This is also our reason for not taking into account in our game theoretical formulation other Greek city states like Sparta, Corinth, Aegina etc. In none of these states did such a short term and of enormous magnitude transformation take place. Also, out of about 300 ships present on the Greek side at Salamis, 180 were Athenian, e.g. almost two third of the total. So, it should be clear, that Athens was the major (or dominant) player within the Greek coalition, which we believe justifies our effort in focusing on Athenian strategy.

A vast literature exists on the history, arts, political institutions and even social relations of Athens. Remarkably, as far as we are aware, little research has been undertaken concerning its economy and economic transformation during the fifth and culmination in the fourth century.² This is even more remarkable if we take into account hints of ancient writers that intuitively and explicitly understood this. Xenophon for example (Hell. 7.1.4) remarked: “Most Athenians were economically dependent on sea-related activity”, Aristoteles (Ath. Pol. 24, 26.1) as well as the author named “Pseudo Xenophon” (Ath. Pol. 1.2) noted that the transformation of Athens from a land power to a sea power led to a shift in the internal balance of power, because the land forces (hoplites) were recruited from the “middle” class, whereas the navy was manned and gave employment, remuneration and political power to the poor (thetes).

This again led to the democratic transformation of Athens. Becoming rowers for the fleet, e.g. giving military service, the poor got full civil rights. So, in our model the decision makers are all citizens (e.g. Athenian males over 18 years of age) and they calculate their individual subjective utilities in a direct democracy model, which leads to the adaptation of new strategies.³

Athens, the first ancient state on which we have a substantial amount of contemporary sources, supplemented by archeological evidence, indicates that seapower in fact transforms the economy and evolves new economic institutions and organizations, as happened also with later sea-powers like Venice (Pezzolo 2004; Lane 1985; Norwich 1982), England (Rodger 1997, 2004; Kyriazis and Zouboulakis 2003) and the United Provinces—Dutch Republic (Halkos and Kyriazis 2005; Kyriazis 2006).

We proceed now to an analysis of the main elements that characterise Athens as a “modern” economy. Kyriazis and Zouboulakis (2004) have estimated the economic effects of the Athenian Naval Law (“The Decree of Themistocles”) of 482 BC on employment and “industrial” linkages. They proposed that building 200 trireme warships within 2 years was the biggest “public work” undertaken in ancient Greece up to that time, employing as many as 30,000 workmen, or as high as 50% of the total male labour force. The building of the “high technology weapon system” as a trieres was at the time, necessitated the acquisition of new technological and organizational skills and gave impetus to new sectors as for example metallurgy (for rams etc.), sailmaking, carpentry, the “chemical industry” (pitch, paints etc.). Answers to questions like: (1) How were the ships to be build and by whom? (2) How would they be financed? (3) How would the “public entrepreneurs” responsible each for building a ship be remunerated, and what kind of liability would they have towards their employer, the state? Had to be and were found.

² Some exceptions being Cohen’s (1997) on the banking system and Gabrielsen’s (1994) on financing the Athenian fleet, Amemiya (2007), Ober (2008), Burke (1985), Karayannis (2007), Morris (2004), Engen (2005) and Doukas (2005).

³ For an extensive analysis of Themistocles Naval Law see Kyriazis and Zouboulakis (2004) while for the working of direct Athenian democracy, see Ober (1989), Manville and Ober (2003) and Kyriazis (2007).

By the middle of the fourth century economic developments had preceded further.

3.1 Economic principles

Athenian democracy was characterised by what we would call “modern economic principles”, like individual freedom and equality of opportunity. As Aristoteles pointed out (Pol. 1317 a40 b17) an Athenian citizen, but also non-Athenian free men (“metics”) could live in the private sphere as they liked. The right to own landed property was confined to citizens, yet metics and slaves took part in trade and crafts to the same extent as citizens and often on the same footing. A day’s pay, for example, was the same at the end of the fifth century for a citizen, a metic and a slave: They were each earning a drachma a day (Hansen 1999). Private freedom, to live and to work as one pleased applied fully and without restrictions to citizens, and metics, and to a high degree even to slaves and women, a shocking situation to contemporary critics of the Athenian democracy (Pl. Resp. 8.563 A-C).⁴ Although the Athenians seem not to have had a concept of property rights as we understand them today, they had an impressive number of rules which protected a citizen’s person, his home and his property, and these rules were believed to be specifically connected with the democratic constitution (Hansen 1999; Mossé 1981; Wallace 1996). Courts existed where a citizen (and in some cases metics) could uphold his rights (in the sense of property rights).

