The Economic Integration of a Late Roman Province

Egypt from Diocletian to Anastasius

By

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DEDICATION

Para Mami y Papi

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ABSTRACT

This dissertation analyzes the extent of economic integration between the province of Egypt and the rest of the Roman Empire during the fourth and fifth centuries by analyzing numismatic, ceramological, papyrological and textual data.

The numismatic analysis rests on the compilation of a database of 30,000 bronze and gold coins which revealed the nature of Egypt's currency during the fourth century CE. The patterns observed in the mint analyses showed that the majority of small denomination coinage was minted in outside mints throughout the Empire and in coin molds throughout the province, not in Alexandria. Furthermore, the high percentage of outside mints does not match patterns in the rest of the Mediterranean, where mostly local mints provide the bronze currency. The low impact of Alexandrian coinage makes it clear that Egypt had a positive balance of trade, and that it was able to absorb much more coinage than it was providing.

The amphorae analysis, which measured the rate of imports and exports during the fourth century CE, showed that during the late third and early fourth century, Egypt produced and consumed its own wine, importing negligible quantities. After the 350s CE however, although Egypt continues a high production and consumption of its wine, it starts importing a substantial amount, namely wine from Gaza. This post 350s integration matches the coinage hoard patterns.

The textile chapter shows the literary and papyrological evidence available for the trade of Egyptian textiles as well as the challenges of quantifying it. Nonetheless the chapter demonstrates the centrality and importance of the textile industry as one of the main exported products from Egypt, which probably drove much of its economic output into other provinces.

While much analysis and research remains to be undertaken, it is evident that Egypt is unlike any province in the Roman Empire. The province connected Rome to India,

the East, and Sub-Saharan Africa, it was able to produce large quantities of agricultural products for the rest of the Empire, and it was a well-connected province thanks to the Nile. The historical and multidisciplinary approach of this dissertation helps to explore new methodological approaches for the study of the ancient economy, as well as placing Egypt front and center in the analysis of the Roman economy.

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CHAPTER ONE

Introduction:

Egypt in the study of the Roman Economy

On July 14, 479 CE, a ship left the port of Alexandria and headed for Smyrna. In the course of its trip along the coast of Asia Minor, during which it was probably scheduled to make numerous stops in port cities to either sell or buy more merchandise, the ship was surprised by a storm. One of its rudders broke as it hit a rock near the coast, presumably somewhere near Rhodes. The travelers aboard the ship were able to abandon their damaged boat and continue on their journey to Smyrna on another vessel, finally reaching their intended destination on July 23.[1]

This apparent delay seems to have been a cause for concern for the people waiting for the ship in Smyrna, who, to the benefit of ancient historians, visited an astrologer in order to ascertain the fate of the awaited vessel. The astrologer recorded details of the ship, including its cargo, which were copied over in books of horoscopes and preserved to the present in a 14th century manuscript by Eleutherios Elios.[2]

The cargo of the ship consisted of small birds (στρουθία) that were very volatile (πτερωτά), papyrus paper (χάρτην λιτόν), bronze cooking utensils (σκεύη μαγειρικά), and a chest full of medicaments (φαρμακοθήκην πεπληρωμένην).[3] This mélange of goods aboard the ship points not only to the multifaceted nature of ancient commerce, but also to a pair of products that were distinctively Egyptian, or, more specifically, Alexandrian: papyrus paper and medicinal goods.

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[1] Dagron and Rougé 1982, 130. I wish to thank Michael McComick for drawing my attention to this publication in particular.

[2] See reference 1 in Dagron and Rougé 1982, 117: Angelicus 29 (cf. *Catalogus Codicum Astrologorum Graecorum* [= CCAG], V/l, p. 4-57), f. 112r"v (ibidem, pp. 31-32) ; Laurentianus 28, 33 de 1542 (f. 235V- 236V ; cf. CCAG, I, p. 56) ; Ambrosianus B 38 sup., 15e s. (CCAG, III, p. 6) ; Vaticanus gr. 1057 from 1542 (CCAG, V/l, p. 73).

[3] Dagron and Rougé 1982, 130.

Dating a century earlier, to 354 CE, a chronicler detailing the cargo of another well-known ship, which had carried the obelisk that would be placed in the middle of the *Circus Maximus*, listed pepper, linen cloth, papyrus paper, and glass, all products which Egypt produced in abundance or redistributed in large quantities, as in the case of pepper.[4]

Although most of these products, with the exception of linen cloth, are not directly the subjects of this dissertation, I draw attention to these goods in order to demonstrate the inflow of Egyptian products in daily transactions in ports and Mediterranean marketplaces. These goods were commonly available in nearby port cities and, if we take at face value the Smyrnaeans' concern over a delay for a trip that took nine days in total, the transit time was in some cases not long by ancient standards. In this scenario, the communication network between Alexandria, Smyrna, and Rhodes seems very dense and active.

In light of these narratives, how can we understand the economic relationship between Egypt and the rest of the Mediterranean in the Roman period? How important and common were Egyptian products in other provinces? As we will see, the conjunction of the large scale of the Egyptian agricultural production paired with its access to water transport by the Nile, the Mediterranean, and the Red Sea makes its economy incomparable to that of any other province. How integrated then, was the economy of Egypt into the overall "Roman Economy"? Can we quantify ancient economic integration, or at least some aspects of it? If so, what approaches should we take and what are the limits or drawbacks of using the larger data sets we do (at least potentially) have, such as coins and ceramics? How can we begin to understand the scale of trade for commodities that leave no archaeological trace, such as

[4] I thank Federico De Romanis very much for pointing my attention to this text. See Chronogr. CCCLIV (*Chron. Min.* I p. 145 Mommsen): *Divus Octavianus Augustus imp. ann. LVI m. IIII d. unum. cong. ded. ter Ж CCCLXIIS hoc imp. navis Alexandrina primum in portu Romano introivit nomine Acatus, qui attulit frumenti modios CCCC, vectores MCC, piper, linteamen, carta, vitria et opoliscum cum sua sibi base, qui est in circo maximo, altum pedes LXXXVIIS excessit Nola*.

textiles?

The aim of this dissertation is to assess the extent of the economic integration of the province of Egypt with the rest of Roman Empire during the fourth and fifth centuries by analyzing numismatic, ceramological, literary, and papyrological evidence. As we will see, each data set will not only answer the question of the extent of economic integration in a different way, but furthermore the integration of different types of evidence will also point to new chronological horizons that do not match conventional political periodization, which, although they had been signaled before, required more data to designate them as new markers of periods of transition. I will present evidence, for example, arguing that the middle of the fourth century marks a period in which Egypt seems to have become much more fully integrated into the Eastern Mediterranean economies.[5]

Methodologically, this dissertation will also address many questions concerning the quantification approaches available from coins and ceramics in order to answer questions of scale, trade, and integration. I will show how combining different data sets is essential in order to refine our understanding of economic integration and market economies.

The Ancient Economy- A Brief Historiographical Overview

In order to explain the contribution that this study seeks to make, it is necessary to contextualize it within the larger field of the ancient economy. While I will mention influential texts and authors from the last century of scholarship, it would be a large project of its own to provide a thorough overview of the subject and its many themes.[6] Nonetheless,

[5] See the discussion on Bagnall and Bransbourg (forthcoming) in Chapter Two, and the conclusions to the ceramic analysis in Chapter Three.

[6] For a good recent chronological overview of the scholarship from the late 19th century until the present, see the section "Antike Wirtschaftgeschichte – 'ein akademisches Schlachtfeld'"in Reinard 2016, 35-53. While Reinard focuses the historiographical overview on the primitivist vs. modernist debate, he provides a thorough updated bibliography on the ancient economy, and furthermore points out how interconnected and influential many of the earlier books were for subsequent scholarship.

it is still essential to place this thesis within the right historiographical context so as to focus on the debates that particularly influence the ideas I will argue in the conclusions, namely that the quantification approach I provide attests the existence of many imperfectly integrated, interconnected, yet complex, economic markets in the Roman world.

Scholarship on the ancient economy is vast: the first overviews of the subject, which were largely devoted to analysis of the classical Greek and the Roman imperial economies, tended to focus in the beginning on describing the nature of the ancient economy, i.e., what drove economic exchange, agricultural production, and economic policies. Already in the late nineteenth century, the debate on the scale of the economy was framed in terms an *oikos*- house economy versus a modern and complex system. Karl Bücher[7] argued for the former, while Edouard Meyer emphasized that trade specifically allowed for the accumulation of wealth.[8] Patrick Reinard notes that Ulrich Wilcken, using papyrological evidence, also positioned himself against a "primitive" view of the ancient economy, but that his scholarship had little impact on this debate at the time.[9]

In 1926, Michael I. Rostovtzeff published his influential "Social and Economic History of the Roman Empire," in which he focused on the role of an identified bourgeoisie in shaping the ancient economy. This emphasis on the social agents of the economy would be also be central to the modernist vs. substantivist debate that Karl Polanyi[10] and Moses Finley introduced, and which continues to frame much modern scholarship in the debate about the *nature* of the ancient economy.[11]

[7] Bücher 1893, cf. Ruffing 2008a, I 1.
[8] See Reinard 2016, 37, cf. Schneider 1990, 423ff.
[9] Reinard 2016, 37 see footnote 72 on Wilcken 1912 and his influence on Th. Reil, *Beiträge zur Kenntnis des Gewerbe im hellenistischen Ägypten* Borna-Leipzig 1913 and M. Schnebel, *Die Landwirtschaft im hellenistischen Ägypten*, München 1925.
[10] Polanyi 1981.
[11] Finley, Moses 1973, 1985, 1999.

A very important work was undertaken by Tenney Frank in 1933 with his *Economic Survey of Ancient Rome.*[12] The multiple volumes, with separate authors, focused on different regions and provinces of the Empire and served rather as a catalogue of different aspects of the economy and the available evidence. The volume focused on Egypt, published by Allan Chester Johnson in 1936, was of utmost importance, as it gathered papyrological evidence for different industries and aspects of the economy, such as the evidence for trade. The work continues to serve as an important guidebook for known texts.[13]

In 1973, Moses Finley, heavily influenced by Max Weber and Karl Polanyi, and relying mostly on sociological approaches, published his Sather Lectures on *The Ancient Economy*, in which he set forth many influential and controversial views of the ancient economy as "primitive" and driven mostly by the social desire for status.[14] In Finley's view, the ancient economy was not centered on economic motivations, seeking profits or accumulation of wealth. The book encountered both positive and negative reactions and spurred a new quest for multiple approaches that seek to assess the scale and nature of the ancient economy, in some cases moving away from more theoretical sociological models. Henry Willy Pleket was one of Finley's earliest critics, followed by Dominic Rathbone and Hans-Joachim Drexhage, among others who have employed papyrological data to show the degree of economic rationality and sophistication evident in the ancient economy.[15]

In the early 2000s an overview of this scholarship was compiled and edited in *The Ancient Economy*, edited by Walter Scheidel and Sitta von Reden. While the quality of

[12] Frank 1933.
[13] Johnson 1936, ESAR Vol. 2.
[14] Finley published a second version in 1985 defending his views.
[15] Rathbone 1989; Drexhage 1991; Pleket 1984; Pleket 1988; Pleket 1990.

the articles, many by eminent scholars, was high, the volume had a more historical than a constructive aim, recapitulating much of the scholarship published in the 1990s.[16]

The utilization of New Institutional Economics and other models borrowed from modern economics has also become a significant trend in recent scholarship. Studying the organization of fiscal regimes and their performance as proxies for the functioning of the ancient economy was widely popularized by the recent edited volume by Monson and Scheidel, *Fiscal Regimes and the Political Economy of Premodern States*.[17]

The quantification approaches I use in this dissertation are part of a wave of studies focused on the Roman economy, which have sought to assess the scale, growth, performance, commerce, population size, urbanization, and a multitude of other aspects by integrating methods and different types of evidence. A major force in this effort has been the Oxford Roman Economy Project, which has produced a substantial amount of scholarship that has integrated archaeological evidence with texts and focused on the need to assess individual markets and small-scale questions in order to build up a larger, macro view of the economy.[18] Some of these issues were brought up by authors in the volume edited by Alan Bowman and Andrew Wilson, *Quantifying the Roman Economy: Methods and Problems,*[19] which has stimulated much debate. François de Callataÿ's recent edited volume, *Quantifying the Graeco-Roman Economy and Beyond*,[20] has also been particularly important for its fostering of a positive approach to quantification methods, statistical analyses, and models for understanding the ancient economy.

Long-distance trade has been integral to the study of the ancient economy since the nineteenth century, when scholars started debating how far the ancient economy was

[16] Scheidel and von Reden 2002, with the review by Edward E. Cohen, *Bryn Mawr Classical Review* 2003.11.23
[17] Monson and Scheidel 2015.
[18] Russel 2013.
[19] Bowman and Wilson 2009.
[20] de Callataÿ 2014.

mostly a domestic economy based on subsistence;[21] in fact, trade was one of the main aspects of the ancient economy which was used against this notion of a primitive economy.[22] Influenced by the discussion first started by Finley, Keith Hopkins' famous 1980 article, "Taxes and Trade in the Roman Empire, 200 BC-AD 400", sets out a model of how the Roman state was actively involved in the formation of prices in the market. According to Hopkins, Rome's imposition of taxes paid in money increased the volume of trade in the Roman Empire. Then as money was spent outside of the taxed provinces, these were forced to seek money with which to pay their taxes by exporting goods of comparable value. This stimulated competition among regional economies, which developed further the manufacture of goods, and led as well to an increased scale of production. Furthermore, the need for more transactions encouraged the use of coinage among the population. Although it received significant criticism, this article marked the beginning of a new trend in scholarship for seeking economic models that integrated numerous types of evidence in order to nuance the functioning of state economies.

These articles and books published within the last two decades focus in large measure on micro approaches to the ancient economy. Two books, however, have recently attempted to offer an overview of the functioning of the whole Mediterranean as an economic system. Inspired by Henri Pirenne's thesis on the formation of Medieval towns, Michael McCormick's *Origins of the European Economy, Communications and Commerce AD 300–900* combines excavated material as well as literary sources, most notably the accounts of 669 travelers, to explain the process of the formation of the medieval European economy from Late Antiquity to the time of Charlemagne. The book uses substantial databases, flowcharts, histograms, and percentages of quantified data to back up larger historical claims

[21] Reinard 2016, 36 on Bücher.
[22] Reinard 2016, 37, on Meyer.

seen in the literary sources.[23] Nicholas Purcell and Peregrine Horden's *The Corrupting Sea* introduced the term *connectivity* to describe the relationship between the various microecologies around the Mediterranean and the ways in which they were intertwined. The authors claim that the diverse regions of the Mediterranean Sea were, overall, well-integrated in terms of communication and economic exchange from the Classical Age into the Early Medieval period.[24] Connectivity and interdependency among the different regions of the Mediterranean are thus a fruitful topic in economic history and have become a central point in scholarship concerning the nature of the Roman imperial economy.

It is a curiosity of ancient historical studies that Egypt has played only a marginal role in much of the high-level debate about the ancient economy, even though it has much evidence to offer and this evidence has been the subject of a lot of scholarly investigation. Because of the aridity of its climate, Egypt is by far the Roman province with the most varied types of archaeological evidence: tens of thousands of papyri have been preserved, as well as other perishable organic materials such as textiles and even spices. Egypt, therefore, offers the rare opportunity to study the materials present in the archaeological record themselves alongside aspects of their manufacture, production, and trade. Since the texts preserved on the papyri are predominantly documentary in nature (e.g., tax and purchase receipts, accounts, and lists of various kinds), they contain information on different aspects of the administration of Egypt as a Roman province and the workings of its economy.

