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Managing Financial Risks while Performing International Commercial Transactions. Intertemporal Lessons from Athens in Classical Times

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Abstract: In this paper, we mainly focus on two institutional aspects that are related to financial risk, that is, profiteering and the use of non-fraudulent coins when performing financial transactions. We argue that these two prerequisites were important for the success of the commercially oriented economy of the Athenian state in comparison with its allies in the East Mediterranean during the classical period. In particular, we briefly explain the structure of the Athenian economy, and then we focus on the *agoranomoi* and the *dokimastai*, the two main financial institutions related to (i) measures against profiteering and (ii) ensuring the purity of the currency when performing commercial transactions. Then, following a game theoretical approach, we provide a fictional example as to how the two institutions functioned in practice. Our findings confirm that these institutions were crucial in reducing financial risk when performing international commercial transactions, since they provided symmetrical information on the quality and purity of the currencies circulating in the Athenian economy. In the case of the Athenian state, we further convey that measures against profiteering and the use of unadulterated currency comprise intertemporal axioms, in the sense that their importance is not merely a phenomenon of modern times, but rather, on the contrary, one that dates back to much earlier times.

Keywords: financial risk; financial institutions; international commerce; profiteering; non-fraudulent currency; classical Athens

JEL Classification: D81; G28; N23; N43

1. Introduction

In this paper, inspired by the Athenian model of economic organization in classical times (508–323 BCE), we provide further evidence to the international bibliography regarding the main institutional mechanisms introduced by the ancient Athenians for the purpose of managing financial transactions and reducing financial risk, thus establishing their state as the dominant economy of the times in the East Mediterranean, as verified by a multitude of scholars nowadays (here, due to space limitations, we will name only Figueira (1998); Amemiya (2007); Gabrielsen (2014); Bresson (2016a, 2016b); Harris and Lewis (2016); Woolmer (2016); O'Halloran (2018); Bitros et al. (2020); and Economou et al. (2021), but there are many others).

We mainly focus on two institutional mechanisms related to financial risk, that is, the avoidance of market failures and the use of non-fraudulent coins when carrying out local or international financial transactions. In particular, we argue that a key reason for the success of the Athenian economy and the great commercial expansion dynamics it exhibited was, among other things, a combination of market supervision against profiteering and the use of a genuine currency (i.e., non-fraudulent coinage) that was to be circulated throughout the Athenian economy, as well as throughout the economies with which the Athenians were trading in the East Mediterranean.

The modern economic theory and evidence reveals the importance of such institutions to the success (or not) of economic systems in the long run. Regulation, allowing the supply and demand mechanism to work smoothly, and permitting no discrepancies to appear in such profiteering or the use of adulterated currency, provides the foundation of a healthy economic environment. On the other hand, market failures, including profiteering and the use of fraudulent currency, are factors of financial risk. This situation leads to inferior Pareto outcomes that are not efficient from a societal point of view.

North (1990) and Hodgson (2015), among others, argue, from an institutionalist point of view, that markets, in order to flourish, need robust institutions that protect the legal aspect of the transactions between different parties, guaranteeing that the parties are being treated fairly (North 1990; Hodgson 2015). Moreover, Mishkin and Eakings (2015, p. 7), among others, add that financial institutions are what make financial markets work, because without them, financial markets would not be able to move funds from people who save to people who seek productive investment opportunities. According to Arrow (1969), it is for this reason that market failures are often the reason that self-regulatory organizations, governments, or supra-national institutions intervene in a particular market.

Profiteering, that is, economic situations in which individuals pursue self-interest only, is a factor of market failures. Counterfeiting, for its part, can negatively affect a currency's functions as a store of value and as a medium of exchange. It can affect the demand for currency through a loss of confidence in the use of currency, as described by the famous Gresham Law. This can lead to financial risk, since it can erode confidence in the market. Market confidence is weakened if the public perceives there to be a greater risk that they could unknowingly receive a counterfeit as payment (Viles et al. 2015). Counterfeiting, in general, causes substantial financial losses and opportunity costs to businesses worldwide (Martinez and Jaeger 2016). In some (extreme) cases, counterfeiting can even severely destabilize financial systems (Nosal and Wallace 2007).

There are a plethora of cases worldwide that can serve as paradigmatic examples of counterfeiting actions; for example, from the late 1980s until the early 2000s, so-called *Superdollars* were being circulated worldwide, printed by unknown entities. These fake banknotes were almost indiscernible from genuine USD 100 bills. The US government accused, among others, North Korea of producing and passing them off in various countries.¹ Another paradigm is related to a recent (June 2020) attempt to introduce several hundred counterfeit banknotes into the markets of Spain and Romania, which was finally effectively prevented by their prosecuting authorities.²

The methodology in our study follows a theoretical approach supported by a game theoretical analysis. Our methodology is basically theoretical in nature because we are dealing with an ancient economy in which cliometric/statistical data are absent. An empirical analysis on the basis of which to test our hypotheses using tangible statistical data is (unfortunately) impossible to carry out. Thus, in order to explain how the institutions we describe below functioned in practice, we have to rely mainly on the findings of historians, further elaborated through our own synthesis of this evidence, as well as by using game theoretical analysis as a further methodology for the interpretation of this evidence.

