

The Empire Strikes Coins: Islamic Conquests, Iconoclasm and Debasement in Byzantium, 650-900 CE*

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Abstract

The present paper is concerned with monetary developments in Byzantium between 650 and 900 CE. Our main aim is to throw a light on the political economy of local debasements of the Byzantine gold currency (the solidus-nomisma). We elaborate an empirical picture of how the fineness of gold coins issued by several provincial mints were affected by politico-economic developments. In doing so, we exploit the recent advances in the field of numismatic metrology regarding the analysis of the chemical composition of Byzantine coinage, treating coins as data sources which can provide a lot of information about their politico-economic background. For our empirical approach we have created a dataset with time series data covering 250 years, including variables like the fineness of gold coins struck at various mints, the estimated extent of Byzantine imperial territory, sea power, dummy variables for violent regime change, civil wars, dynastic transitions etc.; Although the results are still preliminary, they provide confirmatory evidence for a mainly fiscal motivation to debase the gold currency.

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Keywords Monetary economic history · Government and monetary system · Byzantine Empire · Coinage debasement

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1 Introduction

O holy lord, God raised you to the imperial office and by His grace made you a god on earth—so to speak—to make and to do what you will. [...] Do not wish to exploit your city, the lands outside it which are under your power, or the army, but rather be a father to all and they shall serve you with good will. [...] Do not let your soldiers take second place in being paid, and so, too, the senators and the citizens. [...] The lands under your power will not welcome daily tax increases and surprises, strange and novel programs. But they shall not be rebelling against you but rather be serving you wholeheartedly if they [just] pay the yearly taxes to the treasury to the extent they are able. (Kekaumenos, Oration of Admonition to an Emperor, c. 1078 CE)

“The Byzantine Empire, from its foundation by Constantine the Great on Monday, 11 May 330, to its conquest by the Ottoman Sultan Mehmet II on Tuesday, 29 May 1453, lasted for a total of 1,123 years and 18 days—a period of time comfortably longer than that which separates us from the Norman conquest of England in 1066” (Norwich, 1998, xxxvii). Because of its long history the Byzantine, or, more precisely, East Roman, Empire is an ideal subject for research into the *longue durée* of political economy.

When the Western Roman Empire faded away in 476, its eastern counterpart remained the sole heir to ancient civilization. During its lifespan Byzantium suffered many setbacks, territorial losses and catastrophes. Yet it was almost always able to turn the tables even in times of severest crisis and gravest danger. Based on three pillars—Orthodox Christianity, Greek culture and Roman administration—, it was characterised by a remarkable conservatism but at the same time a striking ability to reform its state structures and to adapt to new circumstances.

The effectiveness of Byzantine institutions is attested by the fact that many of them institutions were absorbed or copied by others: The Umayyad caliphate imitated both state structures and processes of their imperial rival in developing what would ultimately become a distinct Islamic civilization: “Byzantine influence in the realm of administrative and economic life was reflected in the retention of the Byzantine civil service and the reliance on Byzantine administrative, legal, and numismatic traditions—and even in language, as Greek continued to be used in state registers. Byzantine standards of weight and measures also survived. Thus the administrative patterns and the political framework that were chosen by the Umayyads were Byzantine in origin” (Cheikh, 2004, 55). The Norman rulers of southern Italy and the Germanic kings of the House of Hohenstaufen acquainted Western Europe with the Byzantine administrative institutions the earlier Arab conquerors had left mainly intact (Lilie, 2007, 147).

Some Byzantine institutions in fact still exist. The former Byzantine capital is still the seat of the Ecumenical Patriarch of Constantinople—meanwhile the 226th in direct succession—even 558 years after the death of the last Byzantine Emperor Constantine XI Palaiologos on the ramparts of his ancient capital. Indeed Constantinople was not renamed Istanbul right after the Ottoman conquest, but continued to be commonly called by its ancient name, al-Qustantiniyah in Arabic, until the year 1930.¹

The thousand-year history of the Byzantine Empire is a story of a civilization constantly devising innovative recipes for survival, many of which can still inspire the modern observer. It does therefore perhaps surprise that Byzantium, for most parts of its history, had an atrocious press in the West. Rivalry between the Eastern Empire and the mostly Germanic successors to the Western Empire often expressed itself in negative characterizations of ‘the other.’ Given centuries of cultural and linguistic alienation it is no wonder then that later

¹The modern Turkish name Istanbul is actually derived from the Greek phrase for “(in)to the city” (*eis ten polin*).

writers, who never sailed to Byzantium to get a first-hand experience, would heap scorn on the Byzantines:

Of that Byzantine Empire the universal verdict of history is that it constitutes, without a single exception, the most thoroughly base and despicable form that civilisation has yet assumed. There has been no other enduring civilisation so absolutely destitute of all forms and elements of greatness, and none to which the epithet *mean* may be so emphatically applied. [...] The history of the empire is a monotonous story of the intrigues of priests, eunuchs, and women, of poisonings, of conspiracies, of uniform ingratitude, of perpetual fratricides. [...] At last the Mohammedan invasion terminated to long decrepitude of the Eastern Empire. (Lecky, 1869, 2;13 f.)

One who was contributed to the Byzantines' bad press as probably no other is the famous English Enlightenment historian Edward Gibbon. In his monumental *History of the Decline and Fall of the Roman Empire*—long time considered the most important work on Roman history—he damned Byzantium as a Grecian demesne, ruled by a degenerate race of “feeble princes of Constantinople” (Gibbon, 1831, iv f.). Corrupted by civilization, the Greeks under Roman rule had made the mistake, in Gibbon's eyes, to reject Roman martial virtues and to remain effeminate faultfinders, having “too much taste to relinquish their language, and too much vanity to adopt foreign institutions” (Gibbon, 1831, 23). As he saw it, for more than a thousand years they populated a decaying empire which was shrinking continuously around them, still nourishing their ancestors' contempt of the barbarians when the latter were battering at the gates. Faced with the inevitable demise of their civilization, the decadent Byzantines managed to delay the end not by valiant bravery but only by barricading themselves up in their capital Constantinople and buying off their enemies.

Perhaps Gibbon's long shadow explains why the political economy of Byzantium does not attract the attention it deserves. The adjective 'Byzantine' still holds connotations of tortuous complicatedness and convoluted trickiness. To many Byzantium is still quity simply some empire which existed in the dark age between antiquity and the Renaissance. But if we look more closely at Byzantium, and especially if we look at what Gibbon and others ignored, we find many surprising traits and features.

The first feature is the Byzantine system of tax collection. No strategic competitor of the Byzantine empire, except—perhaps—the Islamic caliphate, could match its effectiveness in extracting resources from domestic economic activity and trade. Early Byzantine fiscal policy was based on the calculation of an annual total budget which was appointed downward, from province to district level and finally down to individual plots of land in proportion to their estimated agricultural output. During the 'Dark Ages' (7th-9th century) the fiscal system was subject of reforms and evolved in reaction the financial pressures caused by the Islamic conquests, the Bulgar threat as well as the problems of securing imperial control over Italy. Although our knowledge of the changes is only rudimentary, the limited evidence allows us to conclude with some safety that distributive taxation was gradually replaced by a system that was based on the value of commodities (Oikonomides, 2002, 980 f.). These fiscal reforms also entailed far-reaching administrative reforms; as a result, the Byzantines were successful in conserving the decisive virtue of their tax system:

[I]t worked year after year more or less automatically to supply vast amounts of revenue, mostly in gold. This income flow paid for the expenses of the emperor's court and of the entire civil bureaucracy but mostly served to sustain the armies and fleets. The resulting circulation of gold itself stimulated the development of the Byzantine economy: as salaried officials, soldiers, and sailors spent their money, they created a liquid market for farmers, craftsmen, and professionals

of all kinds, who thus earned gold to pay for their taxes as well as their own market needs. (Luttwak, 2009, 9)

The empire's financial liquidity enabled it not only to pay the professional soldiers of its armies and navies. Moreover, the empire could afford to employ diplomacy and deterrence on a much higher level than most other contemporary states. Financial liquidity ensured that the empire could, whenever it suited it, successfully bribe its enemies or acquire important allies.² Byzantine control of important trade-routes ensured that the payments of tributes was not deflationary—most barbarian peoples would anyway use the money to buy Byzantine goods: “The circulation of gold, from taxpayers to the imperial treasury back to the taxpaying economy by way of imperial salaries and payments, was only briefly diverted when tribute was paid” (Luttwak, 2009, 55).

The second feature is decentralization. Of course Byzantium was an absolutist monarchy where the emperor in Constantinople was the highest authority regarding all things mundane, but the empire made deliberate use of decentralization in times of crisis. For example, under Justinian I the Great (527-65) the important provinces of Africa and Italy were transformed into semi-autonomous jurisdictions (exarchates). The local viceroys (exarchs) represented the emperor in almost every respect, combining both civil and military authority; they were apparently also in control of local mints and therefore of coin production. Later, under Heraclius (610-41) and Constans II (641-68), the first territorial military commands known as themes (*themata*) were introduced. Commanded by a general (*strategos*) the thematic armies were able to react quickly to enemy raids and invasions. Moreover, the thematic soldiers were part-time farmers cultivating governmental estates that were granted to them in lieu of cash; the successful defense of Asia Minor against the

²For instance, in modern-day Sweden, about 30 Old Norse ‘Greece runestones’ (*Grekländsstenarna*) have been found, many of which contain information about Norsemen who went to *Miklagard*—the ‘great city’ of Constantinople—in order to serve in the emperor’s famous Varangian (Viking) bodyguard (cf. Blöndal and Benedikz, 2007).

Arab Muslims is probably the most tangible historical proof that the thematic soldiers also had higher incentives to defend ‘their own’ land.

Financial liquidity and decentralization are the source of the third feature, efficiency. Instead of fighting costly wars, the imperial leadership would normally first try persuasion and diplomacy, which was often highly effective as it was based on systematic intelligence and espionage. Only when absolutely necessary the empire would go to war. On the battlefield, the imperial armies were more often than not outnumbered by their enemies, but mostly able to generate a disproportionate fighting strength from the available resources. One reason for this was that the Byzantines systematically studied warfare, building on a corpus of handbooks on generalship, strategy, and tactics that went back to antiquity. In all these works the Byzantine commander was told to be as efficient as possible. For instance, *Maurice’s Strategikon*, probably authored by the emperor Maurice (582-602), reminds the general to consider the following:

A ship cannot cross the sea without a helmsman, nor can one defeat an enemy without tactics and strategy. With these and the aid of God it is possible to overcome not only an enemy force of equal strength but even one greatly superior in numbers. For it is not true, as some inexperienced people believe, that wars are decided by courage and numbers of troops, but along with God’s favor, by tactics and generalship, and our concern should be with these rather than wasting our time in mobilizing large numbers of men. The former provide security and advantage to men who know how to use them well, whereas the other brings trouble and financial ruin. (Maurice, 2001, 64)

The Byzantines tried to learn from their enemies and to develop best responses to their strategy and tactics. This brings us, fourth, to Byzantine innovativity. Almost everyone has heard of the Byzantine secret weapon of Greek Fire. Yet it is not commonly known that the Byzantines had several such innovations at their disposal. Surely less impressive

than the Napalm-like substance, but probably as useful, was another kind of ‘Greek Fire’: We are informed by the eleventh-century chronicler John Skylitzes that the Byzantines operated a strategic early warning system, invented by Leo the Mathematician in the late ninth or early tenth century, that consisted of a series of beacon fires stretching from the fort of Lulum at the Cilician Gates all the way to Constantinople. This optical telegraph permitted the report of an Arab attack and its magnitude to be sent to the capital in about one hour (John Skylitzes, 2010, 108 f.). In fact two synchronized clocks, one in the capital and one in Lulum, allowed the Byzantines to convey twelve specific messages (Treadgold, 1982, 308).