Given the richness of the Egyptian evidence, it is indeed perhaps surprising that the seminal works on the economy and political structures of the Mediterranean to which I have referred have left out the important economic role that Egypt played in supplying the Empire. Furthermore, the use of model-oriented approaches limits engagement with archaeological, numismatic, or documentary evidence in works such as Horden and Purcell's

[23] McCormick 2002.
[24] Horden and Purcell 2000.

The Corrupting Sea. McCormick engages substantially with archaeological evidence, but because his research focuses on connections between East and West, focusing on the fracturing and recreation of the unity of the Mediterranean, he offers only limited analysis based on Egyptian material.

Therefore, in order to give Egypt a role in discussions of the Roman economy more consonant with its wealth and productivity, this dissertation aims to analyze aspects of the extent of economic integration between Egypt and the rest of the Roman Empire during the fourth century by means of case studies in the papyrological, numismatic, and archaeological record. Egypt acted both as a nexus for this wide trade and as a producer of staple goods, such as grain, which fed the Roman population around the Mediterranean, and linen, used for trading with India and Sub-Saharan Africa and for clothing the Roman army. We will focus on the role of the city of Alexandria and on the fourth century CE—a period rich in evidence. This period was also a crucial era, begun with Diocletian's empire-wide economic reforms, which changed the administration of the Roman economy in general and laid the foundation on which the European and Mediterranean economy of later periods would be built.[25]

Though the analysis in each is driven by the question of economic integration, each chapter deals with different types of data. Chapter Two presents a database I have compiled of fourth-century coins found in Egypt, showing Egyptian mint and circulation patterns during the first period in its monetary history in which the province shared a common currency system with the rest of the Roman Empire. Chapter Three presents the evidence from ceramic assemblages throughout Egypt and in other regions of the Empire, showing the changing rates of importation and local production of wine in Egypt as well as the limited exportation of Egyptian wine to other regions. Finally, Chapter Four presents the

[25] McCormick 2002.

available papyrological and literary evidence for the economically important trade of linen outside of Egypt, a complex issue because textiles rarely survive outside of Egypt.

Defining Economic Integration and Market Economies

Before discussing economic integration, I should explain how I am using the terms "market" and "market economies," as these terms will appear in the conclusions of this dissertation. In the abstract sense of the term that I will use throughout this dissertation, a "market" may be defined as a system in which parties engage in constant economic exchange.[26] For example, when I speak of a textile market, I mean the variety of mechanisms through which a textile is traded, purchased, and sold in a defined geographical area. A market economy is an economic system in which prices and decisions pertaining to a particular good or service are driven by the natural, aggregate interactions of individuals and businesses, i.e., supply and demand. A market economy is therefore, by definition, not controlled by a central state or body of governance.[27]

The term "economic integration" has become common in recent historical analyses. We can trace the basic economic rationale to David Ricardo's 1817 book *On the Principles of Political Economy and Taxation*, in which he first introduced the idea of Comparative Advantage, i.e., the potential gains and benefits a certain region may have with respect to a particular product it is able to produce it at a lower cost than other regions, both parties thus benefitting from trading it rather than each party producing it independently. Heavily influenced by Ricardo's analysis, modern economic theory has recently adopted this comparative regional-based approach to understanding the relationship between different

[26] Johnson 2005.
[27] Ibid.

regions of the world.[28]

In the most abstract and strictest definition, economic integration means the unification of prices and economic policies regarding trade, such as the removal of tariffs, with the end goal of increasing productivity through trade between separate economic entities.[29] In this dissertation, however, I will not focus on prices, since our data tends to be skewed heavily towards prices in Egypt; even for grain we have far fewer prices outside Egypt. Rather, I focus on economic proxies that provide evidence for trade and exchange, such as coins and ceramics.

Integration is an ambiguous and intentionally vague term: often, scholars include it among aspects of social integration, while others apply strictly it to international cooperation and collaboration, and some even assume a certain level of economic integration based on the mere existence of trade between independent economies.[30]

The Influence of Taxed Grain on Egyptian Trade

Before I begin to discuss the evidence for the importation and trade of specific Egyptian products, as well as the distribution patterns in the coinage supply, it is imperative to address, albeit briefly, the grain market, and particularly how it has been used to understand economic integration in the Roman Empire.

Grain was both the most important and by far the most studied economic contribution the province of Egypt provided to the Roman state. When Egypt was the base of the Ptolemaic Kingdom, long before it became a province of Rome, it supplied substantial

[28] Suranovic, S. (2010, May). International Trade: Theory and Policy, v. 1.0. Retrieved January 23, 2018, from https://catalog.flatworldknowledge.com/bookhub/28?e=fwk-61960-ch02#fwk-61960-ch02_s02

[29] Balassa 2013, 2.

[30] The topic of modern economic integration and the usage of the term is complex and vast; for a more in-depth analysis of the usage of economic integration in economic and historical analyses see the bibliography in Balassa 2013.

amounts of grain to maintain the growing capital city of the Roman republic.[31] Once annexed to the Empire by Augustus in 30 BCE, the province retained a special status compared to other provinces in the Empire: it maintained its own currency system, and even the visits of senators to Egypt had to be approved by the Emperor himself.[32] These measures have fostered a modern view of Egypt as isolated from the rest of the Empire. At the same time, its abundance of data available in the form of papyri necessitated the formation of the field of papyrology and its specialists to dedicate themselves particularly to the edition of these texts. Since the majority of available papyrological texts survive in Egypt, it has fostered a misguided view that the information the papyri offer is only applicable to Egypt, even when the texts are dealing with larger imperial Roman policy.[33] This view has permeated historical analyses, as previously mentioned, which has meant that Egypt's economy and relationship to the rest of the Roman Empire have for the most part been discussed in relation to the supply of grain in the form of the Annona tax.[34]

The term annona refers to the annual crop yield, but it slowly evolved to mean the tax on land production as well as the subsidized distribution of grain in the city of Rome or to

[31] Gruen 1984, 63 and 691.
[32] Presumably to prevent any more usurpers from claiming the throne; the civil wars during the reign of Cleopatra made it clear that Egypt was prone to revolts and divisions.
[33] Documents of the same nature survive elsewhere, of course; for example, contracts written on leather and parchment survive from Bactria; papyri also survive on a much smaller scale from other provinces of the Empire, like North Africa and Gaza. The range of economic information coming from Egypt is greater, but it does not mean that there is not valuable information for documentary life in other provinces. For more on this see Bagnall 2011.
[34] In Erdkamp 2004, 206-258, a chapter of his book "Rome and the Corn Provinces," the author states that poor market integration is the driving force behind the relationship between Rome and the grain producing regions of the Empire. He states that Sicily and Egypt were essential for supplying Rome. Erdkamp concludes that 30-40% of Egyptian and Sicilian grain was taken as taxes-in-kind, an amount that was not oppressive to the native farmers, though this figure seems a bit high as overall numbers. How much this would have affected the price of the leftover grain to be sold by the farmers remains to be studied.

rations provided to the military.[35] During 133-121 BCE, the Gracchi brothers offered grain at a subsidized price to citizens in the city of Rome, a move that Cicero criticized 75 years later as an attempt to buy the votes of the poor (*Off*. 2.21.72). Versions of the grain subsidy continued until 58 BCE, when the tribune P. Clodius Pulcher converted it into a free handout.[36] Although Augustus boasts in the *Res Gestae* that he paid cash bonuses to those eligible for the dole, Cassius Dio tells us that the emperor actually restricted the recipients of the grain to 250,000 citizens (out of a population of, presumably, a million).[37]

The grain supply, tax, and trade, in the form of the Annona, have been discussed substantially in the past. The most recent overview of the topic is Paul Erdkamp's *The Grain Market in the Roman Empire: A Social, Political, and Economic Study*, published in 2005. While the book focuses particularly on Rome itself and the distribution of grain within the city, Erdkamp discusses the role Egyptian grain played in the Principate: it not only made up the majority of the grain distributed within Rome, it also constantly provided grain to cities in the east (though probably not tax grain) and presumably also to troops stationed there.[38] The most relevant aspect of Erdkamp's book in relation to this dissertation is the role that the taxed grain played in the Mediterranean grain market and its trade. Erdkamp argues that the taxation in kind and transportation of taxed grain to Rome heavily influenced the grain market, creating particular communication channels and trade patterns and forcing Egypt to focus on grain production.[39] The importance of grain in the Mediterranean economy cannot be overstated, but this does not mean it was necessarily the most valuable product, as Bransbourg has noted:

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[35] Annona was personified as a minor goddess of ancient welfare and appeared often on coins holding a basket and a cornucopia with a ship in the background, personifying the importation of grain from foreign provinces to be able to feed the people of the city of Rome.
[36] Nicolet 1980, 192-195.
[37] Res Gestae 15, Cassius Dio 55.10.1, see Stern 2013, 446-447.
[38] Erdkamp 2005, 225-237.
[39] Ibid., 237.

> The grain market was undoubtedly the largest market by volume in the ancient Mediterranean world, although we cannot be certain it was always the first in value. A single ship engaged in the Indian trade was able to carry close to HS 10 million in value. This is equivalent to about 2.5 million modii of grain at the likely second-century A.D. Italian price and 4 million modii at Egyptian prices. This is about the volume of the entire annual Sicilian first tithe as reported by Cicero[40]

The relocation of the capital from Rome to Constantinople in 330 CE also affected the directionality of the grain trade,[41] although Rome still required substantial grain and strong commercial ties continued via the port city of Ostia. An indication of the effect the extraction of taxed grain may have had on the grain market in the East comes from the Theodosian Code, section 13.5.7. The law, dated originally to December 1, 334, established the rules for the recently instituted transfer of grain to Constantinople from Alexandria. The shippers in charge of the transfer, the *navicularii orientis,* were compensated with 4% of the grain transported, in addition to one solidus per one thousand modii.[42]

As pointed out by De Romanis, this 4% of the grain would undoubtedly have been sold in the private grain market, but its price could have potentially been more competitive than non-subsidized grain, affecting the price of the available grain in the market.[43] The payment of the single solidus could also explain a reliable mechanism by which solidi entered the Egyptian territory, a point to which I will return in the next chapter. Because of these and many other considerations, the integration of the Roman grain market remains a controversial issue in modern scholarship.

Peter Temin, an economist of the modern world, has recently used econometrics to argue that the Roman grain market was an integrated and efficient market dominated by the city of Rome, and that the price of grain was therefore directly affected by its shipping distance from Rome. Identifying Rome as an economic magnet force implies a certain

[40] Bransbourg 2012, 4.
[41] Erdkamp 2004, 206-258.
[42] CTh.13.5.7.
[43] De Romanis, personal communication.

cohesiveness of the Empire's economy and describes what a modern economist would identify as an integrated market economy.[44] Gilles Bransbourg has challenged Temin's Rome-centric model by using additional price information to create a larger data set that adds more complexity to the model, thereby showing that the Roman economy was not fully integrated. Bransbourg argues that, although the Mediterranean Sea created some meaningful integration along a few trade routes, "it is not possible to identify pure market forces that existed in isolation, since the political structures that maintained the Empire strongly influenced the movement of money and trade goods."[45] Temin's theory was also refuted by Jean-Michel Carrié, who argued that the Late Roman Empire did not have one market economy, but instead many that were interconnected. Carrié's conclusions align with those of Horden and Purcell in the sense that both argue that the combination of micro systems worked together to create a more complex and multifaceted economic system.[46]

Peter Bang, on the other hand, argues that market integration in the Roman world was extremely low because of high transaction costs, such as the cost of long-distance transport and the slow speed of information exchange. Bang classifies the Roman Empire as a Tributary Empire in which wealth moved from one end of the Empire to the other only through the tribute extracted by the state from its territories.[47] To reach this conclusion, however, Bang omits archaeological and documentary evidence that would undermine his conclusions, which have encountered criticism. Taco Terpstra's published dissertation on trading communities in the Roman world, for example, directly challenges Bang's claims of an inefficient communications network in the Empire by presenting a basic model in which groups of traders with a common origin organized themselves both abroad and at home to

[44] Temin 2012.
[45] Bransbourg 2012.
[46] Carrié 2012.
[47] Bang 2008.

facilitate trade through interchange of information and the creation of trust networks.[48] Likewise, Patrick Reinard's recent study of papyrological letters show that even when apart from the closely defined merchant communities, there was a dense network of communication specifically aimed at acquiring information in order to conduct trade and travel within the province of Egypt.[49]

Accordingly, then, economic integration studies of Ancient Rome have focused on the grain market, for which we have the greatest quantity of price information and which naturally lends itself to analyses focused on price comparison. However, as I have noted briefly, Bransbourg's reaction to Temin's conclusion of an integrated market rightly points out that the grain market was not a proper free market economy in the sense that modern economic historians use the term. The rate of taxation and extraction and transportation from Egypt to Rome meant that the communication and trade channels between Egypt and the rest of the Mediterranean were heavily influenced by this non-commercial enterprise, affecting not only the grain price in Rome and Egypt but the entire structure of Mediterranean commerce.[50]

Thus, there are various points to keep in mind in looking at the evidence from coinage, ceramics, and textiles and what they can say about the role of other Egyptian products in the Mediterranean. First, one has to keep in mind how much trade was free and private and how far it was affected by the state. The available trade routes were heavily influenced by grain movement connected with the annona. Therefore, the distribution of tax grain, which is neither commerce nor trade, influenced communication between regions. Shippers operated under contract to the Roman state. Their ability to provide information about specific markets could have lowered transaction costs for certain trade routes but not

[48] Terpstra 2013.
[49] Reinard 2016.
[50] See footnote 34.

others. Moreover, merchants would not have come have back with empty ships after having delivered grain to Italy, for example.[51] I will suggest in the following chapters the impact of shipments to Constantinople on the movements of coinage and ceramics in the eastern Mediterranean.

The Economic Role of Alexandria during Late Antiquity

For a city as important as Alexandria was, it is remarkable how little archaeological material there is available. The political and religious importance of Alexandria during Late Antiquity has been the subject of past scholarship, and much has been written about its philosophers, mathematicians, and theologians, as well as art, but much less about its economic role.[52]

While recent excavations and underwater surveys around the harbor have revealed important and interesting information, such as the development of the port during the Hellenistic period,[53] there is still much we do not know about how Alexandria functioned as a major economic center or the influence it had over the overall Roman economy. Literary sources abound, but they are only occasionally interested in the economy. No papyri have been found in the city, and because it continues to be a major population center in modern Egypt, excavations in the urban quarters and its environs are nearly always done on a limited scale and quickly, as they tend to be salvage excavations. Nonetheless, as we will see from

[51] Personal communication Erdkamp, January 11th, 2018. For evidence of grain ships coming back to Egypt from southern Italy with luxury textiles see Andorlini 2016.
[52] For an overview of social relations in the city during Late Antiquity see Haas 1997, who manages to gather much literary information, in order to build a picture of Late Antique Alexandria. but he focuses mostly on the social and religious aspects, making few remarks about the economic role of the city.
[53] It is also important to mention the proceedings *Alexandria and the North-Western Delta,* edited by Damian Robinson and Andrew Wilson and published in 2010. The volume gathers important research on the material culture and archaeological surveys of Alexandria up to that date.

the ceramic evidence presented in Chapter Two, these salvage excavations have provided interesting ceramic assemblages.