Our paper is organized as follows: In Section 2, we provide a brief historical analysis regarding the institutional status of the Athenian economy during the classical times. We perform this analysis since the institutions we describe in Sections 3 and 4 could not have flourished unless a sophisticated (for the era) package of financial institutions was present. In Section 3, we focus on the description of two key institutions that are related to the reduction in financial risks and are greatly involved in the success of the Athenian market, the *agoranomoi* and the *dokimastai*. These institutions were related to the prevention of profiteering and of any other kind of fraud in the market, in combination with performing financial transactions through non-fraudulent coinage.

In Section 4, through a fictional case, which is based on historical evidence, we link these two important institutions with a fictional financial transaction between two merchants, and we analyze how they functioned in practice, as a means of preventing

delinquent behavior regarding market transactions. In particular, we develop a two-player game where mixed equilibria are derived, and indicate that higher payoff for the society as a whole is achieved when institutional mechanisms motivate players to act honestly. Section 5 concludes by arguing that the success of commercial cooperation between two parties can be achieved by auditing institutional mechanisms to minimize the risks of performing financial transactions; we found that this does exist and is present in practice.

Section 5 also provides some proposals that could be useful for economies nowadays that come as an inspiration, which derives from the functioning of the Athenian auditing institutions.

2. The Athenian Economy in Brief

The discussion regarding the status of the ancient Greek economy dates back to the late 19th century when two prominent German historians, Karl Bücher (1847–1930) and Eduard Meyer (1855–1930), started a debate, which, today, is known as the *Bücher–Meyer controversy*. Obviously, due to the limitations of space, it is not our intention to reproduce all this evidence in a literature review, but readers could consult [Tridimas \(2019\)](#), among others. This discussion was revived after WWII, mainly due to the influential works of a series of Marxist-oriented historians, such as Moses [Finley \(1973, 1983\)](#), [Austin and Vidal-Naquet \(1980\)](#), and [de Ste Croix \(1981\)](#). These historians were advocates of the *primitiveness* of the ancient Greek and Roman economies.

However, during the last 30 years, a new and convincing trend towards the *formalist* approaches (re)appeared in the international academic literature, regarding the structure, the institutions, and the organization of ancient economies, focusing on those of ancient Greece and Rome. *Formalists* argued that societies such as those of the ancient Greeks and Romans functioned with their own economic autonomy, in a way that was based on a primitive version of what we characterize as a free market economy nowadays. They further argue that modern concepts, such as rational choice and utility maximization, were present in these economies, similarly to nowadays (see, for example, [O'Halloran 2018](#)). Formalist approaches include methodological concepts, such as *new institutional economics*, which, according to [Lyttekens \(2013\)](#), is a very efficient methodology to interpret ancient history. This includes not only the economic history of ancient Greece (by focusing mainly on the history of Athens), but also the history of Rome (see, among others, [Temin \(2012\)](#) and [Verboven \(2021\)](#)). This new trend, which is supported by eminent historians, economists, and political scientists, has almost prevailed in the literature in the last 30 years, and has significantly refuted the older Finleyan approaches.

Due to the limited space in the analysis that follows in this section, we can only retrieve a part of such evidence and argumentation. However, this discussion, regarding the *primitivist* vs. modern or *formalist* characteristics of the ancient Greek economy, is important to the analysis that follows, since, as argued in the Introduction, the kind of institutions we describe in Section 3 could not have flourished unless a sophisticated (for the era) package of financial institutions was present.

To be more precise, [Amemiya \(2007\)](#); [Lyttekens \(2013\)](#); [Bresson \(2016a, 2016b\)](#); and [Bitros et al. \(2020\)](#), among other authors, analyzed the structure of the institutions and markets in the Athenian economy (mainly), while [Bresson \(2016a, 2016b\)](#); [O'Halloran \(2018\)](#); and [Bitros et al. \(2020\)](#) shed more light on the critical issue that, in actuality, the Athenian economy functioned as a primitive version of a market type of an economy where institutions such as public magistrates, who protected the market against profiteering, known as the *agoranomoi*, did truly exist. [Bitros and Karayannis \(2008\)](#) further analyzed the related issue of entrepreneurship in Athens, under free market economy principles. [Economou and Kyriazis \(2017, 2019a, 2019b\)](#) argued that an efficient regime of property rights protection and protection of commercial contracts, through established law, juries, and courts, did function very well in classical Athens and later on. Of course, there is an intertemporal axiom that property rights protection is a very important prerequisite, enabling commercial transactions to become credible ([Hodgson 2015](#)). [Ober \(2008\)](#) adds

that this attitude in Athens effectively reduced transactional costs under a Coasian logic. In addition, E. Cohen (1992), in his seminal book *The Athenian Economy and Society: A Banking Perspective*, exhaustively analyzed the sophisticated way in which banks functioned in classical Athens. The Athenians had established, among others, the following banking service institutions (also see Bitros et al. 2020, p. 110). They performed the following tasks:

- Exchanged coins and foreign currencies;
- Accepted deposits and carried out payments on behalf of their customers;
- Extended loans to various business operations, including bottomry loans in shipping, and even financing of consumer credit;
- Provided sureties, negotiated claims, and offered guarantees and personal advice to important customers;
- Accepted documents and valuables for safekeeping;
- Facilitated export–import activities by settling payments among importers from, and exporters to, merchants abroad.