As Kyriazis and Zouboulakis (2004) showed, the elaborate organization of the contracting in order to build the 200 ships under Themistocles Naval Decree could not function in the absence of properly defined property rights.⁵ As Cohen (1997) has persuasively shown, free Athenian women could also own property, and even could function as entrepreneurs, and as bankers. The law adapted to economic

⁴ Plato actually writes: (At Athens) men and women purchased as slaves are no less free than their purchasers. And in the relationships of women to men and of men to women, how much equality through law, and liberty is developing!” The situation of “slaves living apart” (outside their master’s household) illustrate this clearly. They were working independently, more or less as salaried persons or even independent entrepreneurs, paying only a part of their earning to their master’s. (Cohen 2000). Karayannis (2007) underlines the incentives system given to slaves which increased their productivity. The most important was the possibility of being freed, something which happened often in the banking sector, where the trusted slave co-manager of a bank would be given his freedom, and in some cases, at the death of the owner marry his widow and become owner of the bank. The most famous example of this is Passion, who started as a slave and ended his life as the richest Athenian citizen and bank owner during the first half of the fourth century. Of course, conditions among slaves did vary. Slaves working in the silver mines worked in unhealthy conditions and were eager to escape at least during the end of the fifth century, last phase of the Peloponnesian War (we owe this clarification to an anonymous referee). But we still argue that the general conditions for the average slave in Athens were better than anywhere else in the world during that historical period.

⁵ The contractors were liable with their private property as a guarantee to receive each a talent (6,000 drachmae) to build a ship. If the ship was not found satisfactory, they were liable to “pay back” the amount or part of it paid, in the beginning as a form of loan to him, by the state. The guarantee for the state, was the contractor’s private property. This is why the richest Athenians were chosen as contractors. The above presupposes a clear definition of property rights.

reality by accommodating the property needs of banker's wives, although here it took the form of a "silent tolerance".⁶

3.2 A "mixed" economy with the state as the biggest employer

Modern economies are mixed economies with a public and a private sector, where the state's contribution to GDP varies around 30–50%. Athens showed similar characteristics. Athens had paid magistrates (jurors, legislators), other magistrates, chosen by lot according to specific procedures and elected generals and ministers "of the economy" and "rhetores"⁷ who served for usually a year, and a number of permanent "civil servants", paid secretaries (grammateis) and undersecretaries (hypogrammateis) of whom some were metics and some even slaves. They guaranteed the continuation and efficiency of the various boards of government, very much as modern civil servants do, and accumulated administrative expertise. Contrary to other contemporary forms of government like oligarchies, tyrannies or kingships, all magistrates were accountable and had to give an account at the end of their service, being liable also to juridical prosecution for any misdeeds.

The magistrates but also those participating in the Assembly (demos) were paid (misthos). The level of political activity exhibited by the citizens of Athens is unparalleled in world history in terms of numbers, frequency and level of participation. An Assembly meeting was normally attended by 6,000 citizens, on normal count days some 2,000 citizens were selected by lot to staff various government bodies like courts, etc. The Council had 500 members and there were 700 other magistrates, plus the unknown number of permanent secretaries and under-secretaries. The Assembly met 30–40 days a year, the Council 250 days at least, the courts about 200 days, while the other magistrates almost every day. The above gives 6,000 citizens as employed by the state on a non-permanent base and more than 3,200 (courts, Council, other magistrates and secretaries) on a more or less permanent base (Hansen 1999).

Taking into account that most modern writers estimate the citizen population of fourth century Athens at about or a little above 30,000 citizens, this gives permanent state employment at about 10% of total population.

⁶ Women had substantial property rights in other Ancient Greek states like Gortyn on Crete and Sparta. In Athens we know the names of some famous women "entrepreneurs", like Artemis of Piraeus. She had a flourishing business in building materials (Cohen 1997).

⁷ For a detailed analysis of the various government bodies in Athens, see Hansen (1999) and Jones (1966) "Rhetores", (orators) were the political leaders of Athens, like Pericles, Demosthenes, Hyperides etc. Unlike modern political leaders, they were not part of the administration and were not paid, unless the Assembly of the people decided to reward them specifically for their proposals. They also could receive "gifts" from Athenian allies. According to Hyperides (I.24-25), Demosthenes and Demades had received more than 60 talents each just for decrees in the city and grants of honours to individuals, apart from the (Persian) king's money and Phillip's of Macedon. The importance of the orators lies in that they shaped external and internal policy through their proposals of laws which were accepted or rejected by the institutionalized government bodies, Assembly, Council, etc. Generals on the other hand were elected, reflecting the need of specialized skill, which could not be left to chance. The same applied at least during the second half of the fourth century to the so called "*tamias epi ton theorikon*" who was responsible for the city's finances, and who can be described as a "minister of finance" but being independent since there was no prime minister. Famous "ministers" were *Euboulos* and *Lykourgos* (Kyriazis 2007; Burke 1985).

This excludes the military sector. Athens had not a standing army, using either its citizens in time of war, or paying mercenaries. It had a permanent small “police” force of “Scythian archers” mercenaries.

But it had, like Great Britain from the seventeenth century on, a standing navy, which employed citizens as rowers and sailors. The standing navy could vary from 20 ships during peacetime in the fourth century, to a maximum of a 130 ships for short periods in wartime.⁸ Considering that a trireme had a crew of 200 and that they were paid by the state this gives an additional employment in the navy of 4,000–20,000, i.e. 13–65% of the citizens. Taken together, “civil” and “military” permanent employment in peacetime totals at least 7,200, ie 23% of the citizens. Thus, the state sector was by far the biggest employer in Ancient Athens, a striking similarity to modern states.