Last, perhaps the most impressive feature is the Byzantine monetary system. The imperial gold currency (called *solidus*³ in Latin and *nomisma* in Greek) was characterized by a remarkable stability of its weight and fineness. In fact, “[f]or seven centuries, from its creation by Constantine I the Great until the fourth decade of the eleventh century, the nomisma as struck at Constantinople remained a coin of pure gold” (Grierson, 1999, 10). The currency’s reputation of ‘solidity,’ the degree to which merchants and traders were familiar with it, and the wide geographic distribution of the coins⁴ explain why the solidus-nomisma was accepted as international money for most parts of its existence. Robert Lopez (1951) even went so far as to call it “the Dollar of the Middle Ages.” That the importance of the solidus-nomisma was a source of intense Byzantine pride is attested by several contemporary sources. Indicative is, for example, the exaltation of Cosmas Indicopleustes—a sixth-century merchant and traveller to India—speaking of his homeland’s coinage:⁵

The Roman empire [...] has many bulwarks of its safety in that it is the foremost power in the world, in that it was the first to believe in Christ, and in

³This is actually the root of the English word “soldier,” from middle Latin *soldarius*, literally meaning “one having pay.”

⁴Solidi-nomismata have even been found in China (Morrisson, 2002, 963)

⁵In the same work at 11.338 the intriguing account of how the Byzantine merchant Sopatrus impressed the king of the island of Taprobane (modern Sri Lanka) with the gold solidus-nomisma can be found.

that it renders services to every department of the Christian economy. There is yet another sign of the power which God has accorded to the Romans. I refer to the fact that it is with their coinage all the nations carry on trade from one extremity of the earth to the other. This money is regarded with admiration by all men to whatever kingdom they belong, since there is no other country in which the like of it exists. (Cosmas Indicopleustes, 2010, 2.73)

When we look at the long-term record of the coin quality of the *solidus-nomisma*, an interesting picture emerges: Whereas the *solidi-nomismata* minted at Constantinople remained a coin of almost pure gold for many centuries, provincial mints such as that of Ravenna or Syracuse registered at times pronounced debasements of their gold coinage (cf. Oddy 1988; Morrisson 2002, 934 ff.). These ‘provincial’ debasements seem to have been mainly related to local crises and reactions to fiscal pressures. The local reductions of coin quality were probably aimed at helping to alleviate precarious budgetary positions when the local jurisdictions faced invasions or similar threats.

As we have seen, the developments in the Byzantine monetary sphere are interesting not only from the historian’s perspective, or that of a numismatist, but also certainly from the perspective of the political economist. In the present paper we concentrate on the above-mentioned provincial coinage-debasements between 650 and 900 CE—arguably one of the most crucial historical periods in the long existence of the Byzantine state. Our main aim is to throw a light on the possible interdependency between the debasements of the *solidus-nomisma* and politico-economic developments during this period, like fiscal pressures mainly caused by the conflict with the Islamic caliphate, military unrest, coups d’etat, administrative reforms and conflicts between the church and the state.

Research in this field is by sheer necessity of interdisciplinary nature and requires the transgression of several disciplinary boundaries. Our point of departure is that the study of civilization requires the combined effort of all the social sciences (Braudel, 1995, 9). If

the various disciplinary tools are welded together into a sharp instrument, which can cut through the veil of history effectively, much can be learned about the politico-economic mechanisms underlying the logic of historical developments. Sometimes such findings might even provide lessons for the modern world as well.

Our thesis is that “both the quantitative approach and the interpretation of coinage in the context of state finance have much to offer the historian, provided that they are applied with an understanding of the methodological problems involved, and the limits of the techniques available” (Howgego, 1997, 38). Coins are virtual composite historical datasets, providing a lot of information about the politico-economic background of the state which issued them. The face designs, for instance, provide insights not only into artistic trends but also into the aims of political propaganda. The inscriptions provide insights into the evolution of language. Mint marks provide insights into where, when and for whom coins were issued. The weight and, more importantly, the chemical composition of the coins often reflects the economic situation of the issuing state: In times of crisis governments often reduced the purity of the precious metal used to mint the coins in order to economise on precious metals. We argue, in similar lines like Munro (2009) did for the case of medieval Burgundy, that the Byzantine coinage debasements in the period between 650 and 900 CE should primarily be seen as aggressive fiscal policies, with the direct aim to finance the defense of the empire. In contrast to medieval Western Europe, where “only metal brought voluntarily to the mint was minted, and the mint retained a fraction of the metal—a charge known as *seigniorage*” (Rolnick et al., 1996, 789), the Byzantine empire relied almost exclusively on taxation to channel metal in the form of coins to the mints. The reliance on taxation backed by coercive force increased the state’s control over the currency.

We attempt a threefold contribution: We first discuss the functions of the Byzantine gold currency and the specifics of the fiscal mechanism, developing the hypothesis that due

to its special political functions debasements would only be taken as a matter of last resort in times of crisis. Our second contribution comes in form of a dataset with time series data covering 250 years, including variables like the fineness of gold coins struck at various mints, the estimated extent of Byzantine imperial territory, sea power, dummy variables for violent regime change, civil wars, dynastic transitions etc.; our third contribution comes in the form of a time-series analysis of the variables that significantly affected the degree of fineness of provincial gold coins. In this context it is particularly interesting to test the hypothesis whether debasements are indeed mainly correlated with territorial losses.

This paper is structured as follows: In Section 2 we will provide a brief narrative of the main historical developments between the sixth and the late ninth century CE. In Section 3 we shortly sketch the origins and structure of the Byzantine monetary system and its main functions with a special emphasis on currency debasement. Section 4 provides a very short overview of Byzantine fiscal administration, state finance and fiscal-monetary interdependence. Section 6 provides some highly preliminary econometric tests of our hypothesis. Section 7 sums up and concludes.

2 Historical background: The Dark Age of Byzantium

2.1 The Islamic conquests

The Islamic conquests radically altered the strategic and political geography of the whole Mediterranean region. (Haldon, 2008, 65). An exhaustive historical exegesis of the Islamic conquests up to the early tenth century is beyond the scope of this paper. For a better understanding of the politico-economic developments in this period which may have had

an influence on the debasement of the solidus-nomisma it is necessary to sum up some of the most important events and the conditions leading to them.

The first Muslim penetrations into Byzantine territory occurred in 633, that is, one year after the death of Muhammad, thereby initiating “the advance that was to take them, in the course of a single century, to within 150 miles of Paris and to the very gates of Constantinople” (Norwich, 1998, 94).⁶ After the battle of Yarmuk in 636 the Arabs captured Damascus, Baalbek, Emesa (Hims, or, nowadays, Homs) and occupied most of Syria. In 637 Jerusalem and Gaza fell. After a short truce in the same year the Muslims occupied Byzantine Mesopotamia and Palestine in 639/40. The invasion of Egypt began in 640; in the same year the Muslims raided Cilicia and Anatolia.

The Byzantine Emperor Heraclius’ death in 641 threw the empire into a phase of internal turmoil at the most crucial of times. When Heraclius’ oldest son of his first wife Eudocia, Constantine III, came to power in the same year he discovered that his father had set aside a huge sum of money for his second wife, Martina.⁷ The new emperor expectably confiscated the money which enabled him to pay the annual army payroll of some 2,016,000 solidi-nomismata as well as to distribute the customary largesse due on an imperial accession (Treadgold, 1997, 309). Constantine III died a mere four months later and was succeeded by Constans II.

Unsurprisingly, the Arabs exploited these dynastic troubles and pushed forward. In 642 Alexandria fell and the Arabs established their new capital at Fostat (now Cairo). The loss of Egypt was a tremendous blow to the Empire, as this province had been the biggest and most reliable source of grain for the capital and “along with Syria and the other eastern provinces had provided the bulk of the empire’s tax revenue” (Haldon, 2010, 29). Strengthened by their initial successes, the armies of Islam then drove westward along

⁶The following summary is based on Kaegi (1995, 66-8).

⁷It is very much possible that Heraclius’ saving, obviously aimed at making a dynastic succession easier, explains at least some of the problems in paying Arab tribes; see below.

the north African coast—inflicting a disastrous defeat on the Exarchate of Africa in 647 (Norwich, 1998, 98f.). They also continued to raid Anatolia, Armenia and Cyprus.

The defeats, devastations and territorial losses of the empire caused external and internal instability: The Lombards in Italy exploited the situation and conquered Liguria in 644. The newly appointed Exarch of Italy proclaimed himself emperor in 650 but died of the plague soon after. Earlier, in 648, the African Exarch had already rebelled against Constantinople; his successor bought off the Arabs by promising to pay an annual tribute of 330,000 *solidi-nomismata* (Treadgold, 1997, 312).

Having established control over a long coastline, the Muslims moreover soon started to build up a naval force and to project power, thus further disrupting Byzantine sea lines of communication in the Mediterranean. In 654 the Byzantines, who had hitherto dominated the seas completely, lost a major sea battle at Phoenix. However, the first Arab civil war (654-61) took the wind out of the Arabs' sails. The caliphate agreed to pay the considerable sum of 1,000 *solidi-nomismata* per day and to cease hostilities.

Constans II used the breathing space to re-organize the military defenses. The new strategy was that open confrontations with the Muslim armies were to be avoided (Haldon, 2008, 65); the incentives to fight intruders were at the same time increased by granting the soldiers governmental lands: “The land grants replaced the soldiers' issues of uniforms, arms, and horses and half of their former pay, which now fell to a mere five *nomismata*. Although the soldiers resided on their land grants, they were supposed to appear whenever they were summoned—at least every spring to be inspected, drilled, and paid—and to go on offensive and defensive campaigns” (Treadgold, 1997, 316).⁸

The Arabs completed their conquest of the last Byzantine possessions in north Africa between 670 and 700 and began to raid Sicily. A huge effort was made to defend the

⁸The emergence of the military lands (*stratitika ktemata*) is being debated in the historical literature. Some authors, e.g. Lillie (2007, 121) argue that the landholdings emerged from the long-term deployment of troops in border areas and the subsequent integration of soldiers into civil society.

Exarchate of Africa, which, after Egypt, was probably the most important source of grain for the capital. In 662 Constans II undertook the desperate move of relocating the imperial court to Syracuse, the Greek capital of Sicily. He made himself hugely unpopular by “confiscating plate from the churches and levying taxes rigorously, not only from the island but from southern Italy, Sardinia, and Africa” (Treadgold, 1997, 319).⁹ Yet, despite these efforts, the last Byzantine stronghold in Africa at Carthage fell in 698.

2.2 Iconoclasm and Byzantine reorganization

The caliphate and the empire continued to fight a protracted conflict on several fronts at once. The border zone along the Arab-Byzantine frontier in Anatolia, which followed the Taurus-Antitaurus mountain ranges, was subjected to constant raiding and routine warfare. Larger scale raids wrought devastation on regions far away of the border. As a result, the population withdrew into fortified cities. Scorched earth-policies and dislocations of local populations further added to the already high costs of warfare. Consequently the empire was chronically short of cash. In the Caucasus Arabs and Byzantines competed for control over Armenia and Iberia. These territories repeatedly became protectorates of either side and defected more than once. Arabs and Byzantines also made truces from time to time and paid tributes to each other, with each side interpreting the payment of tribute as a generous sign of goodwill.

Until the mid eighth century the strategic aim of the caliphate was clearly the takeover of the whole Byzantine Empire. Constantinople was put under a naval blockade from 674 to 678 and besieged by a huge Muslim army in 717/8. Both times the Byzantines managed to repel the attackers with their secret weapon of Greek Fire.¹⁰ Between the first half of

⁹Reading the account of Theophanes the Confessor, one gets the impression that Constans II used the christological doctrine of monotheletism as a pretext to expropriate the church’s property (cf. Theophanes the Confessor, 1982, 45 ff.). This is but one example of the ‘strategic’ use of theological doctrines in the Byzantine Empire.