At its peak, the banking industry numbered not less than 30 bankers, such as the famous case of Passio (Cohen 1992, p. 31; Bitros et al. 2020). Cohen (1992), and Homer and Sylla (2005), among others, provide various known cases of given loans. The ordinary interest rate for someone who borrowed money from a bank varied between 12 and 18%. There were also cases of even lower interest rates. Loans contracted at an interest rate of 10% were considered to be very favorable for the borrower. Financially riskier maritime loans were also offered. Acton (2014, pp. 252–53) writes that contracts specified the route and timing, and interest was charged according to the length of the ship’s voyage and the level of danger inhibited, which often depended on the time of year. Those merchants, when they needed to take loans to finance such activities, paid higher interest rates, from 15 to 35%, depending on the degree of risk of a voyage (cargo with or without a return trip, etc.). In exceptional cases, interest rates increased to as high as 100% (Schefold 2011; Bitros et al. 2020). A typical two- to three-month journey, such as from Athens to the Bosphorus and back, was accompanied by an interest rate of 20–30%, while a shorter, one-way voyage, such as from Sestos (an ancient city in Thrace) to Athens, might be worth 12.5% (Acton 2014, pp. 252–53).

The above evidence reveals an intertemporal axiom that was also applied in the cases of Athens and its allies. The level of interest rate was directly and strongly related to the level of financial risk of these loans; for example, a risky voyage, which entailed uncertainties and dangers, such as the ship being attacked by pirates or facing a storm on the high seas, with the danger of losing the cargo, entailed much higher interest rates.

Amemiya (2007) and Acton (2014) provided evidence regarding insurance services that were linked to the loans provided by the banks, for performing efficient international commercial transactions. In other words, to reduce the financial risks of maritime trade, the Athenians introduced insurance, similarly to many other wealthy maritime societies of later times, such as Venice during the Middle Ages, and the United Provinces (Dutch Republic) and England in early modern Europe (1549–1789 AD).

Acton (2014) and Gabrielsen (2014), among others, provide evidence regarding the existence of a primitive version of Athenian joint stock companies. These companies were important for the promotion of very extensive international commercial transactions between the city-state of Athens and other states, and, of course, among Athens and its more than 316 allies in the Delian League during the classical period (Figueira 1998). Bitros et al. (2020) and Economou et al. (2021) analyze how decisions on public finance and public spending were taken by the two most important Athenian policymaking institutions, the Athenian Assembly of citizens (known as *Ecclesia*) and the *Council of the Five Hundred* (known as *Boule*). Economou and Kyriazis (2019a) argue that the process of the transformation of the Athenian economy from an agrarian into a maritime economy, during the classical period, also led to “industrialization” in a variety of areas, such as the development of primitive versions of small industries, with some examples being metalwork, the shipping industry, silver mining, ceramics, carpentry, paints, fabric, etc.

All these transformational procedures rendered Athens the first economy in history in which “services” and “industrial” (handicrafts) sectors contributed more to (what we nowadays call) GDP than agriculture (Kyriazis and Michael 2004; Halkos and Nicholas 2010; Economou and Kyriazis 2019b).

Arguably, the discussion regarding the achievements of the Athenian economy is also related to the issue of economic growth. Even though there are no cliometric data available, authors such as Bergh and Lyttkens (2011); Ober (2015); Harris and Lewis (2016); Carugati et al. (2019); Economou and Kyriazis (2019a); and Bitros et al. (2020), using different methodologies, have convincingly argued that economic growth was achieved in Athens, at least during the periods of the famous political figures of Pericles in the 5th century BCE, and Eubulus and Lycurgus during the 4th.

The above references consist only a small part of the international bibliography in the last 30 years that revisits the older, though influential, views of M. Finley and his followers, regarding the *primitiveness* of the ancient Greek (by mainly focusing on the Athenian) economy; for example, Mackil (2013, p. 238) characteristically writes that ‘Finley’s model has been gradually discredited by specific arguments, and that historians now have begun to return to questions of political economy and the intervention of states in economic activities’. Moreover, Harris and Lewis (2016, p. 8), among others, add the following:

‘In the past fifteen years, however, some ancient historians have shown a willingness to pay more attention to the role of markets in the economy of the ancient Greek polis’.

3. The *agoranomoi*, the *dokimastai* and the Issue of Using Non-Fraudulent Currency

In this section, we argue that a key reason for the success of the Athenian economy and the great commercial expansion dynamics it exhibited was, among others, a combination of two qualitative elements—market supervision against profiteering, and using genuine, non-fraudulent currency to be circulated in the Athenian economy and in parallel with the economies with which the Athenians were trading.