Kom el-Dikka is perhaps the most important Late Roman archaeological site in Alexandria, actively excavated by a Polish-Egyptian team that has been working on the site since the 1970s. Important urban structures, most notably the theater and auditoria, or classrooms, have been uncovered, as well as domestic contexts.[54] The domestic contexts have shown household and urban production of goods.[55] For example, glass workshops with a large variety of glass vessels and bottles that offer glimpses into glass industry in the city have been identified.[56]

While no documentary evidence has been found in Alexandria, there are papyri found in other regions of Egypt, which were written in Alexandria. These continually point to Alexandria as a center for redistribution and commercial transactions in Egypt. For example, P.Oxy. Hels. 40, which is dated between 225 and 275 CE and will be covered much more extensively in Chapter Three, mentions the shipping of large amounts of clothing to be further processed. The intended destination is not specified, but it is assumed to be Alexandria.[57] Another well-known papyrus, dated to the second century CE, is a papyrus, which reflects a voyage from Berenike to Muziris and back. The trip originated and ended in Alexandria, via Coptos. The total value of his cargo is estimated at 7 million sesterces, and we know regular various shipments were sent to the rest of the Roman Empire via Alexandria.[58]

There is also substantial papyrological evidence from other regions of Egypt concerning leases, commercial transactions, and orders of goods to be acquired in the city of

[54] Kiss 2010.
[55] Majcherek 2010.
[56] Kucharczyk 2008, 56-69.
[57] Van Minnen 1986.
[58] De Romanis 2014; Rathbone 2000, 49. According to Rathbone's calculations, this is roughly the equivalent of 769,650 artabas of wheat or 23,320 tons.

Alexandria specifically. Too many exist to list in this introduction, but they further demonstrate the economic importance of Alexandria.[59] But none of this papyrological evidence gives a useful basis for quantifying any aspect of Alexandria's economy.

A particularly notable literary source for the city is the *Expositio Totius Mundi et Gentium*, a fourth-century "commercial geography" arguably written by a textile merchant from Alexandria or Syria that provides a simple yet contemporaneous view into the economic and commercial world of Alexandria:

> "Alexandria is a very large city, outstanding in its disposition, abounding in all sorts of goods and rich in divine foods. Its inhabitants dine on three types of fish – a thing which the rest of the province does not have – river, lake, and marine. All types of spices and other barbarian trade goods abound in it. Beyond the capital can be found Thebes, in which the nation of the Indians dwells, and because all kind of things can be found here, it precedes all other (cities)." [60]

A similar view of the cosmopolitan and economically diverse aspects of life in Alexandria comes from a letter in the *Historia Augusta*:

> "The city is great, splendid and luxurious. No one here lives idly. Some are blowers of glass, others are makers of writing tablets, yet others linen weavers. Everyone is master of some trade and attached to the service of it. There is work for those suffering from gout; there is work for the blind. Even those whose hands are paralyzed find something to do. Their only god is money. That is the god whom all—Christians, Jews, pagans all alike—really worship. Would that this city were endowed with better morals—it would be worthy of a city which has the primacy of all Egypt in view of its fecundity and its greatness."[61]

There are authorship issues with the *Historia Augusta* which I discuss in the treatment of textiles in Chapter Four, but at the very least the image of an economically multifaceted Alexandria is quite apparent.

In light of these literary references, we therefore know a bit superficially about the economic aspects of Alexandria. The city housed weavers' quarters, glass producers, an

[59] For more papyrological evidence concerning the relationship between Alexandrians and the rest of Egypt during the Roman period see Abd el-Ghani 2004.
[60] Translation by Grüll 2014, 632, which is a revised version of Earle Jesse Woodman's translation (1964: 33–35).
[61] Scriptores Historiae Augustae, Saturninus 8.8.

imperial mint, a major library, and numerous religious and scholarly institutions,[62] but it was also a major Mediterranean port where goods coming from India and Sub-Saharan Africa were redistributed.

Indian Ocean Trade

The trade between Egypt and areas to the east, including East Africa, Arabia, and India, will surface from time to time in our investigations, but it remains peripheral to our goals here. The main reason for this is that, while it is very relevant to discussions of the overall Egyptian economy, trade between Egypt and India is not central for the integration between Egypt and the rest of the Roman Empire. Furthermore, the India trade needs to be seen in the context of Roman relations with other regions between Rome and India,[63] namely the Persian Gulf, Central Asia, and regions in Bactria, as well as the Meroitic and Axumite kingdoms.[64]

Nonetheless, the long-distance trade during this period, based in the ports of Berenike and Myos Hormos on the Red Sea Coast, is not completely irrelevant to our purposes. Egypt acted as a conduit for luxury products imported from India, the Persian Gulf, and Sub-Saharan Africa, which were sent along the Eastern Desert roads to Coptos and then shipped down the Nile to Alexandria, whence they were redistributed on to the rest of the Empire. We know from the aforementioned Muziris papyrus that the value of the products

[62] See note 51 above. For the scholarship of the various scholars and philosophers and their schools see Gwyn 2012 on Athanasius of Alexandria.
[63] For the Rome and India connections see: Sidebotham 2011, which offers a synthesis of the Berenike excavations; De Romanis and Maiuro (eds.) 2015, which is the product of a conference at Columbia; Mathew 2015, an edited volume with some new ideas; Gurukkal 2016, which offers a view of the trade from political economy perspective.
[64] Edwards 1998; Eivind 2016, which is a compilation of the evidence relating Palmyra to the Persian Gulf; McLaughlin 2010, which offers a large catalogue of the Classical sources.

was taxed at high rates,[65] and we also know from archaeological and documentary evidence how heavily patrolled and guarded the Eastern Desert roads were during the Roman Period.[66] This constant presence of the army represents the interest of the Roman authorities in protecting these trade routes and, at least on an administrative level, a commitment to the infrastructure of integration.

Egyptian goods, and particularly textiles, featured widely in these trade routes, as is evident from sources like the *Periplus Maris Erythraei* and the *Expositio Totius Mundi et Gentium,* both which will be discussed at greater length in Chapter Four.

Through the Indian Ocean trade and the shipments of annona grain to the capitals of Rome and then Constantinople, we can observe a certain symbiosis in the exchange of different commodities. They generally travelled along the same preexisting networks of trade and communication and were therefore pulled to the same economic centers, though there are differences in the patterns for different goods, as we shall see from the data sets I have analyzed. I will discuss this more thoroughly in the Conclusions, particularly in terms of how we may interpret the different sets of evidence presented in Chapters Two, Three, and Four in light of the role of Alexandria as an economic center.

The Structure of the Dissertation

Egyptian commerce during the Roman period, and even during just the fourth and fifth centuries, is a topic too complex to cover in a single dissertation. I have chosen to focus on three of the possibilities in the following chapters. I plan to map out the extent of Egypt's network of commercial relationships by assessing the evidence from coins, ceramics, papyri, and textiles. This dissertation is the first step toward assessing a variably complex economic system, and therefore important industries will be left out of this analysis, namely glass,

[65] De Romanis 2012.
[66] Sidebotham 2011; see also Cuvigny 2003, an edited volume on Myos Hormos.

papyrus paper, and wood, the last of which Egypt did not produce in quantity and had to import from other regions of the Empire.[67] I will return to the commodities not covered in detail in the Conclusions chapter, but first I will lay out the structure of the evidence covered in Chapters Two, Three, and Four.

Why the Fourth Century CE?

While the literary evidence I use spans the entire Roman period, my evidence and analysis, particularly in the first two chapters, will be focused on economic integration during the fourth and fifth centuries. The chronology of this dissertation was largely determined by the numismatic evidence, because 297/98 acts as a *terminus post quem* for the possibility of studying the circulation of coins minted outside Egypt within Egyptian territory, allowing for a preliminary network analysis. I will discuss the intricacies of this much further in Chapter Two.

The chronology of the economy of the Roman Empire is very frequently split into periods before and after the third century CE. The first two centuries of the Empire are generally considered to have been a period of expansion and movement, which is reflected archaeologically in the wide variety of traded goods available from around the Mediterranean, and particularly from Spain and Italy.

The instability of the third century led to the radical political and economic reforms of Diocletian. Though short-lived, the tetrarchic system he created led to the rise in political importance of other major cities in the Mediterranean, such as Nicomedia, Antioch, and Alexandria. With the foundation of Constantinople, the new capital cemented the movement of the political center towards the eastern half of the Mediterranean, something that had already begun with Diocletian's use of Nicomedia as the *de facto* capital during his

[67] For archaeobotanical evidence on the use of wood in Roman Egypt see Vermeeren 1999 and Cappers 1999 in the same volume. See also Habermann 2000.

reign. The new capital meant a shift in the economic networks of trade, as there was now a new urban center in the East that necessitated communication with the rest of the Empire, as well as imported resources for its growing population.[68]

Diocletian instituted empire-wide economic reforms starting in 287,[69] one of which was a new set of coinages, in 294, and abolition of Egypt's isolated monetary zone, which took effect in 297/98.[70] For over six centuries, entering Egyptian territory had necessitated the exchange of currency at its borders. While this practice allowed very close control of the metal supply and the minting schedule, as well as the extraction of coinage within the province, it separated Egypt from the rest of the Roman Empire. Egypt's isolated economic status relative to the rest of the provinces was a characteristic that strongly challenged Diocletian's political ideal of a well-integrated empire. Furthermore, during periods of rebellion, usurpers were known to mint their own coins. Thus, after the revolt of L. Domitius Domitianus in 297/298, Diocletian could have perceived Egypt's separate currency system as an invitation for further political unrest.

The immediate effects of this reform on the Alexandrian mint will be covered in Chapter Two. On the one hand, the large quantities of fourth century CE bronze coins present in the archaeological record throughout Egypt (in both single finds and hoards) point to a large production of bronze coinage within the territory as well as to the utilization of coins imported from mints abroad, showing a positive balance of trade for Egypt. The archaeological record also provides thousands of coin molds, which have recently been interpreted as quasi-legal autonomous coinage minted in part by the army, and which

[68] Jones 1986.
[69] Carrié dates the beginning of his overall tax reforms to 287 CE.
[70] Although the coinage reform took place in earlier years (294-295 CE) in other provinces of the Empire. Schwartz 1963-1967 initially argued for the reform to have taken place in August 296 CE in Alexandria, based on his analysis of the coinage issued by the usurper L. Domitius Domitianus, but Thomas 1976 convincingly argued for the later date of the revolt in 297/98 based on papyri, ostraca, and literary evidence; the latter date is now widely accepted. See instance Geissen 2012, 561-583, and Staffieri 2005, 937-945.

circulated alongside Alexandrian coins and those minted elsewhere in the empire.[71] This currency change occurred around the same time at which the ceramic evidence points to a growth in Egypt's wine production and an apparent decrease in importation of wines, as will be shown in Chapter Three. Also, at this time, Egypt's robust textile industry, which is the subject of Chapter Four, profited much from the trade of linen, and began to feature cotton, a fiber that increasingly came into demand in Egypt and the Mediterranean world during Late Antiquity.

The extent to which Egypt's economy was closely tied to the various sectors of the Roman economy is the main question that will guide my analysis of the material evidence. Each main category of evidence necessitates a different methodological approach. In the following chapters I have separated the numismatic, ceramic, and the literary and papyrological evidence for textile production in order to address the different issues that arise when dealing with each class of material. In my conclusions in Chapter Five, I integrate the different types of data as much as possible in order to contribute to the broader historical narrative of the economy of Egypt as a Roman province during Late Antiquity.

[71] Lichocka 2005a; Soto, forthcoming. See also Carrié, 2003.

CHAPTER TWO

Egypt's Monetary Supply:

Formal, Informal, and External Sources

In March of 298 CE, Diocletian arrived in the province of Egypt. Official imperial visits to the province did not happen frequently, and therefore they were commemorated with the minting of gold coinages and other special rituals.[72] This visit, however, was not for celebration. Diocletian entered Egypt with his army in order to reclaim the province and end the revolt of L. Domitius Domitianus, a usurper who claimed the purple in Egypt during the summer of 297 CE but died some time later that year.[73] After Domitius' death, his revolt was continued by his *corrector*, a kind of governor's office for some eastern provinces tasked with the implementation of Roman administration, Aurelius Achilleus.[74] As Achilleus was in charge of the fortifications at Alexandria, Diocletian was unable to reclaim the city and the rest of the province of Egypt until March 298. The exact causes of the revolt are debatable, but they were at least in part due to the economic reforms and taxation policies that Diocletian had recently instituted, one of which directly targeted Egypt's isolated monetary zone and its monetarily separate status among the provinces. Domitianus' revolt represented perhaps the last obstacle in the way of Diocletian's long-term goal of stabilizing, unifying, and streamlining the finances of the Empire.[75]

Egypt was vulnerable not only to civil strife, but also to incursions by the Blemmyes and Nobatae, whose constant attacks across the Nubian border threatened the

[72] For imperial visits to Egypt see Millar 1992, 28-40.
[73] Barnes 1981, 17.
[74] Correctors were eventually replaced by the title consularis, though it seems the office was maintained and appears regularly in documents. The Notitia Dignitatum, dated to 400 CE for its Pars Oriens, lists a corrector for the province of Augustamnica. For an extended definition and bibliography, as well as history of the office of the corrector in Late Antiquity see Palme 1998, 123–35.
[75] Ermatinger 1988.

southernmost frontier of the Empire. That summer Diocletian travelled up the Nile and visited Oxyrhynchus and Elephantine and procured a peace treaty with the Blemmyes and Nobatae in exchange for an annual gold subsidy and the establishment of a new border at Philae, which appeased the tribes. He then left Egypt in a much more stable political state than when he had come and joined Galerius in Mesopotamia. [76]

Diocletian's visit to Egypt is crucial in that it shows the Emperor's general strategy for the Roman Empire in a single series of events. Stability in Egypt was important not only to protect its much-needed grain supply, but also for other major industries that supplied the empire and its army with goods, such as linen (and rope), papyrus, and glass. The revolt in Egypt and Diocletian's journey to the province highlighted the central role Egypt played in the stability of the Roman Empire. With his imperial presence and radical economic reforms, Diocletian is portrayed in scholarship as the harbinger of a new era of Egypt's intended inclusion and integration into the rest of the Empire. The inception of a newly reformed coinage replacing Egypt's closed currency system and isolated monetary zone was one of many new political and economic policies instituted in this time. The drastic changes that were brought about in Egypt, and the resistance with which they were met, are perhaps the most tangible illustration of Diocletian's radical overhaul of the Empire's finances and infrastructure. Although the coinage reform of Diocletian was initially established in 294 CE throughout the Empire, the production of tetradrachms with Greek legends ended only in 296, and the full coinage reform did not take place in Egypt until 297/298 CE, presumably because of the revolt of Domitius Domitianus.[77]

But what were the results of Diocletian's reforms? How did they affect Egypt in particular, and what knowledge about the Roman Empire can we gain from foregrounding the

[76] Southern 2015, 150.
[77] Geissen 2012, 563. See also footnote 113 below for a more information on the dating of the reform in Egypt.

effects of the reform in Egypt? This chapter aims to approach these questions by analyzing currency circulation in the fourth century, starting right after the reform of Diocletian in 297/298 and ending at the beginning of the reign of Theodosius I in 388. Through the analysis of coin finds, we will explore how integrated the monetary system of Egypt really was with those of other provinces during this first century after the reform. The main dataset for this investigation is generated from a large quantity, namely 30,000, of fourth-century coins found both in hoards and as single coin finds in Egypt. But, as we will see, this chapter also brings to light the complexity of such an analysis, particularly because of the difficulty of attributing coinage to specific years, rather than to a broad range of years. From the database and other hoards that are considered in this chapter we see the extensive use of coinages from mints outside of Egypt throughout the fourth century. While the Diocletianic reforms of coinage must have had an effect on the monetary integration of Egypt into the empire, the immediacy with which other coinages appear in the province attests to an integration and connectivity between Egypt and other provinces that must have already been in place before the currency reform of 297/298.