Each member of the Council of 500 received a daily payment of 5 obols, so that the Council must have cost about 15 talents per year (Hansen 1999). Athens had a cavalry force of about 1,000, and during the fourth century the state paid for the upkeep of the horses giving each cavalryman a fodder allowance of one drachma a day (Arist. Ath. Pol. 49.1). So, the cavalry cost the Athenian state 365,000 drachmae per year.

3.3 Structure of the economy

In this section, we try to estimate for the first time, as far as we know, sectorial contributions to Athenian GDP and employment. Modern developed economies are characterised by a sectorial structure where services predominate in their contribution to GDP and employment, with industry coming next, and agriculture last, with contribution to employment and GDP in most cases below 10%. Economies before the so-called industrial revolution, with very few exceptions like Venice and the Dutch Republic in the seventeenth century, were characterised by the predominance of the agricultural sector, both in terms of employment and GDP contribution.

Ancient Athens was the first economy, which showed a modern sectorial structure. Although of course statistics are missing, there are a lot of indications, which show that services (trade, shipping and banking) and handicrafts (“industry”) were far more important in terms of employment and GDP than agriculture.

3.3.1 Urbanisation

Athens and its harbour Piraeus, were for the times big cities and it has been estimated that an important part of the Athenian population lived there, and not in

⁸ The Athenians managed to put to sea a fleet of 130 warships in 356–355 BC during the so called “Social War” (History of the Greek Nation 1972). The cost of remunerating the crew was borne by the state, while the upkeep of the ship itself (oars, sails, ropes etc.) was borne by the trierarch. This is clear when considering the evidence of the trierarchy’s expenditure, estimated at 3,000–6,000 drachmae per year (Gabrielsen 1994). The remuneration of the crew, at one or one and a half drachma per day per man, gives 200–300 drachmae per day and a sum of 48–60,000 drachmae per year, assuming 8 months of service (excluding the winter months), e.g. 8–10 talents. This sum exceeded the financial possibility of any Athenian.

the country. Furthermore, in Athens and Piraeus many gravestones have been found of citizens belonging to demes from all over Attica, whereas there are only a few graves round about Attica belonging to citizens from the city demes or the Piraeus (Hansen 1999).

The direction of the movement was evidently from country to the city, which is a characteristic of urbanisation and of changing employment patterns. People left the countryside, found employment in the city, presumably in services (trade, shipping and the navy) and handicraft and died there.

3.3.2 *Market economy*

As far as existing evidence can be interpreted, the Athenian economy was market dominated and highly monetized, in contrast to agricultural economies, which are characterised by a higher degree of self-sufficiency of the households and barter. The importance of money transactions has been made clear by analyzing some Athenian laws, e.g. Nikophon's on money purity and circulation of good "silver coins" whether Athenian or imported, which had the effect of lowering transaction costs (Ober 2008; Engen 2005). Institutions and laws of Athens were established with the aim of making the state attractive to trade and enterprise, and also offering opportunities of economic activity to foreigners, who could settle in Athens and work having the same property and legal rights as the Athenians (with the notable exception of owing land). Contemporary Athenians were well aware of the benefits of attracting industrious foreigners to work and settle in Athens, as made clear e.g. by Xenophon's proposals to grant incentives to foreigners in order to achieve this.

Because the soil of the country was poor, many citizens had to come often into the city to sell their vegetables or wine or olives and buy corn or meal for their daily living. As analysed below, Athens, like many modern economies, was not self-sufficient in cereals and had to import them. They were distributed to the citizens by traders through the market. The territory of Attica was rich in a great variety of products such as cheese, honey, hides, and wool and charcoal, which again required a central market. Importation of agricultural products from the countryside into the city was free, i.e. no customs were levied at the city gates (Xen. Oec. 5.9-11, 11.15-8, Lys. 20.11-12).

3.3.3 *Trade patterns*

At the time when an international credit system was non-existent, the balance of payments of imports and exports must have been equal, the difference being paid by cash, ie import or export of silver and gold coins.

Imported corn, at the rate of 800,000 medimni per year, at a normal price of 5 drachmae per medimn (Dem. 34.39) amounts to about 4 million drachmae or 660 talents. Other important imports were foodstuffs such as fish, although a substantial part may have been fished by Athenian ships and boats. Timber was imported, mainly from Macedon for the fleet, the merchant marine and housing since by the fourth century already Attica had lost a great part of its forests, in part due to her vast shipbuilding programme after Themistocles Naval Law and during the

Peloponnesian War. The navy required pitch, hemp and flax, as well as iron and bronze, needed also for the home “industry”. Some luxury items like ivory were imported, as well as slaves, nearly all imported.

Exports comprised olive oil, Hymetus honey, a little wine from the agricultural sector, but more significantly, handicraft and “industrial” products, like pottery, furniture, silver plate, arts products like marble and bronze statues, iron and bronze domestic utensils, arms and jewelry (Jones 1966; Kyriazis and Zouboulakis 2004).

According to some estimates (Cohen 1997) the import of grain required 600 shiploads at 3,000 medimni (120 tons) per shipload. Total trade value has been estimated to at least 13.8 million drachmae, or 2,300 talents per year (Isager and Hansen 1975).