As was already mentioned, profiteering is related to market failures, which are related to financial risks, and is often the reason that governments intervene in a particular market, so as to remedy this critical discrepancy. This is exactly what happened with the case of the institution of the *agoranomoi* in ancient Greece and in classical Athens in particular. The *agoranomoi* (in singular, *agoranomos*) was a group of public magistrates responsible for supervising the Athenian market, the so-called *Agora*, ensuring, among other duties, that the prices of the goods in the market were not excessive and, in general, for securing the smooth functioning of the market. Opportunistic price increases, through market manipulation or exploitation of sudden changes in supply and demand, were considered unfair and abusive by consumers. In cases of treachery or attempts to sell fraudulent products, the *agoranomoi*, who caught those sellers on the spot, imposed heavy fines on them through their own initiative and judgement, after, in many cases, also hearing complaints from consumers who believed that they had been cheated in some way; for example, that they had been sold adulterated or defective goods (Lanni 2018, p. 63).

Thus, heavy fines were imposed on those merchants who were trying to benefit themselves through profiteering. The *agoranomoi* had to ensure that the quality of the products that were circulating in the market met their specifications (Amemiya 2007; Ober 2008, p. 253; Fröhlich 2013, p. 258; Bresson 2016a; O’Halloran 2018, p. 273; Rahyab 2019; Bitros et al. 2020). The *agoranomoi* further solved disputes among merchants or between buyers and sellers in the market. Moreover, this intervention, according to Harris and Lewis (2016, p. 30), ensured that transactions were free of fear of violence or intimidation. The intervention of the *agoranomoi* also lowered what we know as *transactional costs* nowadays (Ober 2008, pp. 106–8). It also lowered *information asymmetries* during the transactions (Bresson 2016a).

The office to which the *agoranomoi* belonged, known as the Athenian *Agoronomia* (literally meaning ‘market police’), was located in the so-called *Stoa of Zeus*, near to the

Poikille Stoa and the *Basileios Stoa* on the east side of the famous Athenian Agora, and, more specifically, on the hill of the *Agoraios Kolonos*. According to the Athenian laws, in order to perform commercial activity, each seller of goods in the market was obliged to use a special scale that he had to procure or hire from the *Agoranomia*, with which he would weigh the goods in front of his/her customers, so that cases of fraud were avoided. Special scales bore the official stamp, with a seal of the state on them (Elliott 2018, p. 9; Bitros et al. 2020). In passage 24.112 of his work *Against Timocrates*, Demosthenes informs us that when an *agoranomos* had no experience, or he was ignorant regarding an issue concerning his post, or was found guilty of theft, he was punished, but with not a very severe penalty (Demosthenes 1939).

It is obvious that, thanks to the supervisory role of the *agoranomoi*, transactions between two or more parties could take place without the fear of financial loss for any party, due to a possible attempt by one member of the transaction to defraud the other. Furthermore, the supervisory role of the *agoranomoi* reduced the financial risks not only between two parties, but also in favor of the financial system of the Athenian city-state as a whole, in which a multitude of transactions were taking place. This means that through their intervention in the market, information asymmetries regarding real prices in the market, as well as the purity of the currency, were significantly diminished, to the benefit of the consumers as a whole.

As a final comment, the importance of the *agoranomoi* as an institution can be also deduced by the fact that other states introduced them too, and their existence is also attested for the Hellenistic period (323–146 BCE). Mackil (2013, pp. 268–69), who wrote an important book regarding ancient Greek federalism, with the title *The Greek Koinon*, has argued that the *agoranomoi* were widely attested throughout the Greek world, from the fourth century onwards. Economou (2020) conveys this by providing evidence that is focused exclusively on the Achaean League, a federal state in the Peloponnese (South Greece). Manning (2012) and Mackil (2013) provide further evidence for the Ptolemaic Kingdom of Egypt. Rahyab (2019) further conveys the existence of the *agoranomoi* throughout the areas of Greek influence (such as Anatolia and Egypt), even if this institution did not function in exactly the same way in each of these areas.

Regarding the second important prerequisite that our paper deals with, using pure currency in the market, it is important to bear in mind that no fraudulent coins were allowed to be circulated in the Athenian economy. In particular, a special law, known as Nicophon's Law, was introduced in 375/4 BCE, by the name of its initiator in the Athenian Assembly of citizens, which, among other things, required that all foreign-made imitations of the Athenian drachma that were found with a lower silver content, or that had a bronze or lead core, had to be confiscated immediately from the market, then cut, and their metal was then dedicated to a special temple, which also functioned as a state treasury, the so-called *Treasury-Temple of the Mother of Gods*. However, good imitations of Athenian drachmae, made by mints from other states, could be circulated in the city of Athens. Furthermore, other "national" currencies issued from other city-states, such as Aegina or Corinth, could also be circulated in the Athenian economy, providing that they were not fraudulent, that is, they contained the proper quantity of silver or gold (Figueira 1998; Bitros et al. 2020; Economou et al. 2021).

To implement Nicophon's Law, two public slaves were introduced, known as *dokimastai* ('testers'—in singular, the *dokimastes*), who had a bench in the Agora of Athens and at the harbor of Piraeus, and examined whether foreign currencies were fraudulent. Their tasks were related to great responsibilities and had direct effects on the lives of citizens. An earlier version of the institution of the *dokimastai* was dated back to 398/7 (Stroud 1974, pp. 166–67, 176–77).