Using Roman Coins as Evidence

Ancient coins possess numerous physical, pictorial, and epigraphic attributes that lend themselves to historical analyses, especially if they are seriated and considered as a corpus. Every Roman coin has a metal content, weight, denomination, iconography, and textual inscription, which make possible multiple economic, political, and sociological inquiries. More specifically, Roman Imperial coins also bear the name of the city in which they were minted; it is this characteristic, along with the type of metal used, that is the most important for circulation analysis, since it points at each coin's provenance.

Some coins were found within a known archaeological context, while others are at least known to have come from Egypt. Since the core aim of this analysis is to assess the relative strength of the connection between each minting city and Egypt, I utilize coins found as single finds in archaeological contexts as well as those discovered in hoards, whether or not the hoards have specific contexts. The most important characteristics for this analysis of circulation patterns are the coins' minting years and places, their find spots within the Egyptian province if known, and their denominations and metal types. As we will discuss further on this chapter, bronze and gold currencies had very different usage patterns in antiquity, and thus their circulation patterns, even if similar, may have different economic implications.

Not all cities in the Roman Empire had mints, but the most politically and economically important ones did.[78] Before the reorganization of imperial mints under Aurelian, the minting of Roman coins was done in a semi-autonomous manner in the provinces, meaning that each provincial city with authority to mint was able to control their coinage's imagery but maintained the regular weights and standards used across the empire. This civic coinage production seems to have abruptly ended between the reigns of Aurelian (270-275) and Tacitus (275-276) and was finally abolished with the economic and monetary reforms of Diocletian.[79] From this point on, only imperial mints were official, and these

[78] Throughout the first 350 years of the Roman Empire, civic coinages played an important role in the Eastern provinces of the Empire and circulated in tandem with imperial coinages, which were mostly minted in Rome. Egypt is the exception to this, of course, as it maintained a closed currency system and used different denominations, weight, and even metal for its coinage. It also had only one mint, Alexandria. For a full understanding of how Roman Provincial Coinage functioned see the *RPC* volumes (I-X) published since 1992, or see the online catalogue project "Roman Provincial Coinage Online" http://rpc.ashmus.ox.ac.uk/project/.

[79] For more on this analysis of mints see Harl 1996.

produced uniform types of coins with similar, if not identical, imagery.[80] There is evidence of over 20 mints that were active during the fourth century within the Roman Empire.[81] Each mint would also have numerous *officinae*, or minting workshops, and issues of coins consistently changed when a new Emperor came into power or when a new large supply of coinage was issued. The iconography depicted in the coins has attracted the attention of numismatists and art historians alike, and has become a subfield of its own, as the images displayed in coins were often tied to the promotion of local and regional identity on a social, political, or religious level.[82] While some iconographies, especially depictions of the sitting Emperor, were employed at multiple mints, the diverse markers of each series (denomination, mint, officinae, year minted, and iconography) meant that there was always great variety in the typology of coinage in circulation across the Empire at any particular moment, even after the end of autonomous coinage.

Over recent decades, numismatic scholarship focusing on the typology of Roman coinage has produced a generally accepted chronology of the types of coins issued by the Roman Empire, though new ones continue to be found and identified.[83] The multi-volume series of *Roman Imperial Coinage* (RIC), *Roman Provincial Coinage*, and *Roman Republican Coinage*, catalogue the typology of coins minted in the Roman Empire from the

[80] For an introductory discussion of the control exerted on mints during this period see *RIC* VI, 88. This was published in 1967 but is still relevant; for a more updated bibliography on the matter see Johnston in Metcalf (ed.) 2012.
[81] According to the RIC volume typology, there were 20 official imperial mints active between Diocletian and Theodosius I: Londinium (London), Treveri (Trier), Arelatum (Arles), Lugdunum (Lyon), Ticinium (Pavia), Aquileia, Mediolanum (Milan), Roma, Ostia, Carthago, Siscia (Sisak), Sirmium (Sremska Mitrovica), Serdica (Sofia),Thessalonica, Heraclea (Marmara Ereglisi), Constantinople (Istanbul), Nicomedia (Izmit), Cyzicus (Erdek, Turkey), Antiochia (Antakya), and Alexandria.
[82] For an updated bibliography, historiographical introduction, and overview of the iconography of Roman coinage see Elkins 2009.
[83] According to OCRE, over 43,000 types of coins have been identified; see website http://numismatics.org/ocre/?lang=en.

third century BCE until the fall of the Roman West in 491 CE.[84] These works have become central to the study of the chronology and typology of Roman coins. Each volume deals with a chronological period, which is then divided geographically by mints. In more recent years, the "Online Coins of the Roman Empire" database has been developed. The project, jointly developed by the American Numismatic Society and the Institute for the Study of the Ancient World at New York University, records every published type of coin in *RIC* volumes between 31 BCE and 491 CE. Due to the substantial groundwork done through the *RIC* volumes and OCRE, the identification and cataloguing of the types of coins found in archaeological excavations and in museums has become easier, which has fostered and strengthened the field of numismatics overall.

The numbers of coins produced per type is another, much more complicated question; it is even debated whether this can be determined. At a minimum, determining production levels necessitates a die-study, which requires formidable patience for the numismatist. In a die study, all known and identical examples of a specific type of coin are studied and compared with each other in order to be able to determine how many dies were used to strike that particular issue. Because this was a pre-industrial society, no two dies are identical, even if they depict the same iconography and other elements. It is possible, and indeed normal, for two coins to belong to the same issue and to have been minted at the same place, but to have been struck using different dies. The numbers of coins that could be produced by a single die before it lost its ability to mark clearly has been estimated based on modern experiments meant to replicate ancient minting conditions.[85] As the coinages I will

[84] The Roman Empire continued in the East, but historiographical analysis has labeled this as the Byzantine Empire. The *Roman Provincial Coinage* series stops at 294 CE.

[85] Since I am not quantifying the coinage in circulation in this chapter I only briefly touch upon this point. The debate about die output is not without its controversy, due to the high spectrum of uncertainty surrounding the amounts produced from each die. There are two main articles by François de Callataÿ that offer a balanced yet optimistic view of die studies. These were written sixteen years apart, reflecting both the development of the field and also

be analysing in this chapter are from incredibly large issues, as is evident from the quantity of coins found, no die studies have been done yet. Therefore, I will not try to quantify the coins of one type issued in a specific city, but more simply to compare the number of coins coming from each city/mint represented in the archaeological record in Egypt. This fact undoubtedly limits the scope of understanding the production of each mint. For example, we will see the mint at Antioch represented substantially in the eastern Mediterranean, but in relatively smaller quantities in the Peloponnese, where the mint at Thessalonica generally supplied most of the region's coinage during this period. Rome continued to be an important political and commercial center even after the moving of the capital to Constantinople, and we can see coins minted at Rome scattered throughout the Empire. But without a die study we cannot infer which imperial mint minted more coins in a somewhat objective (if problematic) manner. Mint activity in this period, therefore, can only be measured by looking at circulation patterns in various regions during a set amount of time, while also taking into account distance, military presence, proximity to large bodies of water such as rivers and oceans, and economic activities that might have fostered exchange.

Hoards vs. Single Finds

Hoards and single finds are depositional patterns that present their own challenges, and it is important to keep the differences in the nature of their deposits in mind when making larger historical claims. Hoards are groups of coins that were purposely deposited in a storage space. They can be found buried in the ground, stored in wooden boxes, ceramic pots, cloth bags, or even hidden away inside the walls of temples and houses. The length of time over which coins were deposited varies substantially: they could be

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the continuity of the controversy over this issue. See de Callatay 1995 and 2011 for the development of the question of quantification of coinage production. T.V. Buttrey presented the opposite viewpoint in a series of articles, see Buttrey 1993, 1994; and Buttrey and Buttrey 1997.

accumulated slowly and steadily over the course of months or years, or they could be stored together all at once in cases of political instability or a rapid recall of coinage. Analyzing the chronological span of the coinage in the hoards along with patterns of wear on the coins can demonstrate the probable length of time for which a coin was in circulation, in the case of an outlier older coin found with later issues. A tighter chronology can perhaps indicate a rush deposit, which may suggest a more desperate situation. A somewhat well distributed, even chronology can point to a continuous deposit. Nonetheless, even with all these variances, what defines a hoard is the purposeful nature of the storage of the coins.

Single finds, or, as they are commonly called, stray finds, are coins that are found by themselves in the archaeological record. Most of them were not specially stored and seem rather to have been lost and left behind by their unfortunate owner. Because of the uncontrolled aspect of their deposition, single-find coins can normally be assumed to have been in circulation at the time of their loss.

Both hoards and single finds of coins, however, are important for understanding distribution patterns of coins in Egypt during this period. Regardless of whether they were purposely deposited or randomly lost, all coins considered here were found in Egypt. Those that were not minted in the official mint of Alexandria, or manufactured quasi-autonomously with coin molds in other parts of Egypt,[86] were minted outside of Egypt and reflect potential connections with other provinces of the Empire.

The Coin Database

The compilation of this database would not have been possible without the work of two scholars. The first and foremost is Hans-Christoph Noeske, a German numismatist who has published important catalogues and studies on the Graeco-Roman period of the Eastern

[86] See the Coin Mold section in this chapter.

Mediterranean.[87] Noeske's catalogue presents the coinage from Abu Mina as well as all then-known published single finds and hoards from Egypt dating to the period between the fourth and the eighth centuries CE. Because of differences in the character of the original publications of the hoards on which Noeske's compilation is based, the type of information available for each coin varies substantially; not all of them can be associated with a mint and thousands have been described as illegible, an important aspect of this period which I will explore in a later section of this chapter. The second basis of the database is Michael Ford's article "The coin hoards of late Roman/early Byzantine Egypt from the reform of Diocletianus to the reform of Anastasius, AD 294-491" which was also published in 2000, in the journal *Numismatic Chronicle.* The article presents several published hoards that are also featured in Noeske's volume as well as 8 gold hoards and 16 bronze hoards that do not appear in Noeske's work. The article lists the hoards and their bibliographic information, with varying descriptions of the publication.

Between Noeske's and Ford's contributions, there are over 50,000 coins presented that come specifically from Egypt. From these, I have extracted close to 30,000 bronze coins and 400 gold coins dated to the period of the fourth century. The database does not include so far the coins published from the excavations at Athribis, which were published in 2000, nor does it include the coins published by the Centre d'Études Alexandrines in 2012. The coins from Alexandria, which constitute 1535 fourth and fifth century coins, as analyzed by Marie-Christie Marcellesi, include at least 1072 illegible coins (70% of the total) which are seemingly "imitation coinages", a phenomenon I will discuss later in this chapter.[88] The coins from Athribis and Alexandria will be added to the database in the future.

[87] His two-tome catalogue *Münzfunde aus Ägypten I: Die Münzfunde des ägyptischen Pilgerzentrums Abu Mina und die Vergleichsfunde aus den Dioecesen Aegyptus und Oriens vom 4.-8. Jh. n. Chr.* was published in 2000 as part of the series Studien zu Fundmünzen der Antike (SFMA).
[88] Marcellesi 2012, 200.

I have distinguished metals in the database, namely gold and bronze coinages, for two main reasons. The first is that these served different functions.[89] The relationship of value between bronze and gold currency changed continually depending on the availability of precious metal, and the rate of exchange between the two was not always straightforward. We cannot know for certain who was using which types of coins, but a safe assumption, partly based on the quantities of each type of currency found in the archaeological record, is that bronze currency was widely accessible to the majority of the population during the late third and first half of the fourth century, while gold currency was probably used only by the upper classes and wealthy individuals, and perhaps people with occupational access to it, such as bankers and money changers.[90] During the reign of Constantius in the mid fourth century, however, a change can be seen in the usage of gold currency; its usage in large transactions is much better attested than in previous periods, and the numbers of solidi available in the numismatic record rise. During this time, the fiduciarity of the bronze coinage goes down, meaning that after the 350s bronze coinage had more intrinsic value compared to its officially tariffed value than in the early fourth century.[91] But I will return to this point further on in this chapter, in the discussion of bronze currency.

The database contains only coinages that were minted between 297/298 and 388 CE. I chose these ninety years, from Diocletian to Theodosius I, for both practical and historical reasons. As to the former, the time span is long enough to elucidate transitions and patterns of production and circulation throughout the Empire, but also short enough that I

[89] Small-denomination currency was used more for daily transactions such as small purchases and exchanges, whereas larger-denomination currency, such as the gold solidus, was more likely associated with large official payments such as soldiers' salaries, and large official government expenditures.

[90] Howgego 2014 discusses the various underlying theories for the circulation of bronze coinages, with particular focus on the question of whom the coins represent and what they can say about local and state economies. He pinpoints the important issue that bronze coins in particular are transported by people and used readily in market transactions, and may therefore represent the aggregate movement of people, see p. 333.

[91] Bagnall and Bransbourg, forthcoming.

might be able to analyze the data finds within the scope of a dissertation. Establishing any chronological marker is not without its problems, however, and the issues of long-term circulation of bronze coinages will be discussed further in this chapter.

Historical Background

In order to grasp the full extent and impact of the end of the closed currency system, it is necessary to offer a brief historical overview of the monetary history of Egypt. As we will see below, the abolition of Egypt's isolated monetary zone represented the first time since 306 BCE that the territory shared a type of currency with its neighbours.

The earliest coinages of the world were issued in either Lydia or Ionia in Asia Minor in the seventh century BCE.[92] By the mid sixth century BCE the use of coinage seems to have spread widely throughout the Greek city-states and colonies.[93] It was not until the conquest of Achaemenid territories by Alexander the Great in the late fourth century BCE, however, that the use of coinage spread to non-Hellenic regions, including Egypt.[94] Upon Alexander's death in 323 BCE, the territories of the Macedonian kingdom were distributed among the Diadochoi, his generals who survived the subsequent wars. After a series of wars and continuous political unrest between the Diadochoi and their sons that lasted for nearly fifty years following Alexander's death, three main Hellenistic kingdoms were established by the early third century BCE: the Ptolemaic dynasty in Egypt; the Seleukid dynasty in Syria and the East; and the Antigonid dynasty in Macedon.

The first Ptolemaic, or Greek, coinage was officially introduced in Egypt by

[92] It is unclear whether it was Lydians or Greeks who struck the first known coins, since most of Asia Minor at that time was under control of Lydian dynasts. However, their rule has been characterized as not intrusive, allowing the Lydian polis substantial autonomy. For a more in-depth analysis see Price 1983; cf. Howgego 1990.
[93] Konuk 2012.
[94] There is evidence for the production of Athenian Owl coinage in Egypt prior to the conquest of Alexander, though it seems this was not any official state attempt to properly implement a monetary system.