The above numbers of shiploads give a base for calculating the size of the Athenian merchant marine and the employment it generated. Even if one calculates two trips per year per ship, grain imports would require 300 ships. Of course some of the ships will have belonged to foreign shipowners, but since Athens was the major maritime state in the Eastern Mediterranean, it is not far fetched to assume that the great majority of ships were Athenian. To the number of grain ships may be added a number of ships used for other kinds of trade, although of course most ships would be used to transport export goods on the outgoing voyage and transport grain on the incoming. Still, a range of 300–500 Athenian merchant navy ships seems reasonable. Assuming again an average of 10 crew per ship, this would give an employment of 6,000–10,000 for the merchant marine. Unfortunately we do not have any indications as to whether foreigners, metics and even slaves were used as crewmembers. To the above estimate must be added boats used for close inshore fishing, local transport (for example to the island of Salamis which belonged to Athens and to the western coast of southern Euboeia, which lies only a few miles east of the northeastern coast of Attica). Even if we take a low estimate of only 5,000 Athenians manning the Athenian merchant marine, the merchant navy would account for as much as about 15–16% of the total citizen population, making it, together with the state, one of the main employment sectors of the economy.

The harbour of Piraeus served as a redistribution and entrepôt center for the Eastern Mediterranean much as Amsterdam functioned in the 17th (Isok. 4.42, Xen. Por. 5.3). It was the leading commercial center in the region even after the political eclipse of Athens after the defeat by Macedonia in 322 BC, until the rise of another maritime republic, Rhodes, in the beginning of the third century (Cohen 1997). This commercial entrepôt activity provided more land based “services”, employment opportunities, for example to shipyards for construction and repairs, for loading, unloading and transporting the goods, for warehouses, and of course for banking services.

Due to the high grain imports, the balance of payments for goods must have shown a deficit for Athens. The balance for services on the other hand (entrepôt function, banking etc.) must have shown a surplus. Total balance of goods and services may still have shown a deficit, which was covered by silver exports, as both archaeological evidence and ancient sources suggest. In fact vast quantities of Athenian silver drachmae have been found in Thrace, the Bosphorus, Asia Minor, Syria, Egypt and Italy (Jones 1966; Isager and Hansen 1975) Xenophon claimed that

Athens attracted merchants because they could obtain payment for their goods in sound coin (Xen. Vect. iii.2).

We conclude from the above that trade and shipping, being a part of the services sector, was very important for the Athenian economy, for its contribution to GDP and employment.

Due to its economic and commercial supremacy, combined with the fact of high value silver coinage with a standard silver content, the Athenian drachmae had during the fourth century the role of an international means of payment and “reserve” money, much as today’s position of the USD and the Euro’s.

3.3.4 Industry

Here again we have some evidence that the handicrafts sectors was important both for its contribution to employment and GDP. According to the ancient sources, during the fourth century the majorities of the richest Athenians belonged no more to the old landowning aristocracy, but were “industrialists”, bankers and shipowners. One of the largest factories was the shield factory of the metic brothers Lysias and Polemarchus which employed 120 men (Lys. 12.19). The richest Athenian during the second half of the fifth century was the general Nicias, who owned 1,000 slaves whom he let out to a mining contractor at 1 obol a day (Xen. Vect. 4.14–15). Demosthenes’ father owned two factories, producing knives and employing 32 slaves, and beds, employing 20 slaves. The investment value was about 6.5 talents, (the value of slaves being 4 and the value of equipment and raw materials 2.5). His total fortune was 15 talents, the remaining being cash, financial investments and his house and furniture (Dem. 27.9–11). The richest man in Athens during the fourth century was the banker Passion, who rose from slave status to metic and lastly, citizen, being an example of the existence of social mobility (Dem. 36.48. 59.2).

Knowing the number of slaves in Lysias and Polemarchus factory, and the approximate wage of citizens (2 drachmae a day in the fourth century) for either free or slave (Hansen 1997) enables us to estimate the total labour cost per year of the factory (calculated at about 330 working days, ie excluding holy festival days etc when even slaves might not work) at about 6–7 talents. Adding some amounts for the cost of raw material and very small amounts for capital depreciation (since capital equipment was very simple) we could arrive at a total cost in the range of 7–10 talents a year. This again would provide us with a benchmark for the factory’s total turnover, which must have been higher than that. Knowing further that rent was at around 8% (Isaeus 11.42), interest rates at 12%⁹ (Dem. 27.9) return on capital

⁹ Demosthenes explicitly mentions a talent of silver lent at the fixed interest rate of a drachma per minae (1 talent = 60 minae = 6,000 drachmae = 36,000 obols) i.e. 1% per month and 12% per year. Some modern writers maintain that we should take number given by ancient authors with a caveat. This is true for some cases, as for example the excessive number given by Herodotus for Persian armies and navies. On the other hand Demosthenes and the fourth century writers were particularly well informed on the Athenian economy in which they were living and could not give to their audience, the popular courts or the Assembly, numbers thus they could be open to criticism by other orators, who would try to discredit them. Thus although some of the numbers quoted may not be 100% exact, we believe that they were close enough to reality, to be credible then and now.

from more than 100% to not less than 18% (Xen. Por. 3.9) and taking as an hypothesis a mark up price on total cost of about 20% as an approximation for profit, we arrive at a total yearly turnover of 8.5 to 12 talents and profit amounts of between 1.5 and 2 talents, which may be on the low side.