¹⁰In 717/8 the Arabs under Maslama lost 150,000 out of 180,000 men and all but five out of 2,500 ships.

the eighth century and the first third of the ninth Arab-Byzantine warfare concentrated on permanent raiding and counter-raiding in Anatolia and Asia Minor as well as the occasional naval expedition; noteworthy in this period are the major Muslim invasions of Anatolia of 782 and 806 under Harun al-Rasheed, each with more than 100,000 soldiers.

The effects of the Islamic conquests were comparable to those of the Justinianic Plague (cf. Little (2006)): The empire lost its most important sources of tax income, trade was disrupted and whole populations were displaced. “Scholars generally agree that after the early seventh century the Empire lost about two-thirds of its territory, and that its remaining cities, trade, educated class, population, and resources also contracted. [...] The dispute is over how much damage the Empire had suffered” (Treadgold, 1982, 1).

‘International’ trade between the caliphate and the empire existed but was apparently not very busy. The Arabs developed close trading links with Constantinople, Asia Minor, the Aegean and several Italian ports that formed part of the Byzantine Empire. However, many commodities that had been important trade-articles, like gold and papyrus, apparently disappeared from trade (Abulafia, 2011, 247). An exchange of Byzantine goods for Western European slaves as claimed by McCormick (2002) cannot be ruled out but remains speculative in the absence of direct evidence. One reason for the depressed state of trade was certainly Muslim piracy in the Mediterranean. One should also not underestimate a negative effect due to the bubonic plague.¹¹

One important consequence of the Islamic conquests was the transformation of Byzantium from a state of late antiquity to a medieval one. The transformation affected both structures and processes of civil society, the administration and in the military field. The Byzantines reacted to the permanent threat of Arab raids by developing strategies of unorthodox warfare and of how to efficiently counter enemy incursions. They also repeatedly ‘saved’ Christian populations by resettling them—not always voluntarily—on a large scale

¹¹The plague returned in cycles of approximately 15 years from 541 until 750.

in Byzantine territories. In the period of reorganization most of the cities and towns of late antiquity disappeared and were transformed into or abandoned for fortified settlements; the increasing substitution by the term *kastron*, from Latin *castrum*, of the earlier Greek expression for city, *polis*, in toponyms is indicative of the changes that took place. State and society became increasingly militarized. The biographies of Byzantine emperors show a clear tendency: Whereas not a single emperor in the fifth and sixth century had a military background, six high-ranking military officers came to power in the ‘Dark Age’ between the seventh and eighth century (Lilie, 2007, 119).

Another important element of Byzantine grand strategy appears to have been the introduction of a new official religious state ideology: Iconoclasm. It was based on the explicit rejection of the worship of images and icons and allowed the imperial administration to expropriate a considerable part of the very considerable properties of the Orthodox church. Towards the sixth century the church seems to have played an increasingly important role. Over time, it acquired vast estates, mainly by bequests but also because many wealthy individuals, e.g. former high-ranking military officers, often founded their own monasteries. The wealth of the church may be explained by the fact that it was, at that time, exempt from taxation. The church was therefore a major controller of economic resources:

Such was the wealth accumulated by the church by the later sixth century that one estimate has suggested that the resources it consumed to maintain its charitable institutions, its clergy and episcopate, its public ceremonial and its public buildings were greater even than those of the state—excluding the army of course. This wealth was mostly in land, although substantial amounts were invested in gold and silver or in buildings. The church derived a large income from rents from its numerous estates, whose importance was clearly understood [...] and, presumably, church lands and property. (Haldon, 2010, 55)

Whether and in how far the imposition of iconoclasm was motivated by a genuine wish to establish the ‘correct’ theological principles of society or indeed mainly by the revenue motif cannot be said with certainty. However, emperors often resorted to similar means in times of crisis just with different theological justifications. The *Alexiad* of Anna Comnena, daughter of the Emperor Alexius I (1081-118), provides us with a vivid picture of a recently appointed emperor’s dire financial situation and the strategy of expropriating the church:

There was no money—the imperial treasury had been denuded by his predecessor on the throne [...]. Thus the general situation was critical. The Roman Empire was weak and at the same time crushed by poverty. What then was this young emperor, having only recently seized the helm of government, what was he to do? [...] Because they were unable to find another method of providing the money, they first collected their available resources, in the form of gold and silver objects, and sent them to the imperial mint. [...] Afterwards there was a spontaneous and eager offering of available gold and silver by all the more loyal friends [...]; they sent contributions partly to the allies, partly to the emperor. Some allies demanded favours on the grounds, forsooth, that they had fought on our side before; others (the mercenaries) wanted higher pay. The emperor, despairing of the goodwill of the Romans, called for greater efforts and made fresh demands. [...] Then they examined the ancient laws and canons on the alienation of sacred objects. Among other things they discovered that it is lawful to expropriate sacred objects from churches for the ransoming of prisoners-of-war [...]. In order to pay the soldiers and allies, therefore, they decided to convert into money a small quantity of such objects which had long been idle and set aside as serving no purpose. (Anna Comnena, 2004, 156-8)

Against this background we should at least not reject the hypothesis of a ‘strategic’ use of religious dogma.

2.3 The empire strikes back

Byzantium continued to lose territories but managed to keep afloat and to exploit every opportunity to strengthen its position. Some events, like the Abbasid revolution and the subsequent removal of the Umayyads from power in the caliphate in the mid-eighth century gave the Byzantines breathing-space and opportunity to go on the offensive. By the end of the eighth century the empire had suffered the depopulation of its cities due to warfare and plague, the devastation of its farmland, the loss of formerly highly profitable trade-routes and ecclesiastical strife.

Under the iconoclast Emperor Theophilus (829-42) important reforms were implemented. The army's troop strength and pay-scale was increased and the supply of copper coins rapidly increased. In 842 the empire probably had a population of about eight million whereas the Islamic caliphate probably had a population of about 21 million (Treadgold, 1982, 135, FN 259). However, the reforms within the imperial administration and military started to pay off and the empire began to recover lost territories while also its economy expanded: "The revival of the state seems evident from the simultaneous growth of its territory, the efficiency of its administrators, the strength and loyalty of its army, and its government revenues. Meanwhile Byzantine society showed signs of revival by increases in population, general prosperity, trade, urbanization, and the level of education and culture" (Treadgold, 1991, 331).

The Byzantines gained control over some territories in the Balkans and the Greek peninsula while losing some important positions in the Mediterranean. In order to decentralize its border-defense even further against ever more diverse adversaries new provinces and military districts were introduced. As a result, security increased steadily, yet the empire's ability to project force into the southern and western Mediterranean was severely curtailed by the loss of Crete in 824 and the Arab invasion of Sicily in 826. The gains however outweighed the losses and thus "[t]he reviving empire and the disintegrating caliphate

were moving toward approximate equality in strength at a rapid and accelerating pace” (Treadgold, 1991, 341)

After another series of important reforms the Byzantines gradually went into the offensive in the 10th century, recovering some of the territories they had lost earlier. In a remarkable process of systematic expansion the Empire would reclaim its role as a leading power in the Eastern Mediterranean under the Macedonian dynasty.

3 The monetary system and coinage

3.1 Historical development

Like its fiscal system, the Byzantine monetary system was one of several institutions that directly linked Byzantium with antiquity.

Although the evidence is incomplete, what can be said is that coinage was most probably introduced in Lydia around 600 BC. Coins made from precious metal were, from the very beginning, “associated with powerful sovereigns who monopolized the minting of money partly to exploit as a source of revenue” (Ferguson, 2009, 25). Another important function of coinage was to facilitate standardized payments by and to the state (Howgego, 1997, 2f.). The political, economic and social transformation of the Greek *polis* as a state, colonization and peer polity relations enabled coinage to spread rapidly throughout the Greek world. Already in 500 BC several coinages were existing in Asia Minor, the Aegean islands, Greece, Italy and Sicily, and the Cyrenaica. Also the denominational scale of coinage expanded: Since the sixth century BC base metal, usually bronze, coinages were used for daily transactions, whereas gold or electrum¹² coinages were used as ‘international’ currencies. The conquest of Persia by Alexander the Great helped to further spread the use of coinage.

¹²An alloy of gold and silver.

Rome, drawing on Etruscan and Greek traditions, adopted coinage in the late fourth century BC. Probably the demand of a currency suitable for trade with Greek cities in southern Italy led to the first Roman imitation of Greek silver drachmas. In 211 BC a standardized silver coin was introduced. The denarius, initially valued to ten bronze asses, was minted at 1/72 to a Roman pound¹³, or 24 carats,¹⁴ corresponding to a theoretical weight of 4.544 g, and soon became the backbone of the Roman monetary system in the Republican period. The introduction of the aureus, a more or less regular Roman gold coinage, in 46 BC was “a development of major importance” (Howgego, 1997, 10).

The denarius remained a stable currency until it was gradually debased in the late Republican period. In c. 146 BC it was re-tariffed from ten to sixteen asses, but continued to function as the main Roman currency. After stabilization in the early imperial period, the denarius was reduced to a weight of three grams in the late third century CE. From the 240s and onwards the denarius began to be slowly replaced by the antoninianus which was introduced in 215. In the third century the Roman monetary system started to degenerate. Silver coinage experienced dramatic debasements, leading to a shortage of gold coinage. Several unsuccessful reforms under Aurelian and Diocletian did apparently not restore trust in silver and base metal denominations. As a result, in the time of Constantine the Great the gold solidus became to dominate in important sectors of the imperial economy. Like the earlier silver denarius the gold solidus was minted at 1/72 to a Roman pound. It would remain the cornerstone of the Byzantine monetary system for the next 750 years.

Decentralized minting enabled the Roman authorities to meet local demands for coins effectively. Between the late third and the mid fifth century the department of *sacrae largitiones* was operating some 17 permanent or temporary mints: “The location of the

¹³A *libra*, equal to approximately 327 g.

¹⁴One carat, from Greek *kerátion*, Latin *siliqua*, equals 0.189 g. This measure of weight is based on the seed of the carob tree (*ceratonia siliqua*). The modern meaning as a measure of gold fineness comes from the fact that the solidus was, in theory, consisting of pure gold and one carat corresponded to 1/24 of one solidus. Gold with a fineness of 18 carat has, accordingly, a degree of purity of 18/24, or 75%.

mints reflected primarily political and military concerns—provincial mints in particular were mostly located in regions that had substantial military needs, such as garrisons and frontiers” (Haldon, 2010, 46). The collapse of the western half of the empire in 476 was accompanied by a reduction of operating mints, and a concentration of the production of gold coin at Constantinople and Thessalonica.¹⁵

At the end of the fifth century, during the reign of Anastasius I (491-518), the Byzantine denominational scale was formed by the gold solidus and two fractions, the half solidus (semissis, 2.25 g) and the third solidus (tremissis, 1.52 g), as well as a number of copper denominations based on the follis (tarrified at 1/288 to the solidus) (Grierson, 1999, 1). Currency reforms as well as the decentralization of minting reflect a growing monetary economy and public finances in this period. The number of imperial mints further increased after the reign of Justinian I (Grierson, 1999, 5). Coins would now be minted at the capital, Constantinople, Alexandria in Egypt, Antioch in Syria, Carthage in North Africa, Cyzicus and Nicomedia in Asia Minor, Ravenna in Italy and Thessalonica in Greece. New mints, e.g. in Cyprus, Jerusalem and Sardinia, were almost certainly established in order to supply coins more easily to meet local money demand. All mints produced copper coins whereas gold coins were, at least initially, only struck in the substantial mints of Constantinople, Carthage and Ravenna. As a quality certificate, these coins beared the mint mark CONOB, from CON(stantinopoli) OB(ryziacus), meaning “Constantinople, fine gold” (Morrisson, 2002, 911), or CON(stantinopoli) OB, meaning “Constantinople, 72” when OB is read as the corresponding Greek alphabetic numeral $\alpha\beta'$ (Grierson, 1999, 5). The existence of small change copper denominations like the half-follis or the nummus is indicative of an increasing monetization of economic transactions in this period.