Ptolemy I, son of Lagos, soon after Alexander's death in 323 BCE.[95] During the first two decades of Greek rule, Ptolemaic currency used the same weight standard as Alexander himself and the neighboring states that had emerged from Alexander's kingdom, namely an Attic standard of 17.2 grams of silver per tetradrachm (that is, a drachma of 4.3 grams). Although often at war, the Hellenistic territories in the East traded heavily with each other, and the Egyptian monetary system initially served to support trade with other Hellenistic neighbors and to pay soldiers in and outside of Egypt, putting a premium on the ease of exchange.[96] Thus, the first series of Ptolemaic coinage resembled those of other Hellenistic kingdoms in weight and even iconography.

In 306 BCE, however, a fiscal crisis was precipitated by the Ptolemaic defeat at the battle of Salamis, and the on-going war against the Antigonids forced Ptolemy I to seek extra revenue for state expenses. Ptolemy decided to recoin the Ptolemaic tetradrachms to a standard of 15.7 grams (a reduction of about 8.7 percent), and all non-Ptolemaic coinage was banned from use within the Ptolemaic territories. This presumably meant that foreign merchants seeking to acquire Egyptian goods – notably much-needed grain – were compelled to exchange their Attic-standard coinage (which had become the major international currency) for Ptolemaic currency. Because the Ptolemies maintained a close monopoly over some widely traded Egyptian products, the result of this policy was presumably that the Ptolemaic Kingdom gained 1.5 grams of silver per coin from monetary exchange, as long as nominal prices remained the same and the two coinages were exchanged as if equivalent. Given the Mediterranean dependence on Egyptian grain and other products, this exchange did not hinder trade, and was perhaps even beneficial for the Ptolemies, who managed to

[95] Lorber 2012, 2.
[96] Meadows 2014, 169. Alexander set up 25 identifiable mints throughout his conquests in order to pay mercenaries, with all mints producing the same typology of coins bearing his image. According to Meadows, this practice, while logical, is without precedent in history. The unified message of the mints consolidated the territories under Alexander's single weight standard.

maintain a closed currency system throughout the duration of their dynasty.[97] Extensive numismatic and metallurgical analysis of Ptolemaic coinage series has proven that during the late third century BCE, the minting authorities under the Ptolemies planned for a transition into a new monetary system in which the role of the bronze coinage was enhanced.[98] The existence of a localized, limited monetary zone also enabled close control of the gold-to-silver ratio and enhanced the role of bronze coinage in the economy, which continued in the Roman period.[99]

The conquest of Egypt by Augustus in 30 BCE brought about little change to the monetary system. Throughout the Roman period, Egypt remained a separate currency zone. New scholarship on the economic transition between Hellenistic and Roman Egypt has demonstrated that there is no evidence of any attempt to integrate the province monetarily with the rest of the Empire, as happened in the province of Asia, for example. Blouin and Burnett have recently concluded that it was only during the time of Nero (54-68 CE) that there was a potential coordination of the coinage system across the whole Empire. During this time monetary changes were imposed in Rome, Crete, Syria, Cappadocia, and Egypt, meant to extract and recover silver for the Roman government.[100] This analysis of the transition between Hellenistic and Roman Egyptian coinage largely falls in line with the picture recently drawn by Andrew Monson regarding the domains of administration, land management and tenure, taxation, and the agricultural economy, in which the Roman conquest seems not to have been as disruptive as has often been supposed.[101]

Accordingly, throughout the Roman period, until the reforms of Diocletian in

[97] de Callatay 2005.
[98] This change, called "La Grand Mutation," has extensive literature and there are various hypotheses on how exactly the role of silver was replaced. For further detailed analysis see Faucher and Lorber 2010.
[99] Le Rider 1986, 39–48.
[100] Blouin and Burnett, forthcoming.
[101] Ibid, 37. Monson 2012, 2014.

297/98 CE, Egyptian currency retained the Greek system of denominations and dating.[102] Coins, namely tetradrachms, continued to be made of billon, with lower denominations in bronze, and were minted only in Alexandria with some exceptions, such as when minting was conducted in Rome during the Flavian period.[103] The coinage has been termed "Alexandrian coinage" in numismatics, and many studies have been undertaken on the reverse types of the coins, the iconography of which directly alludes to Graeco-Egyptian social, political, and religious culture.[104]

The second century CE marked the height of the Alexandrian mint's productivity, with particularly high output during the reign of Hadrian (117-138 CE). During the second half of the reign of Marcus Aurelius (161-180 CE), however, output declined sharply.[105]

The third century CE is a known era of transition for the Roman Empire, as well as for Egypt specifically. During the early third century, the monetary system throughout the Empire maintained a steadily increasing level of pluralism. The mint in Rome always retained a monopoly on the ability to strike all three metals (gold, silver, and bronze), but a continuously growing number of mints, particularly in Asia Minor, minted their own local bronze coinages. Under the Severans there were at least 340 mints that produced bronze coins.[106] A dual Greek and Latin denomination system contributed to this pluralism, meaning that the types of coins in circulation, especially at centers of high monetary transactions, were innumerable.

During the middle of the third century a military crisis took place. Marcus Aurelius' Marcomannic wars of the late second century had started a military conflict and

[102] Geissen 2012, 566.
[103] Ibid.
[104] For more on Alexandrian coinage see Emmett 2001. For more historical and economic background, however, see Milne 1927 and Christiansen 1988. *Roman Provincial Coinage* volumes and their supplements are also a good introductory source.
[105] Estiot 2012, 563.
[106] Estiot 2012, 538.

mass migration in the north-eastern regions of the Empire. The Goths arrived at the Black Sea in 238 and then entered Thrace. They continuously waged war in Greece and Asia Minor until 267 CE. In the West, the Germans, Alamanni, Juthungi, and the Franks carried out raids on the militarized fronts; in the East the Sasanians overthrew the Parthians in 242 and waged war against the Romans from 253 until 260, attempting to dominate the Near East.

The high expense and pressure of maintaining the military during these decades caused high political instability (there were at least 26 "claimants to the throne" between 235 and 284 CE), and naturally had strong and immediate repercussions on the economy of the Roman Empire. As Estiot explains, the liabilities of the state grew rapidly, as it had to maintain an army as well as pay tribute to its former enemies to maintain peace. The increasing deficit left the Roman state with no choice but to manipulate the coinage system by debasing and retariffing the face value, creating a more fiduciary coinage. This means, that while the precious metal content of a specific coin decreased, its nominal value, more specifically its power to be exchanged at a fixed rate with gold and silver, remained the same or even increased, in theory backed by the Roman state. Fiduciary coinage is therefore entirely dependent on trust.

The silver extracted from the recalled coinage was melted and used for state expenditures, and a new billon coinage was put into circulation. The users of these coins were not fooled, however, and distrust in the State contributed to the political instability, while the new, weaker, coins triggered a loss of confidence that led to price inflation throughout the Empire.[107]

The steep debasement of coinage during the second half of the third century caused high nominal inflation as prices of commodities were adjusted to suit the newly

[107] Estiot 2012.

minted coins' metallic contents.[108] General distrust of the currency was an Empire-wide phenomenon during the second half of the third century, and the situation in Egypt was not much different.[109] While the province continued to function under a currency system that was closed and hence monetarily separated from the rest of the Empire, its silver and bronze coinages were continuously and sharply debased just like coinage elsewhere from 238 to 265 CE. The debased coinage was essentially fiduciary, as the metal content in the coins themselves was worth substantially less than the nominal value of the coins. Indeed, by the second half of the third century CE, the quality of the last issues of Alexandrian coinage under its separate currency system had deteriorated to such an extent that the last billon coins produced were heavily reduced in weight (c. 7–8g) and diameter (c.18mm) and contained virtually no silver. The nominal value of the coins was guaranteed by the state, at least in theory, in order to maintain purchasing power, but as long as prices were free to rise, that purchasing power was easily eroded.

The extreme suspicion of the new coinage provided by the State reached a point where bankers no longer accepted the new tetradrachms, as they were disinclined to accept the new, debased currency in exchange for an older issue with a higher silver content. [110] The Alexandrian tetradrachms, however, were reformed in 273, preceding the official imperial reform of 274, when Aurelian's year 5 tetradrachms had a 15% reduction in weight. Therefore, the weight reduction of the tetradrachm in 273 anticipated the reform of Aurelian in 274.

In order to stabilize the economy of the Empire and to assert himself as its new leader after civil unrest and a war for the throne, Aurelian (270-275 CE) implemented a

[108] Rathbone 1996 and 1997, 183-244.
[109] Haklai-Rotenberg 2011.
[110] Papyrological evidence from this period points to the public distrust of the Egyptian currency. P.Oxy.12.1411, dated to 260 CE, is a copy of a notice by the strategos Ptolemaeus commanding all bankers and traders to accept the newly minted coinage in Egypt.

monetary reform that included measures to cap inflation and a reorganization of the Empire's mints.[111] He severely punished the mint of Rome for filling the empire's economic channels with extremely debased coinage, and thus provoking mistrust in the authority of Rome, in what is known was "the war of the moneyers." The mint in Rome was closed for two years and the responsible moneyers sent to other mints around the Empire. Rome reopened a mint in 273 and in 274 Aurelian's new coinage, the so-called *aurelianus*, was introduced in Milan (Mediolanum). The reform sought to re-establish the trimetallic coinage system of bronze, silver, and gold. The latter two metals were struck to the same standard used under Caracalla. The bronze units of sestertii, dupondii, and asses, however, were only recreated in the mint of Rome, being "merely a homage to Roman monetary tradition: their utility in the system was essentially cosmetic."[112] Aurelian also reorganized the imperial mints, instituting 8 official mints and 39 *officinae* along with a clearer and more systemic method of marking mints on coins. The marking of bronze coinage has actually been recognized as one of the main merits of his reforms. According to Estiot, the symbols used record the silver content of the coins, stating that 20 bronze reformed antoniniani (now termed aureliani) would be (by fiat rather than market value of the metals) equivalent to one argenteus of pure silver. This recognized the fiduciary nature of the reformed antoninianus, a coin type originally issued under Caracalla.[113] This interpretation, however, is not widely accepted, since the silver coin was never produced. The more traditional view is that it represented the value of 1 part of silver in 20 parts of gold.

The reform of Aurelian had regional disparities and was not applied uniformly throughout the Empire. Aurelian managed to recall debased antoniniani in order to make way for his new coinage in the economic channels of the Empire. However, the results in the

[111] Estiot 2012, 546.
[112] Ibid.
[113] Ibid.

western part of the Empire were not very successful.[114] Aurelian's reformed coinage was rapidly debased by his successors, and even the gold aureus fell subject to weight reduction. Nonetheless, Aurelian's reform was somewhat effective in removing the heavily debased coinage issued by his predecessors, and it was these newly instituted measures and systems that Diocletian completed and systematized.[115] However, following the expected reactions in the market and on the part of the users of the coins, prices rose about tenfold at this time in Egypt, reflecting more accurately the purchasing power of the billon coinage.

Starting in 294 CE, Diocletian instituted monetary reforms throughout the Empire.[116] Diocletian's currency reform expanded the previous system instituted by Aurelian in the 270s, whose coinage reform had limited durability. The coinage had been heavily debased by the time of Diocletian, since it had been affected by the policies instituted by Diocletian's predecessors. One of Diocletian's aims was to create a more balanced and efficient political unit. To that end, he needed to streamline tax collection around the Roman Empire in order to maintain his new, larger, political machine and his presumably larger army.[117] The taxation reforms of Diocletian are naturally closely tied to his coinage reforms, but the changes n taxation, which received much scholarly attention during the 1990s,

[114] For more on the Gallic empire and its issuing of imitation coinages during the third century see Estiot 2012 and Estiot et al. 1994

[115] Estiot 2012.

[116] Although the coinage reform took place in earlier years (294-295 CE) in other provinces of the Empire, it did not have an effect on Egypt until two years later. Schwartz 1963-1967 initially argued that the reform took place in August 296 CE in Alexandria, based on his analysis of the coinage issued by the usurper L. Domitius Domitianus. Thomas 1976, however, convincingly argued for a later date of currency reform taking place, in 297/98, based on papyri, ostraca, and literary evidence; the latter date is now widely accepted.

[117] Luttwak 1976, 177; Jones 1964, 17 both argue for an increase in the number of legions, but the size of the legions was reduced; therefore, the actual number of soldiers enlisted did not increase as much as one would have initially supposed looking at the increase in legions and units. More recently, Heather 2005 has argued for an increase of the size of the army by at least 33%.

particularly by Jean-Michel Carrié, cannot be dealt with here.[118] In conjunction with other reforms, he abolished Egypt's closed currency system and instituted a new coinage reform throughout the provinces.[119] For over 600 years, the Egyptian territory had required currency exchange at its borders for the purchase of goods, which allowed very close control of the metal supply and the minting schedule, as well as the extraction of coinage within the province.[120] This also separated Egypt in some respects from the rest of the Empire, however, giving it a partially isolated economic status relative to the rest of the provinces, a characteristic that strongly challenged Diocletian's political ideal of a well-integrated empire. After 296, all of the Empire, including Egypt, had a gold solidus of 5.45g, which was in short order reduced to a weight of 5.3g.[121] There was also a silver argenteus at 3.4g (which soon ceased to be minted) and three denominations of billon coins (with the largest at 10g).[122] For the first time, Egypt utilized the same coinage as the rest of the Mediterranean world.

The end point of our imposed chronology requires less explanation and historical contextualization. The year 388 CE has been chosen as the end date for this study, in order to match the chronology of the Reece periods, a numismatic periodization that I will explain in the chronological analysis of the coinage. The year 388 CE was also 7 years before the death of Theodosius I, and thus represents to some extent the last period in which a single emperor ruled both the east and the west of the Empire. The death of Theodosius I was followed by the conquest of the West by the Goths, whom he had spent decades fighting against to protect the borders of the Empire, before eventually allowing them to settle south of the Danube in

[118] See Carrié 1993 , « Observations sur la fiscalité du IV^{e} siècle pour servir à l'histoire monétaire », in *L' "inflazione" nel quarto secolo D. C., Atti dell'incontro di studio Roma 1988, (Istituto Italiano di Numismatica)*, Rome, 1993, p. 115-154.
[119] Ermatinger 1996.
[120] Christiansen 2003.
[121] Constantine reduced the gold solidus to 4.5 grams, a weight that was maintained for the rest of the Late Antique period, until the 10th century CE, cf. Porteus 1969, 14-33.
[122] Estiot 2012.

Illyricum.[123] Even considering its periods of political instability, the fourth century CE marked the last era of the unified Roman Empire that had characterized the first three centuries CE. As we will see from circulation patterns, some western mints do began to be represented quite readily in Egypt during the fourth century, allowing us to assess to some extent the strength of the monetary unity sought by Diocletian.