Demosthenes (24,111) assessed the total “value” of Athens as being 6,000 talents, which in today's terms could be said to equate to GDP. Against this sum we can compare the fortunes of wealthy Athenians, like those mentioned above, to which a few more can be added: We know by name 30 bankers, some of them citizens, some metics (Cohen 1997) merchants and sea captains like the citizen captains Diodotus and Diogeiton. Diodotus left a fortune of 13 2/3 talents (5 on cash deposit, 7 2/3 on nautical loans, none in land!) (Lys. 32.4,6,15,25). Cephalus, a Syracusan, owned a factory employing 100 men, and Passio the banker another, which yielded a profit of a talent per year (Lys. 12.19 and Dem. 36.11).

A question, to which no definite answer exists, has to do with the total composition of the labour force in “industry”, as well as in the Athenian economy in general. The great majority of Athenian citizens worked themselves, but many did have a slave assistant (Jones 1966; Hansen 1999).

The market of Athens was so extensive, that it had to be subdivided into parts taking their names from the predominant activity, in each part, e.g. tanneries part, stonemasons, etc (Xen. “Cyrus”, A.II.3, Arist. Pol. 1331a, 1331b). Specialization was also advanced and Xenophon was very much aware of the benefits of specialization and its contribution to productivity growth (Xen, “Cyrus” VIII.11.5).¹⁰

We must add the women, free, metics and slaves, to the labour force, whose contribution was very important, not only within the households, but also as producers of some goods like textiles (woven on looms), as shopkeepers, merchants and even bankers, as mentioned above.

We conclude that although no exact estimates are possible the industrial sector's contribution to employment and GDP was very important.

3.3.5 *Banking, other services and organization forms*

As Cohen (1997) has shown, Athens had by the fourth century a developed banking system, with banks offering all kinds of services, maritime and business loans, mortgages and even helping rich Athenians hide a part of their fortune in order to escape taxation. Thus, the Athenian “trapezitai” (bankers) created the world's first all activities private banks giving to the Athenian economy another “modern” characteristic. Banking finance used many modern procedures, like the personal guarantee by a third party, the participation with another lender, the written loan agreement and the taking of security (collateral), for example of the ship in the case of maritime loans. A considerable portion of the bankers were Athenian citizens

¹⁰ Thus, Xenophon was a precursor of Smith in this respect, being the first author to deal with the relation between specialization and productivity. He mentions the example of one shoemaker making men's and another only women's shoes and “in some cities one person just stitches the shoes, another cuts the leather and a third puts the parts together. So, by necessity, somebody who deals with a very limited work, does it optimally”.

(Cohen 1997, p. 174) and some were even women, *fe*. Passion's wife, Archippé (Cohen 1997, p. 77).

As in other maritime economies, for example Renaissance Venice (Pezzolo 2004), England (Kyriazis and Zouboulakis 2003), and the United Dutch Provinces (Halkos and Kyriazis 2005), the banking system developed in parallel with seapower in general and maritime commerce in particular and it held an important, perhaps even a prime financing role (Cohen 1997, p. 15 and 151–160).

During the fourth century, widespread dependence on credit is recognized as characteristic of Athenian life. Hence the importance of the banks, for whom lending was a central function. Moreover, the banks' role in providing maritime credit was critical to the financing of sea trade, which was crucial for Athens due to its dependence on food imports (Millett 1983, p. 42; Cohen 1997, p. 190).

But the Athenian economy, also through banking intermediation, showed one more modern characteristics. It had a "hidden" or "invisible" economy ("aphanés" in ancient Greek). The banking system helped rich persons to hide part of their wealth for tax evasion purposes, in connection with the onerous "leitourgia" taxes, as will be analysed below (Cohen 1997).

Even more astounding, we have indications of the operation of what under today's terminology would be called offshore practices, as the analysis of the Satyros case seems to attest.¹¹

Available information does not allow even a rough estimate of the contribution of the banking system to employment and GDP. While employment will not have been high, since banks were "personal" business with few assistants ("employees"), very often slaves, its contribution to the functioning of the Athenian trade and economy in general, was important, as we have pointed out above.

Other "services", included those related to Piraeus entrepôt function and comprised the warehouses, land transportation to and from Athens and Attica, loading and unloading facilities etc. Although here too indications of their contribution to GDP and employment are lacking, these activities were certainly important for the harbour of Piraeus.