In the mid-sixth century the Empire began to lose control over most of Balkans due to the immigration of Avars and Slavs and over most of Italy due to the conquests of the

¹⁵Interestingly, the denarius remained at least a unit of account in western Europe. In the time of Charlemagne prices were still being quoted in terms of silver denarii (Ferguson, 2009, 25).

Germanic tribe of the Lombards. The speed of ablation of the imperial territory increased during the all-out war against the Persian Sassanid Empire (602-28); this conflict caused widespread destruction and a serious fiscal crisis. Probably as a reaction to the fiscal needs of the state the Emperor Heraclius in 615 introduced a new silver coin of 6.82 g, the hexagram, which, for obvious propaganda reasons, displayed the emperor and his son and carried the inscription *Deus Adiuta Romanis* ('May God help the Romans')(Kaegi, 2003, 90). Officials would be paid in hexagrammata, but only at half the former rate; also the pay rate of the military was reduced (Kaegi, 2003, *ibid.*). In this time, most probably as a reaction to deflationary pressures, also the copper follis dropped in weight, from 11 to around 8 g. Interestingly, Heraclius was only able to issue a sufficient number of silver coins after he 'borrowed' the property of the church. The monastic chronicler Theophanes the Confessor reports that the emperor "took the money of the pious houses as a loan; because poverty compelled him, he even took the candelabra and other suitable equipment from the great church, and minted a great number of nomismata and miliaresia" (Theophanes the Confessor, 1982, 13).¹⁶

The rapid and sweeping Islamic conquests during the first third of the seventh century wrested the richest provinces away from the empire. In the ensuing process of centralization of the fiscal administration several mints were closed; gold coin would now only be struck at Carthage, Constantinople and Ravenna. As a result, the monetary economy suffered a drastic decline. It does not come as a surprise then that between the second half of the seventh and the end of the ninth century stray base metal coin finds in many cities almost drop to zero (Treadgold, 2002, 147). In this period also small change gold denominations disappeared; from the reign of Leo III (717-741) and onwards the monetary system consisted of the nomisma, as the solidus came to be called by then, the miliaresion, an apparently mostly ceremonial silver coin (tarrified at 1/12 to the nomisma), and the follis

¹⁶Theophanes uses the name for the silver denomination used in his own time, miliaresion, instead of the name of the Heracleian silver denomination, hexagram; see below.

(see Table 1).¹⁷ The relationship of the smaller denominations to the nomisma reflected the relative value of gold and was therefore subject to considerable instability. Accordingly, the exchange ratios should not be taken too literally (Grierson, 1999, 5). Especially the follis was not stable and subject to reductions of weight that rendered especially the lower denominations almost unsuitable for popular use.

Table 1: DENOMINATIONS OF BYZANTINE COINAGES FROM THE EIGHTH TO THE ELEVENTH CENTURY (AFTER GRIERSON, 1999, 44)

Metal	Denomination	Weight (g)	Exchange ratio
	Solidus-nomisma	4.55	1
Gold	Semissis	4.55/2	2
	Tremissis	4.55/3	3
Silver	Miliaresion	c. 2.77	12
Copper	Follis	c. 14-3	288

3.2 Economic and political functions

In this section we will throw a light on the peculiar political economy of the Byzantine monetary system. The imperial coinage fulfilled several economic and political functions which were in several ways interdependent. Let us first consider the economic functions of the imperial coinage. In the period between the seventh and the late ninth century credit certainly existed but played a limited role in the Byzantine economy (Morrisson, 2002, 909). The main function of coinage was to provide the population with an easy to handle medium of exchange, store of value and unit of account, in order to facilitate exchange

¹⁷The word miliaresion is derived from the Greek pronunciation of the latin name *miliarensis*. Apparently the miliaresion was not widely used in daily transactions; it surprises therefore that in several important sources on imperial administration, for instance in the Book of the Prefect (cf. Maniatis, 2002), which regulated the activities of private guild in the capital, the miliaresion is mentioned as a profit margin; the profit of grocers in the retail market is fixed at two miliaresia per nomisma, or 16.67%. Perhaps the miliaresion was used as ‘ghost money’, that is, an unit of account aimed at restoring the equivalence between different denominations with fluctuating exchange rates (cf. Sargent and Velde, 2003, 126f.).

between individuals. External trade may also have played an important role. In addition, Byzantine imperial coinage fulfilled other important functions.

The fiscal function of the coinage was the facilitation of exchange between individuals and the state. State payments to individuals were made mostly in coins and public expenditure was the dominant means by which the Byzantine state put money in circulation, either in the form of new or re-minted coins.

From a political economy perspective, coinage should always be interpreted in the context of state finance, especially the coinage of empires. Such states are “political systems based on the actual or threatened uses of force to extract surpluses from their subjects” (Woolf, 1992, 283) and Byzantium was certainly no exception. The fiscal role of the imperial currency indeed allowed the state to appropriate the private property of its citizens quite efficiently by debasing its coinage. There were several ways to do so. One strategy involved military expenditure: Soldiers, who were expected to provide their own arms, equipment and supplies, would be paid their traditional rates in debased currency. Civilians, from which equipment and supplies would be bought, were not allowed to reject the debased coins and might even be forced to sell at fixed prices. Another strategy involved the payment of taxes only in old, undebased coins.

Indeed, according to the *Lex Cornelia Testamentaria Nummaria* of the Roman Civil Law Code, at least imperial coins made of precious metal had to be accepted:

[A]nyone who counterfeits gold or silver money, or washes, melts, scrapes, spoils, or adulterates any coin bearing the impression of the face of the Emperor, *or refuses to accept it*, unless it is counterfeit, shall, if of superior rank, be deported to an island, and if of inferior station, be sentenced to the mines, or punished capitally. Slaves if manumitted after the crime has been perpetrated, shall be crucified. (Scott, 1932, 327, italics added)

Of course, the state did not only circulate coins by means of military payments but also in form of largesses, or, donations, to the public on the ascension of an (co-)emperor and their anniversaries. The silver *miliaresion*, for example, until the reign of Theophilus (829-42) apparently “represented ceremonial issues, struck for the public distributions that were customary when a co-emperor was appointed” (Grierson, 1999, 14). The distribution of gold coins were, by tradition, reserved for the Emperor alone. For example, the 105th Justinian Novel of the Roman Civil Law Code, the *Corpus Juris Civilis*, enacted between 529 and 529, strictly regulates donations made by Consuls:

Therefore We direct that every annual Consul, whom We appoint, shall bestow upon the people by way of largess, distribution, and expenses as much as he can afford; and We set forth in this Constitution everything relative to such presents made by the Consuls. [...] But how much should the Consul distribute among the populace during the seven processions? [...] [W]hen he does not wish to distribute anything among the people, We do not compel him to do so; just as when he desires to be liberal and honor them with gifts of silver coin, We do not prohibit it. We, however, forbid him to scatter gold coin about in either large or small sums, no matter what may be its weight or denomination; and he shall only distribute silver, as We have just remarked: for We grant the Empire the exclusive right to scatter gold, as the amount of its wealth permits it alone to despise this metal. [...] This is a rule that We establish with reference to coins thrown to the populace. Hence if a Consul desires to be generous, he can distribute money during these processions as he may deem to be advisable, and he is only forbidden to distribute gold, which is a privilege solely reserved for the Emperor. (Scott, 1932, 18)

It should be noted that the state was making payments not exclusively in coin. Assets used, e.g. to pay high-ranking officers and administrative officials, included silk garments

and jewelry yet coins appear to have played the most important role. In contrast to other assets, coins were important means of communication between the emperor or empress and his or her subjects. Byzantine coinage should therefore always be interpreted in the context of imperial propaganda. This leads us to the second political function of Byzantine coinage, the articulation of power and communication of information related to this internally and externally. In this respect, coins played a key role as a medium for the assertion of imperial identity.

One information thus transported was, of course, the identity of the emperor or empress. Rulers were able to affirm their power by striking coins with their portrait and inscriptions legitimizing their rule. For instance, Heraclius (610-41) introduced types showing him with his sons Heraclius Constantine and Heraclonas, certainly in order to smoothen dynastic succession (Grierson, 1999, 7). By circulating coins with these types the potential successors could be introduced to the population as co-emperors, thus raising a hurdle against potential usurpers who needed widespread support to secure their rule.

Later, under the iconoclast emperors, changes in the types would be more fundamental: The state policy of iconoclasm was based on the rejection of the adoration of images; now the types showed only abstract depictions of emperors and, importantly, no cross on the reverse (Grierson, 1999, 8). After the restoration of the adoration of images the types would normally show a picture of Christ in order to affirm the new state ideology.

We have so far argued that the political functions of coinage in Byzantium must be seen in connection with its economic functions. This created a politico-economic dilemma for the imperial leadership: On the one hand, control over the coinage enabled the Emperors to appropriate private resources by debasing the currency and forcing the population to accept new coins at the same value as old ones. The benefits of this strategy of surplus-extraction had, however, to be carefully weighed against the costs: Debasements would

invariably have serious negative effects on the emperor's reputation, given that imperial propaganda and imagery were so much tied to the gold solidus-nomisma.

4 The fiscal system

4.1 Historical development

Byzantium had inherited the late Roman fiscal system; like the latter it was aimed at maximizing revenue. Although its institutions evolved over time, this principle of taxation remained unchanged throughout the empire's history.

In the late Roman and early Byzantine period state finances were handled by three departments of the imperial administration: The praetorian prefectures, the department of 'sacred largesses' (under the authority of the *comes sacrarum largitionum*) and the department of 'private finances' (under the authority of the *comes rerum privatarum*) (Haldon, 2010, 33). The department of the sacred largesses, among other responsibilities, also operated the state's mines and mints, the state's textile workshops as well as the issue of military donatives. The department of *res privata* was concerned with the income of the huge imperial estates, herds etc.

In the time of Diocletian the most important tax was the land tax, which was normally raised in coin. The tax rate was flat and determined by the demands of the state budget. The rate was assessed by a formula taking into account not only the amount of land (*iugation terrena*) but also the labor available (*capitatio humana*). The *iugum* was the basic unit of taxation for land; it was weighed according to its fertility: For instance, one *iugum* corresponded to 20 *iugera* of good, 40 of average or 60 of bad grain fields, five *iugera* of vineyards or 220 *iugera* of olive trees (Demandt, 2007, 295). The assessment value of the *capitatio-iugatio* was also used to decide how many soldiers landowners had to provide for the imperial army. After the important monetary and

financial reforms of Constantine the land tax would also, occasionally, be raised in kind, which was stored in state warehouses (*kommerkiaria*) for redistribution to the administration and the military in the form of yearly rations (*annonae*) (Haldon, 2010, 33). The tax rates were, theoretically, re-assessed in regular intervals of at first fifteen and later five years (*indictio*).¹⁸

The administration of state finances underwent several significant changes between the mid-seventh and early tenth century. Already during or shortly after the war against Persia, Heraclius undertook a major reform of state finances. The emperor now assumed much more direct control, mainly through a new general financial supervisor, the *sakellararios* (Haldon, 2010, 46). The drastic territorial contraction of the empire and the loss of its richest provinces to the Arabs triggered far-reaching reforms not only of military organization but of state structures in general.

Table 2: TERRITORY UNDER BYZANTINE CONTROL, POPULATION AND STATE BUDGET (AFTER TREADGOLD, 1982) AND OWN ESTIMATES (PRELIMINARY)

	c. 650 CE	c. 750 CE	c. 850 CE
Territory (sq. km)	980,000	820,000	770,000
Population	10,000,000	7,000,000	8,000,000
Army	100,000	80,000	120,000
State budget (solidi-nomismata)	3,700,000	1,800,000	3,300,000

Subordinate to the *sakellararios* were the accountant for the general finance office (*logothetes to genikou*), the accountant for the emperor’s private household’s finances (*logothetes to eidikou*) and the accountant for military finance (*logothetes to stratiotikou*).¹⁹

A similar process of centralization is discernible in the production of coin.