In passage 24.212 of his work *Against Timocrates*, Demosthenes further argues that whoever tried to promote fraudulent coins in the market was put to death by law, which was the most severe penalty in the Athenian state. This actually implies that the Athenians had understood the importance of not using fraudulent currency because this would have

caused serious malfunctions, such as the disorganization of the Athenian market, and the erosion of the character of the twin city of Athens and Piraeus as the greatest commercial center in the East Mediterranean during the classical period. Additionally, since this privilege of the Athenians was directly related to their overall welfare and progress, anyone who tried to undermine this achievement deserved, according to their mentality, the worst and most severe punishment of all, death.

The rationale behind the protective law of Nicophon lies, according to Ober (2008, p. 233), in the very essence of the famous Gresham's Law. It appears that the perception of the importance of protecting the credibility of the currency was so ingrained in the Athenians that even a comedian, the famous Aristophanes, strongly criticized the phenomenon of fraudulent and debased coins that was observed in his era during the Peloponnesian war, even if this was only a temporal phenomenon that only appeared due to the extraordinary circumstances that Athens faced during the war. In verses 718–724 of his work *Frogs*, Aristophanes wrote the following:

‘Many times, it seems to us the city has done the same thing with the best and the brightest of its citizens as with the old coinage and the new gold currency. For these, not counterfeit at all, but the finest it seems of all coins, and the only ones of the proper stamp, of resounding metal amongst Greeks and foreigners everywhere, we never use but the inferior bronze ones instead, minted just yesterday or the day before with the basest stamp’ (Aristophanes 1994).

There is no doubt that, due to the economic financial institutions, as mentioned in Section 2, as well as the *agoranomoi* and the *dokimastai*, a very productive and extensive commercial network was established, with Piraeus functioning, according to Cohen (1992, p. 141) and others, as an international entrepot of her times, as was Alexandria during the Hellenistic period, Amsterdam during the 17th century AD, and, among others, Hong Kong, Shanghai and Rotterdam nowadays. The Delian League functioned during 478–404 BCE. Except the geostrategic military aspect of the alliance, Athens, the leader of this alliance, actually also managed to integrate a large part of the East Mediterranean region into an ad hoc unified area of economic cooperation, where a network of parallel currencies was established, where the famous Athenian *drachma* was the dominant currency among other competitive coins, such as the Aeginetan *stater* (Figueira 1998; Bresson 2016b; Harris and Lewis 2016; Woolmer 2016; Bitros et al. 2020; Economou et al. 2021). This means that the Athenian drachma functioned somewhat similarly to the ‘dollar of the classical times’.

Bitros et al. (2020); Bitros (2021); and Economou et al. (2021) argue that, essentially, the international success of the Athenian currency should be attributed, among other things, to the following three main reasons: (i) the perfect quality of its construction; (ii) keeping the *seigniorage* charge at a relatively low cost of 5% or 8%, according to the case; (iii) achieving economies of scale in the fabrication of these coins. O'Halloran (2018, p. 130) adds that the widespread usage of owls by Athens and its allies created an enormous conglomeration of interdependent markets that led to regional economic integration, with Athens being the paramount commercial metropolis among them. In his work *Panegyricus*, in verses 4.42, Isocrates proudly proclaimed that there was no good produced anywhere in the world that could not be found in the port of Athens (Isocrates 1980). Similar views were expressed by other ancient authors too, such as Thucydides (1993) in passage 2.38 of his *Histories*, Plato (1969) in passages 2.370e to 2.371a in the *Republic*, and Polybius (1972) in passage 4.38.9 of his *Histories*. The existence of such a unified economic area is described by further modern authors, such as Jarde [1926] (Jarde [1926] 1996, p. 255), who wrote the following:

‘When a single city exercised hegemony over a whole group it was careful to obtain, by persuasion or force, the adoption of its own means. Thus the Attic system became that of the whole maritime confederacy. Money, in the same way, acquired an international value Each city had its mint which struck coins bearing the emblem of the city. But, as in the case of weights and measures, there was a movement towards unification Above all the importance assumed by the trade of certain cities and the good alloy of their currency caused certain

coins to be accepted in every market. The money of Aegina, Corinth, Phocaea, Cyzicus and Lampsacos had international value’

Now, after having analyzed the crucial role of the *agoranomoi* and the *dokimastai* in making the Athenian economy the dominant economy in the East Mediterranean, in the following section, we provide a fictional example of how these two institutions functioned in practice.

4. A Fictional Scenario of International Commerce in Classical Greek Antiquity

At this point, in order to exhibit the importance of the *dokimastai*, regarding the promotion of international commerce, we relate this institution to that of the *agoranomoi* through a fictional paradigm between two merchants, Artemios of Piraeus, and Nikolaos, a merchant from Syracuse.