Chronological issues

Some chronological issues arise when considering the circulation patterns of coins. Bronze coins minted during the fourth century CE have long circulation patterns, meaning that the coins I study did not necessarily enter Egypt during the fourth century. There is evidence of wide usage of Valentinianic coinage, in particular, well into the fifth century.[124] For comparative purposes, nearly every fifth- or sixth-century site in Palestine has yielded fourth-century coins, with the most prevalent minted between 378 and 395 CE and of the type *SALVS REIPUBLICAE,* which is found in almost all fourth-century sites around the Roman world.[125] Other fourth-century types from earlier periods, such as the *FEL TEMP REPARATIO* (351-361*), SECVRITAS REIPVBLICAE* (364-375), and *GLORIA ROMANORVM* (364-375) are also commonly found in later contexts.[126]

Of the 44 hoards represented in the graph below, 29 have depositional dates after the fourth century CE but contain fourth-century coins. This is not unusual in the circulation of ancient coinages.[127] As mentioned previously, there remains uncertainty over when a particular coin entered a certain territory. Did it cross the border close to the date of the deposition of the hoard, or had the coin been circulating throughout the region for decades

[123] Williams and Friell 1995, 34.
[124] Noeske 2000, 112.
[125] For more discussion on this type of coinage see Bijovsky 2012.
[126] Bijovsky 2012, 75.
[127] For example, in Egypt, coins minted under Nero consistently appear in hoards from the second century CE. See Christiansen 2004.

before being stored away? When hoards are consistently analyzed and the same mints continue to be represented, however, some conclusions can be drawn both about the activity of the mint during a specific time period, and the relationship between the said mint and the territory under analysis. There is evidence of a Constantinian hoard deposited between 340 and 343 CE whose minting dates all date to the first four decades of the fourth century. For reasons I will further explain in the section analyzing this hoard, I have not included it in the database.

For the purposes of this chapter, which focuses on the connectivity within provinces that is traceable through coins, setting chronological boundaries is important for limiting the dataset under analysis. The historical implications extracted from the currency patterns can, however, be applied not only to the period of the dataset itself, but also to subsequent periods during which coins minted in the fourth century were still in circulation. More specifically, while I am interested in analyzing the presence of coins from mints outside of Egypt during the fourth century CE, the conclusions I draw may be applied to the fifth century, as late-fourth-century coinage remained in circulation then. As seen in the table below, for example, one can observe that the fourth and fifth century are – in numismatic terms – a "historical unit" for Egypt.

Numismatists believe there was a recall in 354 CE for the purposes of remelting and restriking, since heavier coins with more metal content seem to be missing from the hoards.[128] Thus, the coins issued before the 350s, which are substantially much more limited in number, were more debased and thus more likely to have had a limited chronological circulation than the post 354 CE issues, which continued to circulate widely during the fifth

[128] For example, see DeRose Evans 2006, 43. In Capernaum, Sepphoris, Caesarea, and Samaria there are numerous coins from the period before 354, suggesting that if there were official recalls, they did not effectively remove coins from circulation.

century.[129] This mid fourth-century phenomenon is worth expanding upon, since it characterizes the chronology of the hoard evidence.[130]

The Constantian Reform

Inflation and debasement during the fourth century CE are complex subjects that have been much studied by numismatists and papyrologists over the past thirty years. While the debasement of coinage certainly has a direct effect on the size and frequency of coinage issues, an analysis of inflation is not central to the core question of circulation patterns in this chapter. However, there are certain chronological issues that are evident in the hoard and single find evidence analyzed thus far, namely that of the "Constantian Monetary Revolution." In a forthcoming article, Roger Bagnall and Gilles Bransbourg analyze from both a papyrological and a numismatic perspective the effect of the monetary reform issued by Constantius between 351 and 353. The outlines of price movements and debasement were already set out by Bagnall in 1985 in *Currency and Inflation in Fourth Century Egypt,* but this new study adds price information that has come to light more recently and incorporates a full numismatic analysis of the bronze and the gold currency. In the article Bagnall shows a price discontinuity in Egypt between prices before 351 and those after 353, and Bransbourg identifies a hoard discontinuity around 348-354.[131]

> "Then comes evidence of a rare demonetization, as *C. Th.* IX, 23, 1 (354) implies that a range of coins is by then forbidden and that everyone knows about it – the *maiorina*, the *centenionales communes*, and *ceteras vetitas*. Since the actual demonetization must have preceded such an edict, we have a clear chronological compatibility between the 351-353 price increase, the replacement of the AE2/AE3 348-352 *fel.*

[129] Moorehead 2012; after 361 there is no more silver content in the bronze coinages, though presumably copper is still valued as a precious metal.
[130] It is worth mentioning that there are some pre-354 coins which have a higher silver content, such as the lar AE2 falling horsemen, and there are issues from the 330s which seem to have been produced in large volumes, see Bagnall and Bransbourg, forthcoming.
[131] Bagnall and Bransbourg, forthcoming.

> *temp. reparatio* series by the new Falling Horseman AE3,[132] and the implication in 354 that some coinage demonetization had taken place not long ago."[133]

This monetary revolution is evident in the quantity of hoards deposited after the 350s, compared with the first half of the fourth century, and is also evident in the absence of any solidi dating before the 340s found either in hoards or as single finds. Therefore, when questions of integration during the fourth century arise, it is imperative to recognize that much of the coinage in circulation prior to Constantius was of lower quality and subsequently recalled. What is crucial here, as the authors conclude, is that trust in the fiduciarity of the coinage had mostly disappeared, just as it had in the latter part of the third century. After Constantius, coins were more consistently valued by the intrinsic value of the metal in them, in line with the evolution of behavior from the later third century on, and thus the better-quality billon coins remained in circulation until the late fifth century, when a pure bronze piece was introduced, but fiduciarity remained a common phenomenon in small denomination coinages throughout the Late Roman Empire.[134]

There are further concerns that arise when imposing chronological boundaries on a dataset of coinages. The first is that the coins themselves can seldom be assigned to a single year. This means that most coinages in the database could have been minted in different ranges of years, between 331 and 337 or 351 and 354 for example, and thus it can be complicated to securely date a series to a specific year. However, comparative methodological approaches in dating coinages, particularly those used for Roman Britain,

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[132] See ibid., cf. 23: "The dating of the demonetization remains uncertain: the 354 edict implies a prior date, although nothing would have prevented such a measure from being implemented at different moments throughout the Empire. A step by step scenario starting in 349 in Constantinople and Antioch, in late 350 or early 351 in the Balkans, reaching Italy after September 352 and Gaul in late 353 as Constantius II reunified the Empire, is offered in Kent 1957, p. 81 – although such an early date for Egypt does not fit with the papyrological evidence, which places the price jump after early 351. Broadly speaking, Callu 1989 (pp. 227-228) dates the introduction of the new AE3 between 352 and the spring of 354; see as well Kent 1981, pp. 61-67 and Brickstock 1987, pp. 7-26."

[133] Ibid.

[134] Ibid.

may offer a useful solution in this regard. While circulation studies focusing on the eastern Mediterranean during the fourth century are limited, the western frontier of the Roman Empire, namely Roman Britain, has been a fertile region for numismatists.[135]

Normally, the distance between provinces as far from each other as Egypt and Britain would present a challenge when comparing monetary approaches, especially during the first three centuries of Roman rule, when provincial coinage was commonplace and Egypt had its own closed currency system. Fortunately for this analysis, Diocletian's reform largely standardized coinage production, meaning that methodological practices used for analyzing other areas of the Empire are readily applicable to the analysis of fourth-century circulation patterns in Egypt.

Prior to the currency reform, local mints, especially in the eastern provinces, maintained a high level of autonomy in the iconography of their coinage, although they adhered to the same imperial weight standard. Nonetheless, policing the coinage and metal content of hundreds of mints and issues was difficult, particularly at a time when the Empire wanted to control its precious metal supply. The reorganization of the mints under Aurelian, who ended the production of provincial coinage, created 20 central mints and various officinae, a system that Diocletian maintained. According to the *RIC* volume typology, there were 20 official imperial mints active between Diocletian and Theodosius I. Some mints were active for short periods of time, as in the case of Carthage, and while all of them minted bronze, not all of them minted gold coinage.[136] Under Diocletian the number of types of official coinage diminished, and thus comparative, integrative numismatic analysis is theoretically feasible.

[135] The Treasure Act of 1996 in England has fostered the study of hoards of Roman Britain as more of them are declared, which often leads to their publication. For more on the Treasure Act and its impact on numismatic studies see Bland 2011.

[136] The entries for the mint of Alexandria in RIC VI, VII, VIII, and IX show that only during the early fourth century were there gold coins minted in Egypt, for Diocletian, Maximinus, and Licinius (volume VI).

Attempts have been made to develop a comprehensive and generally applicable periodization for all Roman coinage, based on the types of issues in circulation. The best-known and most utilized system is that of Reece, who divided Romano-British production into 21 distinctive periods ranging from pre-41 CE up to 402 CE, with two periods added subsequently by Sam Moorehead, extending the chronology to 498 CE. As the data will show, this periodization is largely useful but encounters some problems regarding the fourth century, especially considering the Constantian reform of the 350s, which Reece does not seem to take into account.[137] The system thus seems to work well for Romano-British sites, but for Egypt it might not be the most ideal approach. A particular problem is posed by unknown or illegible coinage, meaning that those coins that have not been assigned an RIC or LRBC typology number, or are unidentified, cannot be used. This prevents a number of coins for which we have a wide chronology, but no known mint or number, from being included in the database.

Nonetheless, as an exercise, I have employed the Reece periodization for the fourth century in my coinage analysis as a test to determine which periods may be problematic, given the hoard evidence for Egypt.[138] For consistency and to facilitate comparison with sites in the eastern Mediterranean, I have maintained the original Reece period numbers for each coinage issue. The Reece periods relevant for this chapter are the following:

[137] Their technique has become standard practice in numismatic scholarship. Moorehead 2012, and Bijovsky 2012 make use of it.
[138] In future research, I will expand the database to include coinages through 498 CE, in order to further address the long-term circulation of several late-fourth century issues.

Table 2 Reece Periods

Reece Period Number	Span of years (CE)	Terminology
15	296-317	The Tetrarchy
16	317-330	Constantinian I
17	330-348	Constantinian II
18	348-364	Constantinian III
19	364-378	Valentinianic
20	378-388	Theodosian I

The ranges of some of the published coins included in the database neatly match the date of the issues of known types. Therefore, in the cases where the typology of the coin is available (such as a *Roman Imperial Coinage* catalogue number), the chronological ranges are established. Some coins, however, have wider timespans set by the numismatists who published them, which depend on the legibility of the coin and the length of time a specific type of coin was used. A common typology was used on the reverse of the FEL TEMP REPARATIO coinage, for example, by various mints during the relatively long span between the years 337 and 375. If the obverse of this type of coin is illegible, it is harder to narrow it down to a specific emperor, or even a mint. This results in a variety of unsystematic chronological ranges that become harder to seriate and even harder to analyze. Diameter and weight can be of use, since this type of bronze coinage was consistently debased through its usage; however, this information is not always, nor even often, recorded by numismatists when analyzing hoards, with the result that we are left only with the information that could be obtained by visual inspection. Thus, when separating the coinage into Reece periods in order to better understand the relationships between different mints and the circulation within Egypt

of the coinage they produced, and also in order to present the data in a way that is comparable to other numismatic studies around the Empire, coinage without an identifiable typology has been excluded from Fig 1.

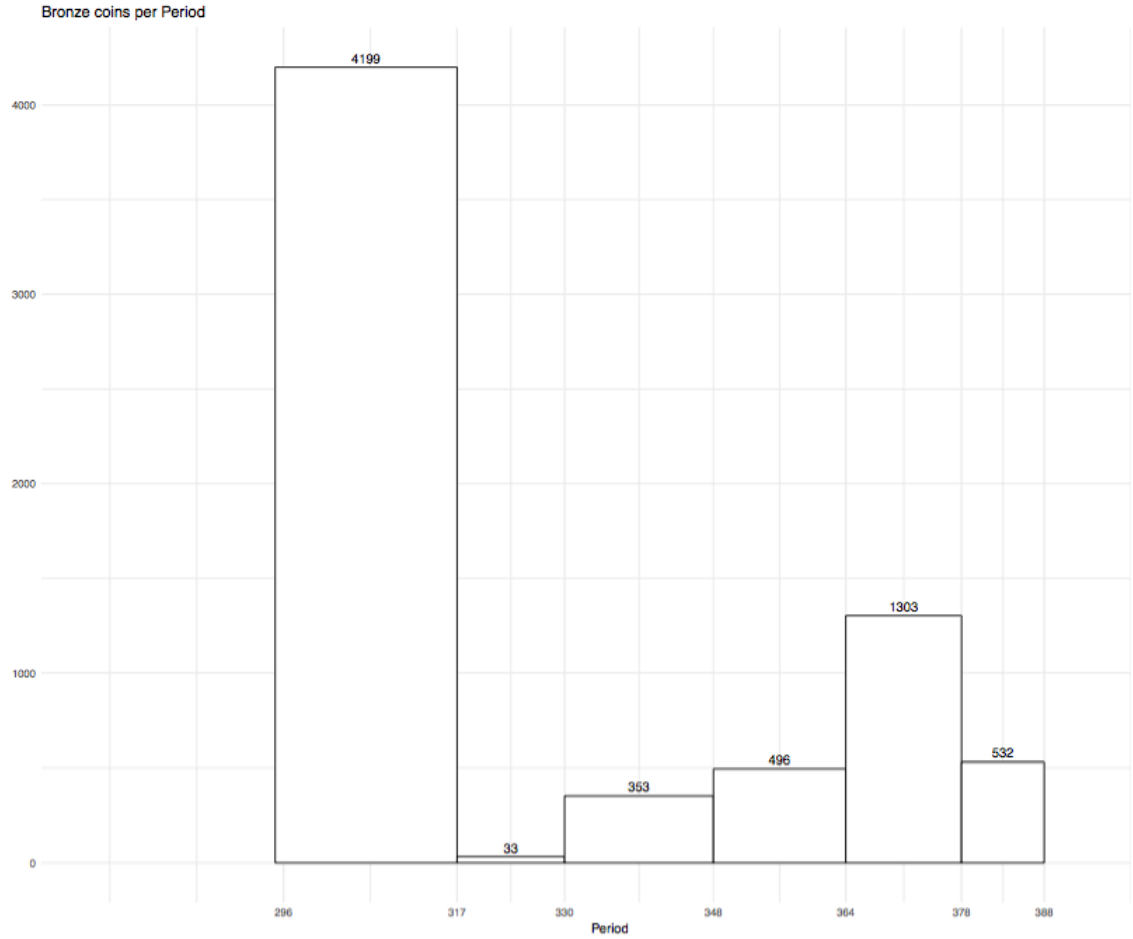

Figure 2 Bronze Coins per Reece Period

Presentation of Data

The database so far includes 7 hoards of gold coinage (solidi), 40 hoards of bronze coinage (of varying denominations) and single finds from seven major sites in Egypt: Oxyrhynchus, Kellia, Clysma, sites in the Bahariya Oasis, Karanis, Hawara, and Abu Mina. There are 400 gold coins and 29,684 bronze coins in total, all minted between 297/298 and 388 CE.[139]

Unfortunately, the varying states of preservation, along with the limited data provided by some of the earlier publications, means that not all of the coins can be used for circulation analysis. Of the 29,684 bronze coins, 19,544 have an identifiable mint. Those coins whose mint has been identified often do not have a correlating RIC or LRBC typology number. They therefore cannot be securely dated to specific years; thus their chronology varies substantially and they cannot be assigned into Reece periods. This creates some challenges when plotting them into a chronological distribution for the purpose of comparison with other sites, as there are maximum and minimum ranges of years into which a coin can be assigned.