¹⁸Interestingly, similar to the Olympiad of antiquity, the *indictio* was used as a calendar epoch. For example, in the chronicle of Theophanes the Confessor (c. 760-818) the description of each year’s events are still headed by the year of the indiction although the author wrote long after the 15-year indiction cycle became obsolete (cf. Theophanes the Confessor, 1982, 2).

¹⁹The transition from Latin administrative titles to Greek ones is apparent; a similar trend is visible in the inscriptions on the Byzantine coins. These changes reflect the increasing linguistic concentration of the empire on the Greek world of the eastern Mediterranean.

It is particularly interesting that in this period Carthage and Ravenna, and later Sicily, were put under a special administrative regime. The local army commanders (*magistri militum*) were promoted to viceroys (*exarchs*), assuming the civil responsibilities of the former praetorian prefects, and represented the emperor in almost every respect. Although the exarchs enjoyed both civil and military authority the introduction of the exarchates must be seen as an important step towards the decentralization of decision-making. This had two benefits: First, in times of crisis, local viceroys could react to threats more quickly, as they would not need to wait for orders from Constantinople. Second, as the empire was faced with multiple threats in a complicated theatre of operations, the emperor could concentrate on the defense of Constantinople and the empire's heartland in Anatolia.

The delegation of power to exarchs was, however, not without its risks for the acting ruler. The african exarch Heraclius the Elder, together with his son, the future Emperor Heraclius, and his nephew Nicetas managed to overthrow the usurper Phocas in 608 (Treadgold, 1997, 239). Heraclius the Elder used the considerable economic resources of the exarchate and his local Berber allies to invade Egypt as well as Sicily, thus cutting Constantinople off from its major sources of grain (Kaegi, 2008, 123f.). Later, in 646, the exarch Gregorius rebelled against the legitimate emperor Constans II but failed to realize his aim of secession from the empire.

4.2 Fiscal-monetary interdependency

Fiscal considerations of the state ranked among the top priorities of the imperial administration. Indeed, civil government in the Byzantine Empire was mainly identical with fiscal administration. The main functions of the fiscal administration were the assessment, collection and redistribution of the revenue from various sources to the maintenance of the state. The biggest item of expenditure by far was the military payroll, followed by the expenses of the imperial household.

The political aspects of state expenditures were obviously clearly understood by the imperial leadership. For apparently political reasons the emperors were, for instance, personally involved in the payment of at least the highest administrative officials and military officers. Liudprand of Cremona, who led two embassies to Constantinople in the mid-tenth century, provides an fascinating eyewitness account of the annual procession in the week of Lent at which the highest ranking administrative and palatial officials and military officers were paid by the Emperor Constantine VII:

But I reckon that this ought not to be passed over in silence, namely, what else I saw there that was novel and marvelous. [...] A table ten cubits in length and four in width had been set down, which supported the coins, bound in bags according to what each was owed, with numbers written on the outside of each bag. Thereupon, they entered before the emperor not in a jumble, but in an order, according to the summons of the herald who recited the written names of the men according to the dignity of their rank. Thee first of them to be called in is the rector of the Palaces, on whose shoulders, and not into whose hands, the coins are placed in four military cloaks. After him are called *o domesticos tis ascalonas* and *o delongaris tis ploos*, of whom the former commands the army and the latter the navy. These two, taking an equal number of coins and cloaks, as their dignity is equal, because of the volume could not carry them away on their shoulders but dragged them off with an effort, aided by others. After them twenty-four generals are admitted, to whom are issued pounds of gold coins, twenty-four to each, according to his number, with two military cloaks. Lastly, right after them the order of the patricians follows and is given twelve pounds of coins and one military cloak. And since I do not know the number of the patricians, I do not know the number of pounds either, except that given to each. After that is summoned the immense horde of first

swordsmen, swordsmen, swordsmen-in-training, chamberlains, treasurers, first headsmen, of whom the first received seven, and the others according to their dignity received six, five, four, three, two, and one. Nor do I want you to think that it was all accomplished in a single day. Having begun on the fifth day of the week at the first hour of the day, it was finished by the emperor at the fourth hour of the sixth and seventh days; for to those who received less than a pound, the chief of the imperial bedchamber, not the emperor, makes payment throughout the whole week before Easter. (Liudprand of Cremona, 2007, 200-2)

Importantly, both the fiscal and the monetary policies of the Byzantine administration must be seen in a direct relationship with the personal interests of the de facto ruler. Especially in times of crisis usurpations were likely to happen in Byzantium. A sensible thing for any emperor or usurper to do was to exploit the state's financial reserves with the aim to stabilize the own position, e.g. by distributing largesses to at least the population of Constantinople, making donations to critical military units, expensive presents to important allies etc.; however, a usurper would almost always find himself in a difficult position, as a competitor could claim to restoring the rule of the legitimate dynasty. It is well possible that, under these circumstances, a ruler might implement a financial 'scorched earth strategy' and deliberately empty the treasury in order to deter competitors from claiming the throne. Especially in times of crisis the imperial treasury was therefore under the risk of constant depletion. Debasement of the coinage was one remedy.

4.3 Coinage debasement

Several explanations of coinage debasements, emphasising different possible incentives to tamper with the currency, have emerged in the literature. Two categories of explanations

can be differentiated (Munro, 2009): The first argues that debasement is mainly a monetary phenomenon. The second argues that debasement is typically fiscally motivated. In what follows we will shortly discuss these hypotheses and their applicability to the Byzantine *solidus-nomisma* in the Dark Ages.

The monetary hypotheses are, in essence, based on the assumption that coinage debasement is an instrument of monetary policy. The idea is that, given a stock of precious metal available to mint coins, growing with a rate smaller than the net demand for coins, the monetary authorities may try to increase the money supply by reducing the weight standard of the relevant denominations and/or by reducing the fineness of the coins. There are, in theory, several possible scenarios of why the monetary authorities might do this: First, and quite intuitively, it is possible that coinage is negatively affected by a ‘bullion famine’ (Sargent and Velde, 2003, 124f.), that is, a shortage of mintable metal, caused by a persistent trade deficit or a drain of precious metals caused by higher bullion market prices abroad. A relatively higher price of gold outside of the empire could have caused a drain of gold coin with the result that the administration might not be able to find the bullion needed to satisfy money demand. Yet the requirement that taxes had to be paid in gold coin ensured, at least up to a certain extent, that gold coins would remain in the domestic monetary cycle.

Second, a growing demand for currency without sufficiently developed institutions and technologies to adequately increase the velocity of circulation may require a higher money supply to avoid deflationary pressures. By debasing the coinage, the monetary authorities could strike more coins from the same amount of bullion, thus providing the additional quantity of money needed for an increased number of transactions in a growing economy. From a modern standpoint this appears as a sensible thing to do, but it can only be speculated whether the Byzantine administration in the time-period concerned had anything close to a comparable understanding of monetary policy. After all, for such a policy

to work, this would require some form of monitoring of prices, precise accounting of the quantity of old and new currency etc.

Third, trade concerns could also be a motif to debase the coinage. Debasement could, in theory, be aimed at devaluating the own currency against that of important trade partners, for instance, the caliphate. This hypothesis may most probably be safely excluded, as external trade was strictly controlled in Byzantium. For the purposes of trade the administration did not need to debase whole issues of new coins but could mint special coins.

It is, fourth, also possible that a rapid decrease in the velocity of circulation, caused for example by a dearth of transactions due to a crisis or by a high propensity to hoard coins coupled with the absence of credit, may require an injection of fresh currency. Interestingly, the decrease in the velocity of circulation might be caused by fiscal policy. For instance, a legal requirement to pay taxes in cash money may induce private economic actors to decrease prices in order collect the necessary amount of coins (see below).

While none of these hypotheses can be rejected out of hand they should, in our opinion, be dealt with care as explanations of the early debasements of the *solidus-nomisma*. First of all, monetary explanations presuppose the existence of a highly monetized economy. While it is true that in the big cities even day-to-day transactions seem to have been conducted with coin, in the rural areas and smaller towns the dominant form of transaction certainly was barter. This means that even if the state would have been trying to implement some form of monetary policy its effects would be limited. Moreover, only in a fraction of day-to-day transactions gold coin would be used.

Second, it is very much questionable whether the monetary authorities, that is, the emperor, the *sakkelarios* and the *logothetes* in the capital and the exarchs in the western exclaves, thought of the coinage as an instrument to implement monetary policy. Certainly, the technocratic expertise of the imperial administration should not be underestimated,

but key sources do not mention monetary policy objectives or even basic thoughts about the functions of the currency. For instance, the confidential manual on diplomacy and administration of the emperor Constantine VII Porphyrogenitus (913-59), known as *De Administrando Imperio* (cf. Constantine Porphyrogenitus, 2002), which was most probably written between 948 and 952, mentions taxes and tributes several times but says nothing whatsoever about principles or instruments of monetary policy.

Third, recall that for the Byzantine rulers most probably the political functions of coinage were much almost certainly much more important than the economic ones. In contrast to manipulations of the base metal denominations, manipulations of the gold denominations were problematic: A reduction of the fineness of the solidus-nomisma or its fractions inevitably affected the reputation of the emperor, who, after all, was depicted on every coin. We should therefore expect pronounced debasement to be a measure of last resort, appropriate only in times of serious crisis. Even if the imperial government tried to confront inflation, or deflation, it certainly would prefer other measures over debasement, for instance price regulations, which, at least in the capital, could be quickly implemented and enforced through the powerful guilds.²⁰

Apart from these theoretical counter-arguments, the facts might contradict a purely monetaristic explanation of gold coin-debasements. If the imperial authorities would really have used debasement as an instrument of monetary policy, we should see some fluctuations of the solidi-nomismata struck in the capital, whose mint had by far the greatest output. As shown in Table 3, the changes in fineness and the weight standard of the coins from the mint in Constantinople were rather small. Also the overall effect on the average per-coin gold weight, shown in the third column, is minimal. Indeed the deviation from the 250-year average gold weight per coin, shown in the last column, is almost negligible.²¹

²⁰In the capital all the smaller manufacturers were organized into guilds; these were used by the government to enforce the fiscal interests of the state (Miller et al., 1987, 154f.).

²¹**Note:** These results are very preliminary and need more scrutiny. They should not be taken too literally.

Table 3: AVERAGE WEIGHT AND FINENESS OF CONSTANTINOPOLITAN SOLIDI-NOMISMATA

CE	Average weight (g)	Average fineness (%AU)	Average gold weight (g AU)	$\Delta(\text{LTA})^*$
650-700	4.333	96.260	4.171	-0.039
701-750	4.435	95.388	4.230	0.020
751-800	4.453	96.125	4.280	0.070
801-850	4.355	96.513	4.203	-0.007
851-900	4.345	96.900	4.210	0.000

* LTA = Long term average (4.210 g AU)

Against the background of the theoretical counter-arguments and the observation of an unbroken record of coin-production with high degree of fineness in the capital's mint, a purely monetary explanation appears more and more improbable; it should however not be completely rejected. What appears more probable is that debasements of the solidus-nomisma were fiscally motivated.

The fiscal hypothesis interprets the currency debasements as a means to increase state revenue. By issuing debased gold coins the administration would be able to extract relatively more bullion from circulation than it injected, for instance, in order to accumulate reserves for contingencies, planned military expeditions, donations or building programs. An at times preferable alternative to debasement would have been to simply inject fewer solidi-nomismata of the same purity as old ones. Given that tax demands were normally in gold coin, this could lead to deflationary pressures which are actually reported several times. For instance, Theophanes the Confessor reports that during the reign of Constantine V gold solidi became scarce because of imperial hoarding: "At this time [767/8] Constantine made the city prosper, for he was a new Midas who heaped up treasures of gold by stripping the farmers bare. Because of tax demands, men were compelled to sell God's abundance cheaply" (Theophanes the Confessor 1982, 131; cf. Morrisson and Cheynet 2002, 822, Fn. 15).