Athens evolved in parallel to its maritime trade, the nucleus of some modern organization forms, joint-stock companies, offshore services and public private partnerships. Ships were owned in partnership ("joint-stock companies"), as Demosthenes himself attests, presumably in well-defined "proportions" or shares. (Dem 35.33).¹²

The use of contracts is well attested, covered by law. The written contract held supreme validity, nothing being above its stipulations, and nobody being able to call

¹¹ Satyros, King of Pontos (Hellespont, the Straits of the Dardanelles) sought the return of funds, which had been brought to Athens by the son of an important royal associate who had later fallen into disfavor. The Athenian banking system offered "offshore" services to this client, helping him to place his funds outside the reach of the kingdom of Pontos authority. This led later on to a famous litigation with international and diplomatic repercussions, bringing Athenian relations with Pontos under strain (Isok. 17.3-17.11). This case reminds us of the pressure put today on "tax paradises" states on disclosure, payment of taxes by non-residents and their remittance to the tax authorities of the states of origin etc. This problem has only partially been solved within the EU, through Council Decisions of 2004.

¹² Apollonidés, in this passage, testifies the co-ownership of the vessel in his deposition.

on a law, or anything else in order to invalidate the contract (Dem. "Lacritus", 39). Bills of exchange were also widely used in international trade (Isok. "Trapezitikos" Banking" 35).

Joint-stock companies were used in every kind of activity, agriculture, handicrafts ("industry") trade and banking. Xenophon underlines, that joint-stock companies reduce risk for the individual shareholder, compared to individual companies (Xen. Por. IV. 27-32; Hyp. "For Euxenipos" 35, Av. Pol. 1280 a 30-35; Ar. Nic. 1163a 35-40).

As to public private partnerships, the first known case was the shipbuilding contracts introduced by Themistocles Naval Law, as analysed in Kyriazis and Zouboulakis (2004). The practice was generalized from then on, being used for example in mining contracts for the Lavreion silver mines: The state rented, for a fixed sum, the mines to private businessmen, who used their own manpower (mainly slaves, sometimes rented from other businessmen, as in the example of Nicias, mentioned above) bore the cost, and made a profit.

We have endeavored above to reconstruct the structure of the Athenian economy, showing its change from a mainly agricultural to a mainly services and "industry" oriented one. One more general consideration attests to this fact. Redistribution of land, and emigration, both major interrelated problems in sixth and even fifth century Athens¹³ and a persistent problem in other city states during the fourth century, is not heard as a problem in fourth century Athens. The total population of Athens in the fourth century has been estimated at about 400,000 (Hansen 1997)¹⁴ broken down as a little above 30,000 citizens, about 20,000 metics (adult males) ie about 100,000 free citizens (male, women, children) 80,000 metics and the rest slaves.¹⁵

¹³ At the time of Pericles, Athens established a colony at Thurioi, in southern Italy, sending presumably as colonists a part of her surplus population.

¹⁴ Other estimates give lower numbers, for example Jones (1966) 20,000 slaves and 124,000 free citizens (men, women, children). We believe this estimate to be too low.

¹⁵ Contemporary Athenians seemed not to know the number of slaves living in Attica. Censuses, even of free citizens and metics were not taken, or if taken, have not survived. We offer here, for the first time as far as we know, an estimate of the Athenian citizens' population in 482 BC. We know from Herodotus that Athens decided to build 100 triremes during this year, costing 1 talent (6,000 drachmae each, i.e. a total expenditure of 600,000 drachmae. The alternative would have been the distribution on an equal basis of this revenue to all Athenian citizens, which would amount again according to Herodotus to 10 drachmae per citizen. A simple division of the two sums (600,000 total revenue, 10 drachmae per citizen) gives 60,000 as the number of citizens. Owing to the ravages of pestilence and war during the last quarter of the fourth century, the population of Athens was reduced strongly, approaching perhaps 30,000 at the beginning of the fourth century and having possibly increased during this century. The earliest surviving census is that of Demetrius of Phaleron of male citizens and metics, between 317 and 307, ie after the fall of democracy. By then, in order to be classified as a citizen, an Athenian had to have a minimum of property, ie the poorest were disqualified. The census produced 21,000 citizens and 10,000 metics. Contemporary Athenians during the fourth century had a feeling that slaves outnumbered free citizens, a common occurrence in many city-states, with Sparta being the extreme. There, for about 6,000 male citizens, the "helots" (native slaves) must have numbered at least four times that many. They would have been many more at the beginning of the fourth century, before Messene was liberated by Epaminondas the Theban and Messenian helots were freed. Hypereides (Fr. 33) surmised that there were 150,000 adult male slaves at his time, a clear exaggeration.

Taking into account that the size of the Athenian state during the fourth century was about 2,500 sq. km, this would give a density of population of about 160 per sq. km, a high density even by today's standards¹⁶ and probably the highest of any ancient city state, compared perhaps only with Corinth's, which was also a maritime and commercial state.

High density of population coupled with the attested fact that there existed no population pressures, is a very strong indication of the changed character of the Athenian economy: Athens no more primarily depended on agriculture, but its services and "industry" sectors guaranteed the livelihood of its population.

We conclude that surviving evidence, as interpreted above, supports the thesis, that the Athenian economy was the first ever in which services and industry contributed more to employment and GDP than agriculture. This character would be encountered again in late Medieval and Renaissance Italian maritime Republics like Venice and Genoa, seventeenth century United Dutch Provinces and eighteenth century Great Britain.