Of the 19,544 bronze coins with a mint, 7058 have a designated typology and chronology that may be assigned into proper Reece periods for chronological distribution, and the plotting of these into graphs make them particularly useful as comparanda for coins from other sites. However, we have to wonder how representative this might be for the whole data set, since the minting dates for the majority of the bronze coins with an identifiable RIC or LRBC number, i.e. an identifiable typology, tend to skew heavily toward the beginning of the fourth century. Applying Reece periods to the data shows a sizeable quantity of bronzes having been minted in the first quarter of the fourth century, but in fact all of the coins from this time period come from a single hoard found in the Northern Sinai Peninsula, as seen in

[139] The specific bibliographic information on the hoards may be found in Noeske 2000.

Table 2. The hoard, labelled AE 17, was found in ancient Boutaphion, located on the coast around 15 kilometers southwest of El Arish, the capital of Egyptian Sinai when the hoard was found in 1967. [140] When the evidence from this particular hoard is discounted, very few coins are found from the first quarter of the century.

[140] King and Spear 1977. The hoard was found in North Sinai just a few days before the outbreak of the Six-Day War in 1967. It was then concealed until 1970, when it reached the markets; at this point, however, it had been dispersed and only 4473 pieces were left together out of what is thought to have originally been 32,000.

Table 3 Bronze Coins per Provenance

Coin Provenance	Number of Coins.	Percentage
Abu Mina 1983	885	2.98%
AE 1	299	1.01%
Dendara 2 (1898)	865	2.91%
El-Kab	219	0.74%
Fayum (1931)	999	3.37%
Hawara 1 (1938)	632	2.13%
Hawara 1892	11	0.04%
Hawara 2 (1926)	1,694	5.71%
Hawara 2 (1938)	8	0.03%
Hawara 3 (1938)	217	0.73%
Hawara 4 (1938)	81	0.27%
Hawara 5 (1938)	126	0.42%
Hawara 6 (1920)	2,105	7.09%
Hawara 6 (1938)	1	0.00%
Karanis 2	160	0.54%
Karanis 2.1	276	0.93%
Karanis 3	259	0.87%
Karanis 8	3	0.01%
Kellia	29	0.10%
Kom el-Ahmar	7	0.02%
Kom washim-karanis	523	1.76%
Meydun	1,775	5.98%
Pelusium	29	0.10%
Qaw el Kebir	811	2.73%
Single finds Abu Mina-1906	60	0.20%
Single finds Abu Mina 1983	324	1.09%
Single finds Abu Mina Kaufman	9	0.03%
Single finds Bahariya	7	0.02%
Single finds Clysma	22	0.07%
Single finds Kellia	69	0.23%
Single finds Oxyrhynchus	749	2.52%
AE16	37	0.12%
AE 17	4,455	15.01%
AE 18	505	1.70%
AE 19	218	0.73%
AE 2	2,820	9.50%
AE 23	1,849	6.23%
AE 24	6,085	20.50%
AE 30	31	0.10%
AE 4	430	1.45%
Total	**29,684**	

Table 4 Gold Coins per Hoard

Hoard	**Number of Coins**	**Percentage**
Alex Chatby	8	2.00%
AU 1	29	7.25%
AU 2	42	10.50%
AU 3	15	3.75%
AU 4	75	18.75%
AU 5	3	0.75%
AU 6	69	17.25%
AU 7	50	12.50%
AU 8	80	20.00%
Karanis 1974	29	7.25%
Total	**400**	

When all coins, including fourth-century coins with unknown mint and assignable typology number, are taken into account and plotted into two-box plots without using Reece periods, the quantity of coinage available from the latter half of the fourth century rises substantially (see Figure 2 above).

There is more published evidence that needs to be considered, however. The Constantinian hoard analyzed in the following section provides a much-needed addition to the understanding of circulation patterns during the first three decades of the fourth century. The hoard was found in the Sinai region, and even though this was not part of Egypt during antiquity, I believe it can shed some light into the bronze coinage which was commonly in circulation in the region. Furthermore, as we will see, the mint pattern evident in the hoard matches much more closely with the Egyptian pattern than those in nearby provinces. Because the coins have not been given an RIC typology number, the exact chronology is not known for each individual coin, but according to the author they all belong to the Constantinian period.[141]

Mint discussion

The provenance of the hoards varies. Some have specific findspots and were properly excavated, while other hoards were analyzed and published after appearing on the antiquities market in the late 19th and early 20th centuries, and therefore their findspots may only be approximated to a general region such as "Luxor" or "the Delta."

There are 23 mints that produced bronze coinage and 13 mints that produced gold coinage represented in the Egyptian finds, which I illustrate in the table below, along with the abbreviations used in the graphs. The discrepancies in the number of mints represented here

[141] Milne 1914.

and the number of mints listed in RIC is due to the categories "unspecified western mint" and "unspecified eastern mint," which are simply indications that while the area of the empire is known, the specific mint is not identifiable; that correction removes two of the three additional identifications. The third additional mint is located at Axum, a city that was part of the Axumite empire, and therefore is not included in the *Roman Imperial Coinage* volumes. "Egyptian mint" represents imitation coinages, which I discuss in the section on coin molds in this chapter.

Table 5 Imperial Bronze Mints with Abbreviation.

Imperial Bronze Mint	**Abbreviation**[142]
Alexandria	Ale
Egyptian mint	Aegy
Antioch	Ant
Unspecified eastern mint	east mint
Cyzicus	Kyz
Nicomedia	Nic
Constantinople	Con
Heraclea	Her
Thessalonica	The
Serdica	Ser
Sirmium	Sir
Carthage	Car
Rome	Rom
Ostia	Ost
Siscia	Sis
Axum	Axum
Aquileia	Aqu
Ticinium	Tic
Arelate	Are
Lugdunum	Lug
Treveri	Tre
Unspecified western mint	Westmint
Londinium	Lon

[142] The abbreviations used for the mints have been taken directly from Noeske 2000.

Table 5 Imperial Gold Mint with Abbreviation

Imperial Gold mint	**Abbreviation**
Antioch	Ant
Cyzicus	Kyz
Nicomedia	Nic
Constantinople	Con
Thessalonica	The
Sirmium	Sir
Rome	Rom
Siscia	Sis
Aquileia	Aqu
Mediolanum	Mediolanum
Arelate	Are
Lugdunum	Lug
Treveri	Tre

Mint	Number of Bronze Coins	Percentage	Number Gold of Coins	Percentage
aegy	881	2.97%	0	0.00%
ale	5,496	18.52%	0	0.00%
ant	3,787	12.76%	252	63.00%
aqu	473	1.59%	3	0.75%
are	111	0.37%	4	1.00%
axum	72	0.24%	0	0.00%
con	1,134	3.82%	25	6.25%
eastmint	371	1.25%	0	0.00%
her	948	3.19%	0	0.00%
kyz	1,947	6.56%	1	0.25%
lug	144	0.49%	1	0.25%
mediolanum	0	0.00%	1	0.25%
nic	1,037	3.49%	80	20.00%
ost	9	0.03%	0	0.00%
rom	1,281	4.32%	10	2.50%
sir	2	0.01%	5	1.25%
sis	385	1.30%	2	0.50%
the	545	1.84%	12	3.00%
tic	218	0.73%	0	0.00%
tre	73	0,.25%	1	0.25%
unknown	10,140	34.16%	3	0.75%
westmint	88	0.30%	0	0.00%
car	394	1.33%	0	0.00%
lon	2	0.01%	0	0.00%
ser	143	0.48%	0	0.00%
tar	3	0.01%	0	0.00%
Total	**29,684**		**400**	

Table 6 Figures and Percentages of Bronze and Gold Coinage by Mint

While regional differences in circulation patterns will certainly be important for understanding the movement of coinage within the province, I will first look at circulation

patterns on a macro scale, meaning that I will consider, for now, the Egyptian province as a single unit. Egypt's relative geographic isolation, bordered by two seas and two deserts, means that coins from the rest of the Empire would most likely have entered from the port cities of Alexandria and Pelusium, from the Cyrenaica region via Paraitonion along the Mediterranean coast in the north, from the Sinai Peninsula, and from the Red Sea coast. More than just a port, Alexandria was an economic hub of the Eastern Mediterranean, producing a variety of luxury and staple goods and acting as a major redistributive port between the Akusmite Empire, the Indian subcontinent, and the rest of the Roman Empire.

Although there is substantial evidence that cast-bronze coinages were manufactured throughout the province in a semi-autonomous capacity, a point which will be further discussed in the coin mold section in this chapter, Alexandria was the only official imperial mint in Egypt, and thus it had very strong political, administrative, economic, and social impacts. The influence of Alexandria over the rest of the Egyptian province must undoubtedly have been dominant. The Delta region, full of canals and subsidiary branches of the Nile, to which it was closely connected, further solidified its reach. Because of its high connectivity, it thus, to some extent, makes sense to analyze the circulation patterns in Egypt geographically all together, despite its vast size. The only mint south of Egypt that appears in fourth-century hoards is the mint of Axum in modern Ethiopia, which belonged to the Aksumite Kingdom and was not a mint of the Roman Empire. This has very interesting monetary implications, which I will discuss further.

Coin Molds and the Coinage Supply

In 1948 and 1950, a Franco-Swiss mission directed by Jacques Schwartz excavated the site of Dionysias, modern Qasr Qarun, in the Fayyum Oasis in Egypt.[143] The site contained a fort, unearthed in 1950 (but published only in 1969), that received scholarly attention because it was mentioned in the *Notitia Dignitatum* as housing the *ala V Praelectorum* around 400 CE.[144] Equally important for the understanding of the organization of the army and of the monetary economy of Roman Egypt, however, was another building located between the fortifications and the village. It contained a rudimentary oven, two channels in which soot and ashes were disposed, and 15,000 coin molds made from coins dating to the Tetrarchic and Constantinian periods.[145]

Alessandra Gara, an ancient historian at the University of Pavia with a focus on ancient economic history, quickly recognized the economic importance of the presence of these coin molds and published the seminal article "Matrici di fusione e falsificazione monetaria nell'Egitto del IV secolo" in 1978.[146]

Gara was able to place the evidence for wide production of cast coins in Dionysias within the larger setting of the Roman Empire, pointing out that the manufacture of non-official coins was a well-known phenomenon in France and Britain, and therefore she situated Egypt's production of "imitation" coinages within the greater monetary history of Europe and the Mediterranean.[147] The article also provided a lengthy discussion of the legal

[143] Schwartz and Wild 1950; Schwartz 1969.
[144] Davoli 2012, 158.
[145] Gara 1978, 234.
[146] Gara possessed a rare ability to utilize papyrological and numismatic evidence elegantly and, using a sophisticated theoretical analysis, to place that evidence within a wider historical framework. Before her untimely death in 1993, she published a series of articles dealing with papyri and coinage, as well as a more synthetic piece on the monetary economy of Roman Egypt, published in 1988; see Bagnall 1993b, 79-80.
[147] Gara 1978, 232.

status of these coins, a point to which I will return later. Based mostly on the coin molds themselves and laws preserved in the *Codex Theodosianus*, Gara challenged the notion that this represented an illegal production of coinage, a claim that continues to be advanced regarding the production of coins outside official state mints,[148] and offered a more nuanced view of cast or molded coins:

> "Il problema di fondo sta, infatti, nel significato da attribuire a questa moneta fusa, se sia cioè opera di falsari…o se non si tratti, invece, di una moneta autonoma di emissione non statale, a circolazione locale, comunque tollerata in aree marginali e in periodi storicamente caratterizzati da rivolgimenti economici e sociali, o da incertezze nella gestione del potere politico."[149]

Gara located the production of cast coinage in Dionysias within the complex political and economic context of late third- and early fourth-century Egypt, and more recent scholarship on coin molds and the hoard evidence from this period has necessitated an even more nuanced view of the role of these "imitation" coinages.[150] Key papyrological texts and an on-going and more comprehensive hoard analysis of the bronze coinage corroborates Gara's hypothesis that these coins were not merely tolerated, but indeed supplied a necessity for the highly monetized society of Egypt during the fourth century.

In this section, I will deploy archaeological, numismatic, textual, and papyrological evidence in an attempt to connect the large quantities of fourth-century CE coin molds found in Egypt with the apparent contemporary shortage of official bronze coins in circulation during this period. I will discuss the information the molded coins can yield regarding the role of the mint of Alexandria during this century. The sets of data are large and complicated, but their mere existence demands attention. The questions raised by these coin

[148] Lichocka 1996, 206 asserts that these cast coins were most likely tolerated given the need for currency by Egypt's population, but the author continues to treat them as illegal productions of coinage.
[149] Ibid.
[150] See Barakat 2005; Lichocka 1996, 2005a for more information on the actual manufacture of the cast coinage.

molds, coin hoards, and single finds cannot be solved or answered in one chapter, especially because much of the evidence is so far unpublished. I hope, however, that by contextualizing and inserting these objects into a broader economic historical frame, we may begin to achieve a more nuanced view of minting and the role of the state in the fourth-century economy, and lay the groundwork for more detailed future investigation. As I will discuss, the widely-tolerated practice of imitation coinage also raises questions about the application of Roman law in the provinces. Furthermore, the preliminary results of analyzing coin hoards and molds from Egypt suggest ancient roots for a trend that is common in the *longue durée* of later economic history, namely the limited supply of small denomination currency. [151]

In Michael Ford's 2000 compilation of fourth- and fifth-century CE coin hoards from Egypt, the author continually references the original editors' and authors' remarks on the poor quality and illegibility of numerous coins within these hoards.[152] The illegibility is often dismissed as a product of the decay or extensive circulation of the coin, which may well be the case in many instances, as all bronze coinage, struck or mold-made, is susceptible to wear and corrosion. But it is worth considering another hypothesis, namely that many of these coins were not struck at all, but made from molds. This possibility is particularly significant because ceramic molds cannot produce the same crisp quality that can be obtained by striking with a metal die; mold-made coins may therefore be illegible even when newly

[151] The so-called imitation coinages and their production are not an unknown phenomenon in economic history. Sargent and Velde 2002 have introduced a model showing the recurrent scarcity and depreciation of small change in medieval and early modern Europe, mainly stemming from the expensive pressure on the state to provide a constant stream of coinage. In summary, the minting of small currency was not profitable to the state, but its shortages were harmful to the state because they hurt trade and caused further inflation and depreciation. The authors used case studies mainly from medieval Florence and Venice and 16th century France, and were able to isolate and distinguish various monetary "symptoms": Free minting, bullion famine, ghost monies, and units of accounts (along with attempts by the state to fix prices). While indubitably closely related to many issues of bronze coinage production in this chapter the similarity in small-change problems identified is out of the scope of this chapter since it requires much closer analysis and discussion of the price data available on papyri and inscriptions during this period.