Nikolaos is an architect in Syracuse and has been assigned to construct a new luxurious house for a rich merchant in Syracuse, Hermogenes, whose intention is to build the new house and offer it as dowry for his beloved daughter Irene’s forthcoming marriage. Hermogenes wishes to please his daughter and her prospective husband, and, for this purpose, he is determined to build the house with the best quality materials of the time. He also wishes to decorate the house beautifully. Thus, he asks for Nikolaos, an experienced architect, to handle this. Nikolaos responds that, among other things, high-quality marble is required and the most famous is the Athenian marble from Mt. Pentelikon, from which the Parthenon of the Acropolis was also built in the past. However, it is also expensive. Hermogenes agrees and asks for Nikolaos to buy the required quantity of marble.

Nikolaos then travels to Piraeus and finds Artemios of Piraeus, one of the most competent businessmen in Athens, famous for his capabilities of satisfying his clients. Nikolaos meets Artemios, and they agree on a transaction for a specific quantity of marble, and the price is to be paid in Syracuse *tetradrachms*. However, for an unknown reason, neither Artemios nor Nikolaos trust each other. Nikolaos has fears that the quality of the marble is not the proper quality. If it was not, he would return to Syracuse and he could not please his employer. On the other hand, Artemios does not trust the purity of the currency that Nikolaos brings with him on behalf of Hermogenes.

At this point, the financial risk between the two parties is quite high. Thus, they first apply to an *agoranomos* and then to a *dokimastes*. Being asked by Artemios and Nikolaos, one of the *agoranomoi*, with the aid of a connoisseur hired by the state, confirms the high quality of the marble. Being satisfied, Nikolaos then agrees to finish the transaction by paying Artemios. However, the latter denies payment unless the purity of the currency is confirmed by a *dokimastes*. This is performed by a *dokimastes*. The currency is found to be of the proper silver content, and then Artemios is also happy and he agrees to finish the transaction. The intervention of the two state institutions was the means by which the risk regarding the transaction of the two parties was almost neutralized.

Nikolaos and Artemios now become friends and trust each other. In fact, Artemios decides to offer a meal to Nikolaos at a famous *kapileion* (restaurant) in Athens, located in the Agora, just below the Acropolis, known as Athenais. There, they have a good time tasting nice seafood and amazing wines from the international markets of the Aegean, and delicious and juicy wines from Samos and Chios.³ Nikolaos, being excited by the character and the integrity of Artemios, trusts him and assures him that he wishes to establish a long-term cooperation with him and his firm⁴. Furthermore, he will introduce him to all the architects and contractors of Syracuse, a privilege for him, since Syracuse is a very populous and prosperous polis, a mega-polis of its times, similarly to Athens. Thus, perhaps, new orders for building materials for the firm of Artemios may come from abroad in the next period. Artemios, on his side, is also very satisfied with Nikolaos’ initiative to introduce him to the other architects in Syracuse.

5. Commerce and Financial Risk. Preferring Fairness than Cheating. A Game Theoretical Approach

The fictional example that was described in Section 4 is also related to the discussion of another important market failure, which is *asymmetry of information*, as defined by Akerlof (1970) in his seminal paper, *The Market for 'Lemons'*, as well as by other authors (Tirole 2017, pp. 117, 120–21). Before applying to both the *agoranomoi* and the *dokimastai*, neither Artemios nor Nikolaos had any information regarding the quality and purity of the currency, and the character of the market participants. This, of course, posed a high financial risk to both traders.

Thus, what we argue here is that the Athenian institutional setup was successful in the following two particular directions: through its auditing institutions, it gave symmetrical information on the quality and purity of the different currencies, and information on the character of the market participants, if they were honest or dishonest. Artemios does not know if the foreign currency is good and Nikolaos does not know if the construction materials he was about to buy were of the proper quality. This problem is solved as soon as both parties apply to both the *agoranomoi* and the *dokimastai*. After the evaluation of the latter, the information of the former becomes symmetrical and the financial risk they both face significantly reduces (or is even nullified in the ideal scenario).

This argumentation is further elaborated with the following game theoretical approach. In Table 1, we present four scenarios of 'cheat' and 'fair game' between Artemios and Nikolaos, followed by their payoffs in each case.

Table 1. Payoffs of Nikolaos under alternative strategies.

			Artemios	
Nikolaos			Strategy D (y)	Strategy E (1-y)
	Strategy A	(x ₁)	35	30
	Strategy B	(x ₂)	30	40
	Strategy C	(x ₃)	40	25

Nikolaos, who holds the money, could either use half of the money of good quality and half of the money of bad quality (strategy A), all the money of bad quality (strategy B), or all the money of good quality (strategy C). The numbers in Table 1 represent the payoff for Nikolaos. We suppose that the maximum utility that can be achieved by this game equals 100, as is used in these types of strategic games. Let us denote, with x_1 , the probability that Nikolaos follows strategy A. Moreover, x_2 would be the probability that Nikolaos follows strategy B, while x_3 the probability that Nikolaos follows strategy C. It should be noted that $x_1 + x_2 + x_3 = 1$.

On the other hand, Artemios, who holds the marble, could either give Nikolaos marble of good quality (strategy D) or of bad quality (strategy E). Let us denote, with $0 < y < 1$, the probability that Artemios follows strategy D, whereas $1-y$ is the probability that he follows strategy E.