3.4 Taxation

Modern economies are characterised by a tax system that relies not only on indirect taxes (on consumption and duties) but on

1. direct ones (income and capital taxation), shows
2. progression (ie, higher incomes are taxed with higher tax rates) and
3. the revenue it generates is used also for redistributive purposes.

All three elements existed in the Athenian tax system.

Athenian citizens thought that free men ought not to pay taxes. Taxes were a sign of servitude. Metics, being free but not citizens paid a metic tax of 12 drachmae annually. On the other hand, Athenians were realists and understood that "normal" state revenues like market dues,¹⁷ a tax on sales concluded before state officials, a charge of 3 obols on slaves and freedmen, import and export duties and a tax on those who pursued certain callings requiring special supervision (such as oracle—mongers, jugglers and prostitutes), and the proceeds from the silver mines (Tod 1979) were not always sufficient for the smooth running of the state. So they introduced a special property or income tax, "eisphora" and the institution of "litourgies".

"Eisphora" was originally a sporadically levied war tax imposed by Assembly decree. From 347/6 BC it became a regular annual tax yielding revenue of 10 talents a year. The tax was paid by both citizens and metics, but only by the richer ones, so having an element of progressive taxation. As far as the tax rate is concerned, we know that the guardians of Demosthenes had to pay for the 10 years during which they administered his property, a total of 1,800 drachmae on a fortune assessed at 15 talents (90,000) drachmae (Thuc. 3.19.1, Xen. Oec. 2.6, Iso K. 5.45, Dem. 3.4,

¹⁶ Density of population for contemporary Greece is about 83.

¹⁷ As mentioned above, modern authors disagree as to the existence of market duties, Hansen for example denying it and Tod supporting it. Metics had to pay a special fee, the "xenikon telos" to set up a stall in the market (Dem. 57.34).

20.28, Lys. 22.13, 27.10). This yields a tax rate of 2% (180 drachmae per year on 90,000). According to Jones (1966) no less than 6,000 citizens were liable to *eisphora*.

In order to facilitate the payment of *eisphora*, the rich citizens liable to pay were grouped together in 374/7 BC in 100 “symmories” (groups) with 15 men per group, giving an estimate of at the maximum 1,500 rich Athenians (“upper-income” citizens). The taxable property was assessed at 5,750 talents (Polyb. 2.62.6-7).

More important in some ways and certainly more onerous for those liable to undertake them, were the “public duties” (*leitourgies*) that lay at the heart of the Athenian tax system. The liturgy was a form of taxation cum—personal service, which obliged the wealthiest citizens to finance and perform such duties as paying for the yearly running expenses of a warship (called “trierarchy” from “trieres”, the main warship type), underwriting the cost and producing a dramatic or choral performance (connected also to religious festivals), or training and supporting a group of relay runners. According to Davies (1971) persons with property worth less than three talents were free of liturgical obligation. Liturgies could not fall on the same persons during consecutive years.

The most costly liturgy was “trierarchy”. Gabrielsen (1994) researching the sources gives a range of 3,000–6,000 drachmae per year per trierarchy.

Having some evidence of the property of some wealthy Athenians, and knowing interest rates and rates of profit, as mentioned before, we attempt to estimate a range of tax rates as represented by trierarchy. Taking a conservative estimate of total return (averaged as coming from various “investments”) on property of 10%, a property of 50 talents would yield yearly 5 talents, or 30,000 drachmae. An outlay of 3–6,000 drachmae for trierarchy would thus correspond to tax rates of 10–20%. Accepting that a property of 15 talents would lie near to the mean of the properties of the 1,500 wealthiest Athenians liable for trierarchy, we arrive through the same estimate (annual yield of 9,000 drachmae) at tax rates of 33–66%, comparable to the highest income tax rates in some currently developed economies. Of course, the cost of the other liturgies was much lower.¹⁸

The existence of *eisphora* and liturgies, falling, at high tax rates on the rich, indicates the highly progressive nature of the Athenian tax system, as has been underlined by Cohen (1997, p. 194). Further, as far as we know, the Athenian tax system was the first one to rely heavily on property and income taxes, as modern systems do, and not just consumption taxes and duties.

Public revenue was used to finance the functioning (remunerations) of the various government bodies, public goods such as defense and “education” and social policy measures. Defense included the navy, (ships, naval yards and “ships homes” “*νεόσοικoi*”), horse fodder and repair of fortifications.¹⁹ During wartime, citizens’ armies and mercenaries had also to be paid.

¹⁸ The Athenians understood the too onerous charge put on citizens by trierarchy and they reformed the system by introducing group sharing for each trierarchy, similar to that for “*eisphora*” (*symmoriae*).

¹⁹ Attica was probably the most and best-fortified region of Greece. The Long Walls linked the harbour of Piraeus and its fortifications with Athens and the Acropolis. The northern border was guarded by a chain of fortresses, at Porto Germeno, (on the Gulf of Corinth), Phyle, Eleutherai and the harbour of Rarnous opposite Euboeia.