It is important to note that currency debasement may also have fulfilled another, political function. Almost every Byzantine emperor was faced with a serious threat of military unrest (for more on this see Kaegi, 2008). Not surprisingly, this threat increased with the decentralization of territorial defense in the form of military districts known as themes which were introduced in the seventh and eighth century. Ensuring the loyalty of critical military units, like the armies of the themes which were located close to the capital Constantinople, normally necessitated a policy of good will by the ruler; only under exceptional circumstances a ruler was able to enforce his or her will with authoritarian measures. Normally the ruler bought the troops' support with "promises and gifts"

Of course, economic and fiscal incentives to debase the gold currency are related to each other. What is important to keep in mind is that debasement was a serious decision with far-reaching negative consequences. In our view, the importance of the solidus-nomismata's political function were at the center of attention of the Byzantine rulers. Political considerations kept a powerful check on incentives to debase the gold coinage. We should therefore expect currency debasement to be a measure taken only in time of serious crisis and not as an instrument of monetary policy. The debasement of the currency must however also be seen in relation to the degree of administrative (de-)centralization of the empire. As we have noted earlier, Byzantium was characterized by a geography that was fragmented not only physically but in political and religious terms. As a result, from early on the Byzantines relied on decentralization. The exarchates of Carthage, Sicily and Ravenna operated imperial mints and were thus in local control of 'monetary policy'.

5 The early debasements of the solidus-nomisma: An empirical perspective

5.1 Dataset

For our empirical approach we have created a dataset with time series data over 250 years regarding the purity of gold solidi issued in Constantinople and the provincial mints of Naples, Ravenna, Rome, and Syracuse, the estimated extent of Byzantine imperial territory, variables capturing violent regime change, civil wars, dynastic transitions etc. A complete list of the variables can be found in Table 13.

5.2 Empirical analysis

In the following, we exploit this dataset to analyze the relationship between the fiscal capacity/needs of the Byzantine state, which we proxy with the size of the territory under its control, and the gold content of its coins: The solidus-nomisma and its fractions. Since monetary policy was decentralized in the empire, we use information on coins issued by the mints in Syracuse and Rome. We rely initially on graphs. Thereafter, we conduct cointegration analyses and estimate error-correction models.²²

5.3 Graphical evidence

Figure 4 consists of plots of the gold content of the solidus-nomisma and its fractions issued by the Syracuse mint during the period 650-900 CE. Figure 5 plots the gold content of the coins issued by the mint in Rome during the same period. Both figures also include plots of the evolution of the log of the empire's territory over time.

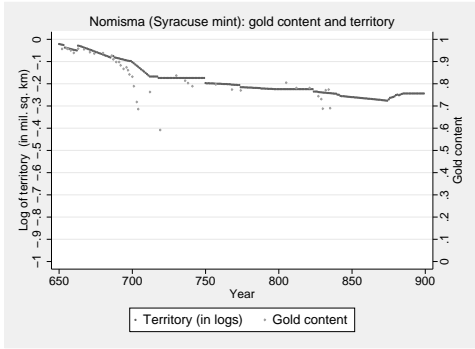
²²**Note:** This section presents only some very preliminary results that should be seen as a first glimpse at the data.

The plots in Figure 4 suggest that the gold content of the solidus-nomisma from Syracuse has varied considerably during the 250 years covered by our dataset. The purity of the solidus-nomisma has continuously declined up until 700. Around 712, an attempt for stabilization was made. However, even though the gold content increased somewhat, this stabilization did not last, and the gold content began to decline again. Around 730, another marked increase in the gold content took place. This time, the attempt for stabilization proved to be more successful. Nevertheless, the solidus-nomisma did not reach previous levels of purity.

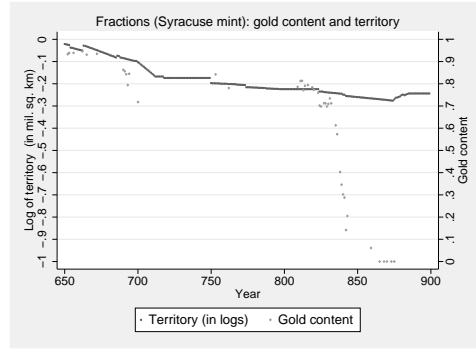
As the solidus-nomisma, the fractions from the Syracusan mint have witnessed considerable variability with respect to their gold content. However, the dynamics are somewhat different. The fractions were continuously debased until around 700. During the 700-750 period, the gold content of the Fractions increased somewhat. After 750, their gold content was stable until around 832; but starting from 835, a steep decline in purity took place.

According to Figure 5, the coins from the mint in Rome have developed differently than those issued in Syracuse. This reinforces the notion that the imperial monetary policy was decentralized. Both the solidus-nomisma and its fractions have witnessed successive debasements in Rome. While there were isolated attempts for stabilization for the solidus-nomisma – for example in 714, 737, and a particularly noteworthy one in 751—they were never able to stop the overall decline. For the Fractions, we do not even observe isolated attempts at stabilization. For these coins, the 650-900 period was one of repeated debasements.

These figures reveal furthermore that the 650-875 period was one of continuous territorial losses for the Byzantine Empire. Even though there was one particularly large territorial expansion in 663, it was insufficient to reverse the trend. Only at the end of the sample period, starting in 875, the empire witnessed a sustained phase of small territorial expansions.



(a) SOLIDUS-NOMISMA



(b) FRACTIONS

Figure 1: GOLD CONTENT OF DIFFERENT BYZANTINE COINS OF THE SYCRACUSE MINT AND CUMULATIVE TERRITORIAL LOSSES

At first sight, the plots suggest a positive relationship between the size of the territory controlled by the empire and the gold content of its various coins. Yet, the nature of this relationship apparently varies between coins. The Syracusan solidus-nomisma series closely follows, at least in the long-run, the territory series. The Syracusan Fractions series does so as well until around 832. However, the relationship between the territory and Fractions series breaks down after 832 as the fractions face repeated and severe debasements. The gold content of the solidus-nomisma and the fractions from the mint in Rome also decline with shrinking territory, but the decline is much steeper and begins much earlier than for the coins from Syracuse.

In general, the plots in Figure 4 and 5 suggest that the nature of the relationship between the empire's territory and the gold content differs between coins. Nevertheless, all plots also point towards a negative effect of territorial losses on the gold content. The next section asks whether this negative relationship continues to prevail in a comprehensive time-series analysis.

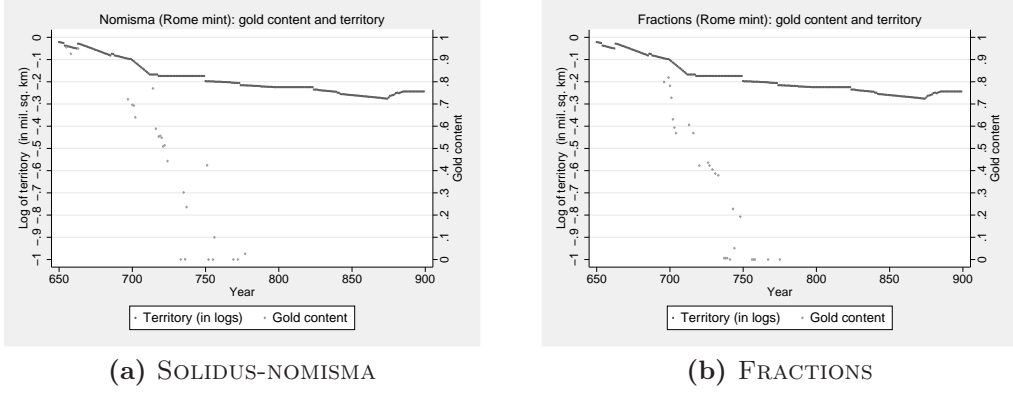


Figure 2: GOLD CONTENT OF DIFFERENT BYZANTINE COINS OF THE SYCRACUSE MINT AND CUMULATIVE TERRITORIAL LOSSES

5.4 Time series analysis

In this section, we explore with time-series methods whether the gold content of Byzantine coins is related to the territory of the Byzantine Empire. A straightforward approach to analyze this question is to estimate a simple linear model where the gold content of the various coins is explained by the size of the Empire’s territory:

$$\text{Gold content}_t = c + \beta_1 \text{Log}(\text{Territory})_t + \epsilon_t. \quad (1)$$

In this model, the dependent variable is the gold content of either the solidus-nomisma or the fractions from the mints in Syracuse and Rome in year t ; the independent variable is the log of the territory controlled by the Byzantine Empire in period t .

It is well known that estimating such a model with time-series data will lead to wrong inferences if the dependent and independent variables contain unit roots. To check for this possibility, we calculate in the next section Augmented Dickey-Fuller unit root tests.

5.4.1 Unit root tests

We calculate for each of the series—the solidus-nomisma and the fractions from the mints in Syracuse and Rome and the territory size—four variations of Augmented Dickey-Fuller

unit root tests: without trend and lags, with trend and without lags, with trend and one lag, and with trend and two lags.

Table 4 presents the results for the unit root tests for the territory series. The results suggest that this series is $I(1)$: its level is integrated whereas the first difference is stationary.

Table 4: AUGMENTED DICKEY-FULLER UNIT ROOT TESTS FOR NOMISMA AND FRACTION (MINT IN ROME) AND TERRITORY

	No trend, no lag	Trend, no lag	Trend, lag = 1	Trend, lag = 2
<u>Territory</u>				
Level				
t-statistic	-3.989	-0.416	-0.649	-0.719
p-value	0.001	0.986	0.976	0.972
N	249	249	248	247
First Difference				
t-statistic	-12.646	-13.354	-9.079	-6.914
p-value	0.000	0.000	0.000	0.000
N	248	248	247	246

^a This table presents ADF-unit root tests with up to two lags and a trend for the Nomisma, Fraction, and Territory series.

Next, we calculate unit root tests for the coin series. However, unit root tests cannot be calculated if missing and non-missing observations alternate too much because these tests rely on lagged values. Unfortunately, the solidus-nomisma and fractions series from both mints suffer from this problem (see Figure 4 and 5).

In order to proceed with the analysis, we replace the missing observations in these series with linearly interpolated values. Replacing missing observations with interpolated values is a reasonable approach if the series have developed smoothly between two non-missing observations. However, if there had been significant changes in monetary policy during the periods with missing observations, i. e. either marked stabilizations or debasements, then interpolation might be inappropriate. Considering Figure 4, the assumption of a

smooth development of the solidus-nomisma series appears to be tenable. As periods of missing observations are relatively short, it is unlikely that the gold content of this coin has witnessed significant variations from the general trend during these periods.

For the Fractions from Syracuse, the assumption is somewhat more questionable for the 700-750 period. As this period is relatively long, it is possible that discretionary interventions have shifted the series from its general trend. For the remaining periods, the assumption of a smooth linear development during periods with missing observations seems appropriate, however.

As can be seen from Figure 5, there are no extended periods with missing values for the solidus-nomisma and the fractions from Rome. For the solidus-nomisma, however, there were several periods with marked increases in the gold content which went against the general declining trend of the series. Nevertheless, it appears tenable to use interpolated values for the solidus-nomisma from Rome since the spikes were never sufficient to reverse the general trend. For the fractions, the series develops smoothly.

We report the results from the unit root tests for the solidus-nomisma and fraction series from Syracuse with the interpolated data in Table 5. The results suggest that both series are $I(1)$. The results for the coins from the mint in Rome are reported in Table 6. Here, too, the evidence suggests that the both the solidus-nomisma and the fractions series are $I(1)$.

5.5 Cointegration

Clearly, estimating Model 1 with the level of the series would lead to wrong inferences as all variables contain unit roots. However, if the gold content of the coins and the territory

Table 5: AUGMENTED DICKEY-FULLER UNIT ROOT TESTS FOR NOMISMA AND FRACTION (SYRACUSE MINT) AND TERRITORY

	No trend, lag =0	Trend, lag = 0	Trend, lag = 1	Trend, lag = 2
<u>Nomisma</u>				
Level				
t-statistic	-1.329	-1.443	-2.342	-2.313
p-value	0.616	0.848	0.411	0.427
N	183	183	182	181
First Difference				
t-statistic	-5.722	-5.647	-5.249	-5.331
p-value	0.000	0.000	0.000	0.000
N	182	182	181	180
<u>Fraction</u>				
Level				
t-statistic	2.525	0.362	0.071	-0.538
p-value	0.999	0.996	0.995	0.982
N	223	223	222	221
First Difference				
t-statistic	-12.127	-12.507	-6.658	-4.817
p-value	0.000	0.000	0.000	0.000
N	222	222	221	220

^a This table presents ADF-unit root tests with up two two lags and a trend for the Nomisma, Fraction, and Territory series.