The expected payoffs for Artemios, given the strategies of Nikolaos, are as follows:

$$V(\text{Art}, A) = 35y + 30(1 - y) = 30 + 5y \quad (1)$$

$$V(\text{Art}, B) = 30y + 40(1 - y) = 40 - 10y \quad (2)$$

$$V(\text{Art}, C) = 40y + 25(1 - y) = 25 + 15y \quad (3)$$

If one wished to make a graphical representation of strategies A, B, and C of Nikolaos, it would be made by setting $y = 0$ and $y = 1$, and the derived lines could be used in order to discern the *minimax point* (the minimum of the maxima), which would be given by the crossing point of the lines that represent strategies B and C. Therefore, strategy A would

no longer be needed for finding the solution of the game, as Nikolaos would never use this. So, the following applies:

$$V(\text{Art}, B) = V(\text{Art}, C) = 40 - 10y = 25 + 15y. \text{ Therefore } y = 0.6. \quad (4)$$

Thereby, the mixed strategy of Artemios is (0.6, 0, 0.4, 0).

By replacing $y = 0.6$ with either $V(\text{Art}, B)$ or $V(\text{Art}, C)$, it can be derived that Nikolaos will acquire a payoff that is equal to 34% of the total payoff from the transaction. It can easily be found that Artemios will obtain the remainder of the total payoff, which is equal to 66% of the total payoff from the transaction.

The optimal mixed strategy for Nikolaos (as a maximin point) is as follows:

$$V(\text{Nik}, D) = V(\text{Nik}, E) = 30x + 40(1 - x) = 40x + 25(1 - x) \text{ so } x = 0.6 \quad (5)$$

Consequently, the mixed strategy of Nikolaos is (0, 0, 0.6, 0.4). By replacing $x = 0.6$ with $V(\text{Nik}, D)$ or $V(\text{Nik}, E)$, it is, once again, calculated that $V = 34$.

Thereby, this mixed strategy game has no unique Nash equilibrium, but leads to the optimal solution where Nikolaos takes 34% of the maximum utility of the transaction, while Artemios takes 66%. These payoffs represent the weighted average of the potential payoffs, derived from the possible strategies undertaken by both players when the optimal responses to the other player's strategy are employed. Thereby, given that Nikolaos and Artemios have set their reaction factors, as indicated by their best interests given by the possible outcomes, these factors are replaced by their utility functions, and their weighted optimal payoffs (in the form of utility) are calculated. As the total utility of the game is supposed to equal 100, we exhibit that one player takes 1/3 of the utility and the second player takes two thirds of the utility. This solution is reached after the dominated strategies have been deleted, and maximization of the utility has taken place by graphical and numerical methods.

Based on the above, it can be argued that the inclusion of the scenario about mitigating risk due to the institutions of *agoranomoi* and *dokimastai* is beneficial for the society as a whole, as it serves to create higher overall wealth that can be achieved by mixed strategies. This is valid, as the honesty perspective for both players is reinforced due to the existence of auditing mechanisms. The existence of such mechanisms gives higher possibilities of both players being honest. Thereby, the optimal positive outcome for the economy as a whole is significantly more feasible. Such a situation obviously benefits society as a whole, since such institutions are supportive of what [Tirole \(2017\)](#) characterizes as the 'common good'.

What is also important is that it appears that through institutions such as the *agoranomoi* and the *dokimastai*, the Athenian economic system, during its historical heyday, had managed to create the conditions for policymaking to be carried out by citizens who, as a general trend, were 'educated' by the functioning of the institutions themselves to behave through a 'generalized morality', according to [Tabellini's \(Tabellini 2008\)](#) perspective, that is, the ethical attitudes and beliefs of people about how to interact with each other, beyond their family and kinship or social group. On this issue, [James \(2015\)](#) presents an empirical examination of the relationship between the public morality of people and economic growth, and he finds a positive relationship between the two. It, of course, also applies that if such values of 'generalized morality' are absent, this is detrimental for a society, since phenomena such as corruption, graft, and bribery may appear, which are further linked to economic inefficiencies. Additionally, as [North \(1990, p. 33\)](#) argues, from an institutionalist point of view, achieving a state of ethical behavior in a society also reduces transaction costs, thus laying the foundations for economic growth.

Two further aspects of the success of these two Athenian key market auditing institutions are directly related to the following two facts: The first has to do with the immediate punishment of a merchant or citizen who behaved illegally; the *agoranomoi* were public magistrates, who were authorized by the state authorities to impose fines on illegal financial/commercial transactions on the spot. The *dokimastai*, also being public magistrates,

were authorized to immediately confiscate any fraudulent form of currency that they found through their inspections. We believe that these immediate procedures of punishment were an important factor in discouraging illegal commercial activities in the market, since the punishment was severe. Secondly, as mentioned in Section 3, according to the Athenian law, any forger who tried to distribute fraudulent coins in the market was punished by death, the most severe punishment of all. This was obviously a very discouraging factor to those who planned to make illegal profit through injecting fraudulent currency into the market.