It may appear strange to write that Athens spent revenue on the public good “education”. It is of course true, that ancient states did not have a system of public education (schools, universities etc), this being considered a private choice, the cost of which should be born by the beneficiary. Nevertheless, Athens was the first state in history to introduce at least one element of publicly financed “education”, this being the theatrical plays. As we have seen, theatrical performances were one of the “liturgies”. But Athens went one step further: Considering that the theatre had a very important educational function to perform (teaching “morals”, history, mythology and religion) all Athenian citizens should be able to benefit from attending the performances.²⁰ Since performances took place during daytime and lasted during the whole day for a 4-day period, the poorer citizens would have to loose 4 days wages (or remuneration from work) in order to attend. Many would not be able to afford this loss. So, they had to be compensated, and the “*theorika*” was introduced, being a payment to poorer citizens, allowing them to attend performances and compensation for wages and remuneration lost. Seen in this light, “*theorika*” was the first educational programme in history financed by a state for the benefit of a substantial part of the citizen’s population.

Lastly, let us consider the social policy measures. Athens was again the first state in history to introduce social policy programmes that have a “modern” character. They had a sort of “social security” (or poor relief) for disabled persons with no means of support.²¹ These persons could be registered with the Council and receive a subsidy of one obol and later two obols per day. Further, if a citizen died in battle the state undertook the upbringing of any under—age sons. Moreover, at times of food shortages, the state often distributed corn, either free or subsidized (Lys. 24.26, Arist. Ath. Pol. 49.4. Aeschin. 3.154, 1.103-4). The re-distributive character of these social policy measures is clear and strong, since the beneficiaries, poor citizens, were paying no taxes at all, while the rich were taxed to generate the revenue used to finance these measures.²²

4 Conclusions

We have analysed in the previous sections, using a game theoretic approach, the Athenian–Persian conflict of the beginning of the fifth century. The successful outcome of the war for Athens, transformed it into a seapower.

²⁰ That plays were not concerned only or mainly with religious themes, is made clear if we take into account the following: Aeschylus “*Persians*” is concerned exclusively with history (i.e. the Persian defeat by the Greeks). The so-called Theban and Mycenaean cycles have to do with history and mythology. Many of Euripides and almost all of Aristophanes plays are criticisms of the contemporary political and social situation.

²¹ They had to own property of less than 300 drachmae.

²² The Athenian tax system introduced also other innovative ideas, as for example “*antidosis*”. Under it, if an Athenian charged with a liturgy thought that another Athenian should be charged with it on equity reasons (being in reality richer than himself, but appearing to be poorer because he was hiding part of his wealth), then he could call the other Athenian before a court and ask him to exchange properties and obligations (liturgies). This was a means countering “tax evasion”. We owe this comment to professor Karagiannis. For a more extensive presentation of the Athenian budget, see Kyriazis (2009).

By the fourth century, seapower had further transformed the Athenian economy into the first “modern” economy in history. We analysed the main “modern” elements of this economy, focusing on its structure, new organization forms, taxation etc, offering some very rough quantifications of some crucial points. We argue that the Athenian economy was the first in history, as far as we know,²³ where services and industry contributed more to employment and GDP than agriculture. According to our estimates, the “permanent civil service” (government bodies) and the armed forces (navy) accounted for about 23% of citizens employment during peacetime. Merchant marine employment may have accounted for another 15%. Thus, these two sectors alone could account for about 38% of total employment. If the employment of other branches of the services sector are added (banking, land transportation, commerce-shops, warehouses etc.) it is clear that the services sector would account for more than 40% of total citizens’ employment, a percentage not too different from the employment structure of modern economies.

To the employment in the services sector must be added employment in “industry”, for which we lack sufficient evidence to make even rough quantifications. But our present knowledge of the great variety of handicraft industry production (furniture, pottery, jewelry, arts products, weapons, metal utensils, textiles, “chemicals” e.g. paints, pitch etc) warrants an assumption that employment in services and industry together would exceed by a safe margin 50%. We believe that employment is also an indicator for GDP sectorial participation. We do not possess sectorial labour productivity data, but we have no reason to expect that productivity in agriculture in Attica (where the soil is not especially rich) should be higher than in “industry” or “services”. In fact it might be the other way round, if we take as an index of productivity the rates of return of which we know something. We know that “business” rates of return could be as high as 100%, something that certainly did not apply to agriculture. And although of course rates of return are an indication of total and not just labour productivity, it seems still reasonable to assume that labour productivity in “business”, incorporated in rates of return, was higher than in agriculture.

If this is accepted, contributions to employment and GDP should go “hand in hand”. The end result is that services and “industry’s” contribution to GDP in Athens must have exceeded agriculture’s.

The transformation into a sea-power resulted in a revolutionary expansion in liquid wealth, permitting fourth century Athens (despite its loss of imperial power after the defeat in the Peloponnesian War) to maintain a high level of prosperity, manifested above all by the booming commerce of Piraeus and the flourishing “services” sector.

We have endeavoured to present a new and challenging perspective of the Athenian economy. We hope that the present paper will incite new research and discussion in order to corroborate or refute our arguments and attempts at quantification.

²³ A similar structure might have existed in the great maritime Phoenician city-states like Tyre and Sidon, for which we lack adequate evidence.

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