Table 6: AUGMENTED DICKEY-FULLER UNIT ROOT TESTS FOR NOMISMA AND FRACTION (MINT IN ROME) AND TERRITORY

	No trend, lag = 0	Trend, lag = 0	Trend, lag = 1	Trend, lag = 2
<u>Nomisma</u>				
Level				
t-statistic	-0.904	-3.210	-2.786	-2.708
p-value	0.787	0.082	0.202	0.233
N	122	122	121	120
First Difference				
t-statistic	-12.990	-12.936	-8.768	-6.106
p-value	0.000	0.000	0.000	0.000
N	121	121	120	119
<u>Fraction</u>				
Level				
t-statistic	-1.616	-1.639	-2.366	-2.388
p-value	0.475	0.777	0.398	0.386
N	79	79	78	77
First Difference				
t-statistic	-6.816	-6.888	-5.546	-4.221
p-value	0.000	0.000	0.000	0.001
N	78	78	77	76

^a This table presents ADF-unit root tests with up two two lags and a trend for the Nomisma, Fraction, and Territory series.

size are cointegrated, Model 1 could be estimated in an error correction specification, which would enable us to capture both long-run and short-run relationships.²³

Cointegration would imply that the gold content of the various coins and the size of the Byzantine territory evolved in the long-run simultaneously, so that a linear combination of the variables in Model 1 is stationary. Given our hypothesis that monetary policy in the Byzantine Empire had a fiscal dimension, it indeed appears possible that the gold content of the two types of coins from the mints in Syracuse and Rome and the territory size are related in the long run. Therefore, we can make a theoretical case for cointegration.

To explore whether the various coin series and the territory series are indeed cointegrated, we use Augmented Engle-Granger cointegration tests. We calculate two sets of cointegration tests: without and with additional control variables. Each set of cointegration tests is calculated for 0 to 3 lags. In addition to the tests, we also report the results from estimating the long-run cointegration relationship described by Model 1.

5.5.1 Cointegration for the Syracusan coins

The results for the cointegration tests with the Syracusan coins are reported in Table 7. When no additional control variables are included, there is evidence for cointegration between the *solidus-nomisma* and the territory series. With one exception, the test statistic is either above and close to the 10% critical value.

In the second set of cointegration tests, we include as additional control variables dummies that control for *coup d' etats*, the accession of a new emperor, and for whether a siege of Sicily (the island where Syracuse is located) is taking place in year t .

Once control variables are included, the cointegration test statistics are not significant. However, the test statistics continue to be fairly large. Their insignificance is obviously due to the fact that the critical values for the Engle-Granger test increase with the number of

²³Of course, we could always estimate Model 1 in first differences since they are stationary, but then we would also forgo the long-run information captured by the levels of the series.

control variables. Therefore, the insignificance of the test statistic when control variables are included is likely due to the low power of the test, and the notion of a long-run cointegration relationship between the solidus-nomisma and the territory series consequently appears to be tenable.

The estimate of the long-run cointegration equation suggests that there is a strong and positive relationship between the size of the territory and the gold content of the solidus-nomisma, irrespective of whether or not additional control variables are included.

For the Fraction, there is less evidence for cointegration. When no additional control variables are included, the t-statistics are always well below the critical values. Once additional control variables are included, the t-statistics increase. Nevertheless, they are still far from being significant. Overall, there is no convincing evidence for cointegration between the Fractions and the territory of the empire.

In summary, we can establish that there is a stable long-run relationship between the gold content of the solidus-nomisma from Syracuse and the territory of the Empire. To explore both the long-run *and* short-run dynamics of this coin, we estimate further below error-correction models.

For the Fractions, we cannot estimate error-correction models because the size of the territory and the gold content do not appear to be cointegrated. Therefore, we explore further below only the short-run dynamics for the Fractions by estimating Model 1 in first differences.

5.5.2 Evidence for the coins from Rome

In Table 8, we report two sets of cointegration tests for the coins issued by the mint in Rome: with and without control variables. The control variables are those already used for the Syracusan coins except the dummy variable that indicates whether a siege of Syracuse is taking place.

**Table 7: COINTEGRATION TESTS FOR NOMISMA AND FRACTIONS
(SYRACUSE MINT)**

	Lags=0	Lags=1	Lags=2	Lags=3
<u>Without control variables</u>				
<u>Nomisma</u>				
Long-term equilibrium: Gold content= 0.958 (92.96)+0.914 (15.55) Log(territory)				
t-statistic	-1.551	-2.599	-2.638	-2.403
10%-cv	-2.575	-2.575	-2.575	-2.575
N	183	182	181	180
<u>Fraction</u>				
Long-term equilibrium: Gold content= 1.144 (30.69)+2.545 (13.24) Log(territory)				
t-statistic	1.028	0.540	0.022	-0.414
10%-cv	-2.574	-2.574	-2.574	-2.574
N	223	222	221	220
<u>With control variables</u>				
<u>Nomisma</u>				
Long-term equilibrium: Gold content= 1.021 (106.52) +2.474 (17.13) Log(territory) -0.021 (- 1.79) Coup d' Etat -0.021 (-2.09) New Emperor -0.075 (-4.76) Sicily siege +0.002 (11.43) Trend				
t-statistic	-2.970	-3.386	-3.770	-3.804
10%-cv	-4.208	-4.208	-4.208	-4.208
N	183	182	181	180
<u>Fraction</u>				
Long-term equilibrium: Gold content= 0.955 (33.45) +0.779 (1.83) Log(territory) -0.035 (-1.03) Coup d' Etat +0.000 (0.00) New Emperor -0.490 (-15.09) Sicily siege -0.000 (-0.32) Trend				
t-statistic	-2.172	-2.222	-2.435	-2.478
10%-cv	-4.197	-4.197	-4.197	-4.197
N	223	222	221	220

^a This table presents Engle-Granger cointegration tests between the Nomisma and the log of Territory and the Fraction and the log of Territory, respectively.

^b The rows entitled Long-run equilibrium report the results from estimating the cointegration equation. t-statistics are reported in parentheses.

^c The cointegration equation is estimated for both types of coins with and without the following control variables: Dummy variable for coup d' etat, dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place.

^d Missing values for coin gold content have been linearly interpolated.

The results are similar to those for the Syracusan coins. While the test statistics for the solidus-nomisma series are never significant, they are relatively high. Thus, it appears that the insignificance of the test statistic is again primarily due to the low power of the tests. Consequently, we treat the solidus-nomisma series from Rome and the size of the Byzantine territory as cointegrated and thus estimate further below error-correction models. For the Fractions, the evidence in favor of cointegration is again weaker than for the solidus-nomisma. Therefore, we only explore the short-run dynamics for this coin by estimating Model 1 in first differences.

**Table 8: COINTEGRATION TESTS FOR NOMISMA AND FRACTIONS
(MINT IN ROME)**

	Lags=0	Lags=1	Lags=2	Lags=3
<u>Without control variables</u>				
<u>Nomisma</u>				
Long-term equilibrium: Gold content= 1.193 (36.43)+5.086 (22.98) Log(territory)				
t-statistic	-2.409	-2.166	-1.931	-2.156
10%-cv	-2.580	-2.580	-2.580	-2.580
N	122	121	120	119
<u>Fraction</u>				
Long-term equilibrium: Gold content= 1.621 (17.31)+ 7.736 (14.44) Log(territory)				
t-statistic	-1.480	-1.763	-1.847	-2.172
10%-cv	-2.587	-2.587	-2.587	-2.587
N	79	78	77	76
<u>With control variables</u>				
<u>Nomisma</u>				
Long-term equilibrium: Gold content= 1.013 (36.51) -0.647(-1.11) Log(territory) - 0.087 (2.27) Coup d' Etat +0.073 (2.32) New Emperor -0.010 (-10.06) Trend				
t-statistic	-3.978	-3.224	-2.955	-3.256
10%-cv	-3.910	-3.910	-3.910	-3.910
N	122	121	120	119
<u>Fraction</u>				
Long-term equilibrium: Gold content= 0.778 (7.96) +0.602 (0.79) Log(territory) +0.067 (1.51) Coup d' Etat + 0.046 (1.22) New Emperor -0.001 (-9.66) Trend				
t-statistic	-1.988	-2.198	-2.267	-2.753
10%-cv	-3.951	-3.951	-3.951	-3.951
N	79	78	77	76

^a This table presents Engle-Granger cointegration tests between the Nomisma and the log of Territory and the Fraction and the log of Territory, respectively.

^b The rows entitled Long-run equilibrium report the results from estimating the cointegration equation. t-statistics are reported in parentheses.

^c The cointegration equation is estimated for both types of coins with and without the following control variables: Dummy variable for coup d' etat in the Byzantine Empire, dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place.

^d Missing values for coin gold content have been linearly interpolated.

5.6 Error-correction, first differences, and short-run dynamics

In this section, we estimate error-correction models in order to study the short and long-run dynamics of the relationship between the territory of the Byzantine Empire and the gold content of the solidus-nomisma from the Syracusan and Roman mints. For the fractions from Syracuse and Rome, we only explore the short-run dynamics by estimating Model 1 in first differences.

5.6.1 Dynamics of Syracusan coins

The results from estimating an error-correction model for the solidus-nomisma from Syracuse are reported in Table 9. We find that error correction is indeed taking place. However, it proceeds rather slowly. A one unit deviation from the equilibrium gold content at a given size of the territory leads to a reduction in the gold content of 0.04 units. In addition, the insignificance of the coefficients on the (lagged) first differences of the territory size series also suggests a slow pace of adjustment: there is apparently no significant short-run effect of changes in territory size on the gold content, neither independently nor jointly.

The results from estimating Model 1 with the Fractions in first differences are reported in Table 10. As for the solidus-nomisma, we find no short-run relationship between territory size and gold content. As there is no cointegration between these variables, we cannot say anything about the long-run relationship nor about error-correction.

Table 9: COIN GOLD CONTENT OF THE NOMISMA (SYRACUSE MINT) AND TERRITORY SIZE IN THE BYZANTINE EMPIRE, ERROR-CORRECTION MODEL, LINEARLY INTERPOLATED DATA, 650-900

	(I) b/t	(II) b/t	(III) b/t	(IV) b/t	(V) b/t
Error correction term	-0.022 (-1.227)	-0.040** (-2.535)	-0.041** (-2.500)	-0.040** (-2.329)	-0.043** (-2.518)
Δ Territory	0.435 (1.421)	0.208 (0.783)	0.234 (0.847)	0.218 (0.783)	0.172 (0.626)
Δ Territory _{t-1}		0.104 (0.394)	0.098 (0.365)	0.132 (0.475)	0.184 (0.672)
Δ Territory _{t-2}			0.030 (0.114)	0.018 (0.068)	0.081 (0.304)
Δ Territory _{t-3}				0.173 (0.646)	0.177 (0.653)
Δ Gold content _{t-1}		0.601*** (8.171)	0.594*** (6.563)	0.592*** (6.503)	0.586*** (6.366)
Δ Gold content _{t-2}			0.010 (0.111)	0.055 (0.520)	0.080 (0.758)
Δ Gold content _{t-3}				-0.085 (-0.908)	-0.120 (-1.295)
Control variables	no	no	no	no	yes
Lags	0	1	2	3	3
F-test territory (p-value)		0.43 (0.65)	0.32 (0.81)	0.37 (0.83)	0.43 (0.79)
N	183	182	181	180	180
DOF	180	177	174	171	159
F	1.486	17.970	11.813	8.934	4.772
R-Sq.	0.016	0.289	0.289	0.295	0.375

^a Models are estimated with a successively larger number of lags; Model (I) includes 0 lags while Model (IV) and (V) include 3 lags.