In fact, according to our view, the above two elements, immediate punishment and increasing the degree of punishment, also come as practical and intertemporal proposals from Athens, in the classical times, to current policymakers worldwide, as a means of deterring those who try to undermine global markets through profiteering or selling fraudulent products, or illegally trying to inject large (or even small) amounts of fraudulent currency into global markets to make illegal profit.

Furthermore, there is no homogeneous system of law regarding punishing such illegal activities at the global level nowadays. The penalties that are imposed to legal frauds are quite different; for example, we indicatively mention that in the USA, the penalties for creating and injecting counterfeit money into the market include 20 years of imprisonment, with a fine with or in lieu of imprisonment, whereas in the UK, the penalty is 10 years, with a fine with or in lieu of imprisonment.⁵ We believe that to achieve a more homogeneous system at the international level, further cooperation is needed among governments in these areas.

6. Conclusions

In this study, we have undertaken the strenuous task of investigating the interaction between two important financial institutions that proved to be crucial for the success of the internationally oriented Athenian commercial strategy, the *agoranomoi* and the *dokimastai*.

Based on the findings of prominent historians, referred to at appropriate points in Sections 2 and 3, and through a fictional scenario that we developed in Section 4, we simulated a typical commercial transaction in Athens during the classical period, which, in our case, included two trading parties, the fictional characters of Nikolaos and Artemios, and the presence of two state auditing mechanisms, the *agoranomoi* and the *dokimastai*. Finally, in Section 5, we also employed a mixed strategy game that examined the case of honesty, semi-honesty, and dishonesty during this kind of transaction.

Our study leads to some specific conclusions that we believe are of scientific value. We argue that the Athenian institutional setup, through its auditing institutions, proved to be successful in the following directions: Firstly, we know that the existence of robust auditing institutions, so as to ensure transparency while performing financial transactions, is widely accepted nowadays as a basic prerequisite for the establishment of a healthy international commercial environment. The modern economic theory and evidence reveals that the existence and the efficient functioning, in practice, of auditing institutions against profiteering, and for ensuring that only pure currency is circulated in the market, is an important prerequisite that can guarantee the success of an economic system in the long run. In this paper, we argue that such an axiom is not only a concept of modern times, but, on the contrary, has an intertemporal nature, since it has origins in Greek antiquity. Thus, such an axiom has an intertemporal historical orientation.

Secondly, a key element of the success of these two Athenian institutions is that they provided *symmetrical* information on the quality and purity of the different currencies, and on the character of the market participants, if they were honest or dishonest. This was important so that transactions between two or more parties could not cause financial losses for any party, due to a possible attempt by one member of the transaction to defraud the other. The supervisory role of the *agoranomoi* reduced the financial risks not only between two parties, but also regarding the Athenian financial system as a whole, in which a multitude of transactions were taking place.

Thirdly, through the game theoretical approach we performed, we argued that the institutions of the *agoranomoi* and the *dokimastai* enhanced the economy to reach a socially optimum level that better served the interests of the society as a whole. This happens because these institutions motivated both players to act honestly. Thereby, the mixed equilibria that we have calculated, based on the best-response parameters that were estimated according to the game structure, represent high utility for each individual, in comparison with the maximum utility that one player could achieve. Moreover, a higher potential payoff can be achieved for the overall economy in relation to a hypothetical game where the *agoranomoi* and *dokimastai* interventions would not be available options, and this would lead to a smaller space for mixed strategies.

The current practical utility from the Athenian auditing institutions, as described in this paper, that could come as an inspiration for policymakers nowadays lies in the three following directions: (i) immediate punishments to those who attempt to undermine global markets through profiteering, selling fraudulent products, or illegally trying to inject large (or even small) amounts of fraudulent currency into global markets; (ii) imposing much heavier punishments for those illegal activities, as described by (i); (iii) further international cooperation among governments, to achieve a more homogeneous system of surveillance against the illegal activities, as mentioned in (i).

There were, of course, some limitations regarding this particular research. The most important was the absence of cliometric data, but this applies not only for classical Athens, but also for every other ancient economy in general. In this case, we could only rely on the findings of history by using them cautiously, through interpretative tools from disciplines such as financial history and historical political economy, as well as game theory, as our paper does.

As a final comment, we hope that the methodology we follow in this paper, which combines financial history, issues of risk while performing financial transactions, and game theory as an interpretative tool for financial transactions, will further stimulate the interest of the academic community on related issues.

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Notes

- ¹ <https://www.uscurrency.gov/media/news/federal-reserve-announces-day-issue-redesigned-100-note> (accessed: 25 July 2021).
- ² <https://www.europol.europa.eu/newsroom/news/counterfeit-currencies-worth-millions-of-euros-prevented-entering-eu-economy-in-romania-and-spain> (accessed: 25 July 2021).
- ³ For the confirmed existence of restaurants in Classical Athens see Davidson (1997).
- ⁴ Efficient cooperation mechanisms based on trust are necessary for the efficient function of modern firms and business associations (Fink and Kessler 2010). Among others, trust itself is a coordination mechanism that lowers transaction costs between firms (Adler 2001).
- ⁵ <https://www.law.cornell.edu/uscode/text/18/471> and <https://www.legislation.gov.uk/ukpga/1981/45/section/22> (accessed: 22 July 2021).

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