^b Several control variables are included in Model (V): dummy variable for coup d'etat, dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place. Results for control variables are omitted but available upon request.

^c Missing values for coin gold content have been linearly interpolated.

^d Stars indicate significance levels at 10%(*), 5%(**) and 1%(***).

^e t-statistics in parentheses.

^f The row entitled "F-test territory" reports test statistics and p-values for joint significance of the differenced territory variables.

Table 10: COIN GOLD CONTENT OF FRACTIONS (SYRACUSE MINT) AND TERRITORY SIZE IN THE BYZANTINE EMPIRE, OLS REGRESSIONS WITH FIRST DIFFERENCES , LINEARLY INTERPOLATED DATA, 650-900

	(I) b/t	(II) b/t	(III) b/t	(IV) b/t	(V) b/t
Δ Territory	0.505 (1.290)	0.606 (1.562)	0.578 (1.519)	0.539 (1.437)	0.518 (1.347)
Δ Territory $_{t-1}$		-0.643 (-1.634)	-0.572 (-1.508)	-0.585 (-1.528)	-0.563 (-1.438)
Δ Territory $_{t-2}$			-0.127 (-0.336)	-0.078 (-0.208)	-0.037 (-0.097)
Δ Territory $_{t-3}$				-0.355 (-0.957)	-0.287 (-0.754)
Δ Gold content $_{t-1}$		0.209*** (3.171)	0.141** (2.182)	0.068 (1.023)	0.066 (0.959)
Δ Gold content $_{t-2}$			0.323*** (5.036)	0.289*** (4.517)	0.299*** (4.515)
Δ Gold content $_{t-3}$				0.225*** (3.374)	0.217*** (3.157)
F-test territory (p-value)		2.23 (0.11)	1.42 (0.24)	1.23 (0.30)	1.01 (0.40)
N	223	222	221	220	220
DOF	221	218	215	212	202
F	1.665	4.558	8.137	7.738	3.427
R-Sq.	0.007	0.059	0.159	0.204	0.224

^a Models are estimated with a successively larger number of lags; Model (I) includes 0 lags while Model (IV) and (V) include 3 lags.

^b Several control variables are included in Model (V): dummy variable for coup d'etat in the Byzantine Empire, dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place. Results for control variables are omitted but available upon request.

^c Missing values for coin gold content have been linearly interpolated.

^d Stars indicate significance levels at 10%(*), 5%(**) and 1%(***).

^e t-statistics in parentheses.

^f The row entitled "F-test territory" reports test statistics and p-values for joint significance of the differenced territory variables.

5.6.2 Short-run dynamics of coins from the mint in Rome

Table 11 presents the results from error-correction models with the solidus-nomisma from Rome. As for the solidus-nomisma from Syracuse, we find that error correction is taking place. The speed of adjustment is somewhat faster than for the Syracusan solidus-nomisma, however. A one unit disequilibrium leads to an adjustment of about 0.1 units. In contrast to the Syracusan solidus-nomisma, we also find that there is a significant short-run effect of territory size of the gold content. An increase in the territory leads to a rise in the gold content with a lag of two years.

The results from estimating Model 1 in first differences for the fractions are reported in Table 12. We find no short-run relationship between territory size and gold content. As there is again no cointegration between these variables, we cannot say anything about the long-run relationship.

Table 11: COIN GOLD CONTENT OF THE NOMISMA (MINT IN ROME) AND TERRITORY SIZE IN THE BYZANTINE EMPIRE, ERROR-CORRECTION MODEL, LINEARLY INTERPOLATED DATA, 650-900

	(I) b/t	(II) b/t	(III) b/t	(IV) b/t	(V) b/t
Error correction term	-0.115*** (-3.214)	-0.121*** (-3.258)	-0.085** (-2.236)	-0.095** (-2.449)	-0.110** (-2.445)
Δ Territory	-1.738 (-1.188)	-1.564 (-1.069)	-1.541 (-1.087)	-1.446 (-1.016)	-1.521 (-1.029)
Δ Territory $_{t-1}$		-2.153 (-1.422)	-2.424 (-1.649)	-2.435 (-1.655)	-2.532 (-1.654)
Δ Territory $_{t-2}$			4.755*** (3.213)	4.922*** (3.306)	5.138*** (3.289)
Δ Territory $_{t-3}$				-1.122 (-0.724)	-1.004 (-0.614)
Δ Gold content $_{t-1}$		-0.143 (-1.619)	-0.147* (-1.687)	-0.111 (-1.179)	-0.110 (-1.114)
Δ Gold content $_{t-2}$			-0.023 (-0.266)	0.005 (0.058)	0.006 (0.066)
Δ Gold content $_{t-3}$				0.129 (1.495)	0.132 (1.474)
F-test territory (p-value)		1.77 (0.18)	4.71 (0.00)	3.72 (0.01)	3.67 (0.01)
N	122	121	120	119	119
DOF	119	116	113	110	102
F	5.448	3.896	4.517	3.740	1.907
R-Sq.	0.084	0.118	0.193	0.214	0.230

^a Models are estimated with a successively larger number of lags; Model (I) includes 0 lags while Model (IV) and (V) include 3 lags.

^b Several control variables are included in Model (V): dummy variable for coup d^* , dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place. Results for control variables are omitted but available upon request.

^c Missing values for coin gold content have been linearly interpolated.

^d Stars indicate significance levels at 10%(*), 5%(**) and 1%(***).

^e t-statistics in parentheses.

^f The row entitled "F-test territory" reports test statistics and p-values for joint significance of the differenced territory variables.

Table 12: COIN GOLD CONTENT OF FRACTIONS (MINT IN ROME) AND TERRITORY SIZE IN THE BYZANTINE EMPIRE, OLS REGRESSIONS WITH FIRST DIFFERENCES , LINEARLY INTERPOLATED DATA, 650-900

	(I) b/t	(II) b/t	(III) b/t	(IV) b/t	(V) b/t
Δ Territory	0.793 (0.618)	0.555 (0.426)	0.482 (0.358)	0.595 (0.431)	0.342 (0.293)
Δ Territory $_{t-1}$		0.210 (0.161)	0.204 (0.150)	0.377 (0.270)	0.130 (0.112)
Δ Territory $_{t-2}$			0.213 (0.152)	0.247 (0.169)	-0.925 (-0.756)
Δ Territory $_{t-3}$				-0.639 (-0.445)	-0.060 (-0.050)
Δ Gold content $_{t-1}$		0.237** (2.100)	0.245** (2.057)	0.247** (2.044)	0.396*** (3.239)
Δ Gold content $_{t-2}$			-0.041 (-0.343)	-0.065 (-0.519)	0.056 (0.472)
Δ Gold content $_{t-3}$				0.099 (0.814)	-0.028 (-0.276)
F-test territory (p-value)		0.12 (0.88)	0.08 (0.97)	0.12 (0.97)	0.17 (0.95)
N	79	78	77	76	76
DOF	77	74	71	68	61
F	0.382	1.626	0.950	0.763	3.579
R-Sq.	0.005	0.062	0.063	0.073	0.451

^a Models are estimated with a successively larger number of lags; Model (I) includes 0 lags while Model (IV) and (V) include 3 lags.

^b Several control variables are included in Model (V): dummy variable for coup d' etat, dummy variable for the accession of a new emperor, and a dummy variable for whether a siege of Sicily is taking place. Results for control variables are omitted but available upon request.

^c Missing values for coin gold content have been linearly interpolated.

^d Stars indicate significance levels at 10%(*), 5%(**) and 1%(***).

^e t-statistics in parentheses.

^f The row entitled "F-test territory" reports test statistics and p-values for joint significance of the differenced territory variables.

6 Summary and Conclusion

Summing up, when we look at the long-term record of the coin quality of the solidus-nomisma, an interesting picture emerges: Whereas the solidi-nomismata minted at Constantinople remained a coin of almost pure gold for many centuries, provincial mints such as that of Ravenna or Syracuse registered at times pronounced debasements of their gold coinage. Overall, our preliminary results suggest that there is a significant long-run relationship between the solidus-nomisma issued by the mints in Syracuse and Rome and the territory of the empire. However, as expected, we find little evidence for a short-run relationship. Only for the solidus-nomisma from Rome, there are some indications hinting at a significant short-run effect of territorial losses on the gold content. One interpretation of these findings could be that monetary policy in Byzantium was not used to accommodate short-term fiscal needs or windfalls due to territorial losses or gains, but rather to cope with structural and long-lasting changes in the military and fiscal position of the empire.

However, especially the graphical analysis of the data reveals a noted correlation between territorial developments in the western half of the empire and the debasements of the coinage produced at the western mints. Local developments, like the siege of Syracuse, seem to play an important role. Interestingly, iconoclasm The Sicilian solidus-nomisma and its fractions, after a long period of debasement during which the gold content fell to c. 60% stabilized at a gold content of c. 80% during the iconoclast period. In contrast to that, the solidus-nomisma of Rome and its fractions did not stabilize during the iconoclast period but continued to be debased until minting was finally discontinued at around 780. The ‘provincial’ debasements seem to have been mainly related to local crises and reactions to fiscal pressures. The local reductions of coin quality were probably aimed at helping to alleviate precarious budgetary positions when the local jurisdictions faced invasions or similar threats.

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Table 13: DATASET

Gold content (%AU) of a solidus-nomisma minted at Syracuse*
Gold content (%AU) of a fraction (semissis or tremissis) minted at Syracuse*
Gold content (%AU) of a solidus-nomisma minted at Ravenna*
Gold content (%AU) of a fraction (semissis or tremissis) minted at Ravenna*
Gold content (%AU) of a solidus-nomisma minted at Rome*
Gold content (%AU) of a fraction (semissis or tremissis) minted at Rome*
Gold content (%AU) of a solidus-nomisma minted at Naples*
Gold content (%AU) of a fraction (semissis or tremissis) minted at Naples*
Total estimated area of territory under Byzantine control (sq. km)
Territorial losses (sq. km)
Cumulative territorial losses (sq. km)
Index of territory under Byzantine control (650 CE = 1.00)
Total estimated area of territory under Byzantine control (sq. km) west of the 20th meridian
Territorial losses (sq. km) west of the 20th meridian
Cumulative territorial losses (sq. km) west of the 20th meridian
Index of territory under Byzantine control west of the 20th meridian (650 CE = 1.00)
Estimates of annual Byzantine state budget (solidi-nomismata)**
Estimates of annual Byzantine army payroll (solidi-nomismata)**
Name of ruling Byzantine emperor
Dummy variable: 1 = new emperor, 0 = old emperor
Name of ruling Byzantine dynasty
Dummy variable: 1 = new dynasty, 0 = old dynasty
Name of Byzantine patriarch of Constantinople
Dummy variable: 1 = new patriarch, 0 = old patriarch
Dummy variable: 1 = coup d'etat, 0 = not
Dummy variable: 1 = civil war in Byzantium, 0 = not
Dummy variable: 1 = iconoclasm is dominant state ideology, 0 = not
Dummy variable: 1 = Military unrest, 0 = not
Name of ruling Islamic caliph
Name of ruling Arab dynasty
Dummy variable: 1 = coup d'etat, 0 = not
Dummy variable: 1 = civil war in Caliphate, 0 = not
Number of major Byzantine naval bases
Number of minor Byzantine naval bases
Sum of major and minor Byzantine naval bases
Number of major Arab naval bases
Number of minor Arab naval bases
Sum of major and minor Arab naval bases
Number of Arab naval bases relative to Byzantine naval bases
Dummy variable: 1 = Siege of Constantinople taking place, 0 = not
Dummy variable: 1 = Arab siege of Sicily taking place, 0 = not

* Variables without a complete time-series of observations

** Variables with only a very small number of observations