[152] Ford 2000.

made. Molded or cast coins tend to have a smaller diameter, and the contour of the imagery is blurrier.[153] To the numismatist, however, this difference in diameter is not always diagnostic of manufacturing technique since struck coins can be blurry as well, depending on the level of preservation of the coin and how long it was in circulation before being deposited. Thus, little attention has been paid in the past to the measurements of individual coins when analyzing a hoard, or to other physical traits, such as fineness, that may be indicative of the manufacturing technique of each coin. Much analysis thus needs to be performed again on these bronze hoards. Given the quantity of coin molds found dating to the first half of the fourth century CE, however, it is hard to avoid the suspicion that a substantial portion of these illegible bronze coins were originally not struck in Alexandria (or anywhere else), but cast. If this is indeed the case, then in accordance with the dates of the coin molds, which I will discuss later in this article, many of the illegible coins can be dated to the first quarter of the fourth century.

Correlating coin molds to coins is not a straightforward endeavor; sets of evidence need to be reconciled. Metallurgical analyses on various types of bronze coins could perhaps offer further insight as to which coins were struck and which were cast, as long as one accepts the assumption that the silver content in cast coins would be lower and less consistent than in officially struck coins, or even non-existent. How much care was devoted to the composition of the molten metal poured into molds remains unknowable, but a metallurgical analysis of silver content in bronze coins from this period would offer substantial insight into the manufacturing process of non-official coinage and should be done to advance our understanding of the production of these coins.

To summarize the argument up to this point: the archaeological record provides comparably small numbers of officially struck bronze nummi securely dated to the first third

[153] Lichocka 1996, 197.

of the fourth century, whereas nummi minted between 340 and 408 CE are found by the tens of thousands. A large percentage of the bronze nummi are of such poor quality as to be illegible and undatable; similarly, most of those datable to the early part of the century are poorly legible to the point that their mints are not identifiable. This poor quality may result from their having been manufactured in coin molds, in which case we can link the molds to the their coins. This is a tentative hypothesis, however, and needs further analysis and testing. What remains clear is that a deficiency of small-denomination coinage struck at the official mint at Alexandria may be identified, based on the skimpy archaeological record of bronze coins and on the presence of tens of thousands of coin molds from the same period.

Coin molds

Official coins from the mint of Alexandria during the Graeco-Roman period were always struck, not molded. A fresh flan would be placed over a die, which contained the obverse negative of a coin, and then it was struck with a mallet, which contained the negative impression of the reverse type. Due to the malleability of the metal in the flan, the crisp definition of the obverse and reverse impressions in the dies, and the force used to strike the flan, officially struck coins are easily recognizable if they have not been subject to extensive wear and use. If they have been in lengthy circulation, however, and subject to constant handling and weathering, the quality of the impression may decline until it becomes hard to tell if the coin has been officially struck or made from the mold of another coin. Therefore, the identification of a cast versus a struck coin depends substantially on the state of preservation of the object, which is an uncontrolled variable.

By contrast, coin molds themselves are unmistakable. There are two main types of coin molds. One of them consists of a clay disk into which a coin has been impressed multiple times; a channel is incised connecting each impression left by the coin and then

molten metal is poured into the mold. Once the metal has hardened, the mold is broken and the coins are separated and polished. The second type consists of a cylinder formed from various clay disks impressed with the obverse and reverse of a coin. Once the cylinder contains about 10 molds, a triangular incision is made along its length, into which the metal is poured. Once used, the clay molds were discarded.[154] It is in these depositional contexts that thousands of used molds are found in Egypt.

The existence of coin molds in Egypt can be traced to the very beginning of the presence of coinage there. In 2009, for example, excavations at the temple of Karnak uncovered ceramic coin molds from the Ptolemaic period.[155] The practice was in continuous use, and one can find examples from various periods of Graeco-Roman Egypt up until the seventh century CE.[156] Even so, the scale on which they are found following Diocletian's reform is unparalleled. Just in the published material, we have nearly 2,888 molds found at Hermopolis Magna[157] and 15,000 at Dionysias; in a later campaign, another 2,768 were excavated.[158] Excavations in a sector of Alexandria in 1880 uncovered 356 molds, and J. G. Milne published 153 molds from the 1903-1905 excavations from Oxyrhynchos.[159] There are 1,054 unpublished pieces (dating 295-317) present at the Cabinet des Médailles in Paris. There is also a small group of 14 molds dating to the Tetrarchic period at the Australian Center for Ancient Numismatics[160] and 6 molds in the University of Winnipeg collection.[161] Furthermore, Thomas Faucher has remarked that there are thousands of fourth-century coin

[154] For a full description on the manufacturing process and useful illustrations, see Barakat 2005.
[155] Faucher 2015.
[156] Noeske 2009, 210. Excavations at the White Monastery unearthed a clay mold for casting dodecanummi in the name of the emperor Phocas.
[157] Schwartz-Wild 1950, 39-48; Jungfleisch 1950, 250; Schwarz 1969, 99-105; Noeske 2000, 408.
[158] Lichocka 1996 cf. no.2 Schwartz 1950, 99-105; Schwartz 1959, 11-17; Schwartz 1974, 45-48.
[159] Milne 1922, 158-163.
[160] Nixon 2013, 23-38.
[161] Lichocka 1996.

molds in storage in the Egyptian Museum in Cairo and about 16,000 uncatalogued molds at the Institut Français d'Archéologie Orientale in Cairo.[162] The British Museum contains a small collection of about 20 molds dated 337-395, which are very similar in size and clay composition to the ones found in Kom el-Dikka in Alexandria.[163]

The blurriness and poor quality of the ceramic molds often makes them illegible and thus hard, but not always impossible, to date. Chameroy compiled and dated the available coin molds, and by analyzing the differently-combined impressions of the reverses of coins he identified two main production phases: 312-313 CE and 316-317.[164] To put this in a wider chronological context, according to C.E. King there were nine recognized periods of coin-copying between the first century BCE and the fifth century CE. Of these nine, four occur during the fourth century in a nearly consecutive manner, between 310 and 360 (specifically 310-318, 318-325, 330-348, and 348-360).[165]

When we tie the chronology of the coin molds to the chronology of the bronze coinage, a relationship between the phases of cast coin production and the phases of debasement is immediately apparent. To illustrate this point, I reproduce the following table from Bagnall 1985, cataloguing the periods of debasement and the size of the largest *nummus* piece in each.

[162] Faucher, personal communication.
[163] Lichocka 2005.
[164] Chameroy 2010.
[165] King 1996.

Period	Weight of largest *Nummus*	Percentage of Silver
296-307	10 g	4% or 400mg
308-312	7.75 g	3.8% or 295 mg
312-318	5.25 g	3.8% or 200 mg
318-324	3.4 g	3.3% or 112 mg
324-325	3 g	0.12% or 3.6 mg
325-330	3.05 g	2.1% or 63 mg
330-335	2.48 g	1.1% or 27 mg
336-337	1.61 g	1.5 % or 24 mg
337-341	1.64 g	1.4% or 23 mg
352-357	2.5 g	1.2% or 30 mg
357-358	< 2.5g	?
359-362	< 2g	?
363-364	2.9 g	?
364-375	2.3-2.4 g	.2% or 4.7 mg

Table 7 Periods of Debasement after Bagnall 1985.

The first period of debasement begins around 308, which is also precisely the time to which the earliest and most numerous nummi coin molds are dated. Moreover, it has already been established by Bagnall, among other scholars, that these periods of debasement match periods of inflation identified on the basis of prices in the papyrological record.[166]

Bronze, gold, and silver coinages had different practical roles in the ancient economy. The purchasing power of a bronze coin was far less than that of a silver or gold issue. Bronze facilitated ease of exchange for quotidian transactions, while silver and gold were used for larger transactions, including purposes that were more central to the state, such as paying soldiers' salaries. If silver and gold were not available, then large quantities of small-value bronze currency would have been needed for these larger transactions.

There is in fact papyrological evidence from Egypt that clearly points to a shortage of silver and gold bullion for state needs during the first quarter of the fourth century. *P. Columbia* VII 138, 139, and 140, dated to 307/308 CE, are receipts for gold and silver bullion from Karanis, which form part of the archive of Aurelius Isidoros. Bagnall edited and analyzed these texts, concluding that these exactions did not represent a tax, but

[166] Bagnall 1985, 31, 37.

rather an imposition on landowners, who were required to provide gold and silver bullion for purchase by the government at a determined price. The quantity of bullion was calculated based on the amount of taxes paid in wheat by the landowners, quantified in artabas, and was then purchased by the state, with the amounts of gold and silver apparently equal in value. Because the state set the relative value of the two metals at a ratio of 12:1, they required twelve times the quantity of silver as of gold. [167] We may safely assume that the compulsory sale to the state of this precious metal supply is also evidence for a lack of access to large quantities of silver bullion on the part of the minting authorities in Alexandria responsible for producing the official billon coinage.

The state's limited access to supplies of precious metal could partially explain the need for alternative minting in the province. At present, as we have seen, there exist no metallurgical analyses of the silver content of cast coins that could provide comparative data for the officially minted series. Gara concluded that both an uncontrolled quantity and a complete absence of silver in the bronze currency in circulation would be particularly problematic for the minting authorities, who controlled the amount of precious metal in each official coin.[168] The fact that a large quantity of coin molds are dated to the same period during which there was both a scarcity of officially minted coins and evidence for the state's lack of precious metal clearly demonstrates that these phenomena are related. The mint at Alexandria could have been closed for a period of time due to this lack of silver bullion, or the officinae could have been reduced, creating an immense need for small-value currency.[169] The contemporaneous lack of high denomination currency could also have fostered the use of small change for large monetary transactions, which would mean that, given the difference in

[167] See Bagnall 1977.
[168] Gara 1978, 248.
[169] Ibid 238.

value, still more billon or bronze coinage would have been needed for purchases, putting stress on a mint whose political situation had been tenuous for the preceding decades.[170]

Gara offered a lengthy discussion of the legality of the coinage in her article, which allows me to summarize her conclusions regarding what we know for certain about cast coins:

- they can be distinguished from struck ones;
- they were not necessarily made using coins that were in circulation at the time;
- they were accepted without any evident resistance by their intended users;
- they tended to imitate the weight of the nummus (but without silver); thus, they must represent one of the lowest denominations in circulation;
- they are clearly, in the case of Dionysias, tied to and dependent on the military.[171]

The large-scale presence of coin molds challenges the allegedly illegal status of imitation coinage in the Empire, and instead suggests a monetary system that relied during certain periods on non-state coinage production for part of its needs. The clear widespread use of these coin molds indicates that the practice of manufacturing cast coins could not have been a covert practice in Egypt, a point that has been made ever since Schwartz initially published this discovery. Schwartz and Wild concluded that neither the nature of the work nor the resultant smoke emissions from the building in Dionysias manufacturing the coins could have possibly been concealed.[172]

The proximity of the findspot of the Dionysias molds to the local military camp implies that the practice was directly linked with the army stationed there.[173] Perhaps one of the reasons these coin molds are found near military camps is that the army was the biggest

[170] Metcalf 1998.
[171] Gara 1978, 245.
[172] Ibid. 234; Schwartz and Wild 1950.
[173] Gara 1978; Callu 1980, 102.

consumer of local goods and was in constant need of coinage to maintain troops and pay soldiers' salaries. Furthermore, army involvement in cast production could essentially legitimize the industry, a point that J.P. Callu has also reiterated. Gara concluded that given the papyrological evidence from the archive of Abinnaeus, prefect of the *ala V Praelectorum* and commander of the fort in Dionysias, cast coinage was an autonomous local response on the part of agents of the state to the needs of the local villages, and made it possible to conduct monetary exchanges. The archive dates between 342 and 351 CE and elucidates the role the army played within the rural population in Egypt: they offered protection and provision of justice to the local villages in the Fayyum. Therefore, the cast coin could be seen as an official response to the large local need for currency.[174]

The question of the role of these cast coins in light of the legal texts has also been analyzed. The laws preserved in the late antique codices of Roman law repeatedly condemn the practice of fusing coined metal. However, Gara has theorized that the army could be seen acting as a local minting authority in a time when the mint at Alexandria, for one reason or another, was not able to supply the needed amount of small value currency. Therefore, as the producers of the coins were acting in an official role legitimized by the army, the laws forbidding the fabrication of cast coins could not be applied in this scenario; at any rate, the authority most likely to enforce the laws was the one implicated in their apparent violation.

Furthermore, the laws in the Theodosian code forbidding the illegal manufacture of coinage seem to be concerned less with the existence of counterfeit coins than with precious metal being melted down from older coins in order to manufacture more.[175] The Constantinian law of 326 CE severely punishes the manufacture of illegal coinage,[176] but years later, in 349, *C.Th.* IX. 21. 6 explicitly mentions *quam crebre separato argento ab aere*

[174] Gara 1978, 247.
[175] From Lichocka 1996 *C. Th. IX*. 21.1,3,6,9,10; 23.1, *C. Just. XI*.11.2
[176] *C.Th. IX*.21.3

purgare, perhaps implying that it was the act of extracting the silver from official coinage that concerned the state most.[177] Even if the official status of these coins was that they were illegal, this does not necessarily mean that the local authorities in Egypt frowned upon their use. Perhaps a more important question that remains unanswered is the value that these coins held in the market. In hoard AE 1 from Luxor, for example, we can see that cast coinages are found alongside official nummi,[178] presumably circulating for the same kind of transactions. Even if they were modeled after the nummus, were they accepted at the same nominal value?[179] Were they then a response to price inflation or a product of the state's lack of access to bullion? Any single explanation for the existence of coin molds and their coins and for their relationship to the precious metal supply would no doubt be an oversimplification of the multifaceted currency system and the complex market price relationships between metals.[180]

Metallurgical analyses on these cast coinages are necessary in order to understand fully the role that these coins played in the monetary economy. The fact that cast coin production is a widespread phenomenon in Egypt shows that for at least the first half of the fourth century, the currency system was not being fully maintained by the Alexandrian mint alone, nor even with imports from other imperial mints.

If indeed there was a decentralized and autonomous mint at Dionysias, then, as with other centers that produced these coinages, the toleration of imitative coinage of low intrinsic value would introduce a functioning monetary economy made possible, in part, by freely minted coinage. This directly implies the practice, if not the theory, of a decentralized monetary policy in Egypt. The coin molds are a sign that the provision of coinage by the

[177] For a more thorough discussion and primary sources on the legality of cast coins see Gara 1978, 240-250. The author points to the complicated nomenclature for the different sets of coinages in circulation during this period as indicative of the complex numismatic reality.
[178] Ford 2000.
[179] Gara 1978, 252.
[180] See conclusions in Gara 1978 and Bagnall 1985 for more on the currency and inflation during the fourth century CE.

Alexandrian mint, and by other mints outside of Egypt, must have not sufficed to maintain the highly monetized economy.[181]

Though the historical question of the legitimacy of coin molds has been debated in the past, numismatic analysis and papyrological evidence have corroborated Gara's hypothesis that these coins were quasi-official and functioned in response to a low output of small denominations by the Alexandrian mint.

Illegible coins

After a millennium and a half of wear and tear and exposure to the elements, the legibility of ancient bronze coins is often very poor. Solidi are made of almost pure gold, meaning that when found in the archaeological record they are usually in a relatively good state of preservation due to the element's chemical stability; that is, any deterioration is the result of wear rather than of degradation of the metal itself. This results in an extremely high legibility rate, in this case the highest – all 400 gold coins in the database have a legible mint, and therefore it is possible to trace their minting provenance. The contrast with bronze coinage, however, is stark. Not only is the base metal (silver and copper) in bronze coinages chemically more interactive with other elements, but also the varying metal composition caused by continuous debasement, as well as the varying manufacturing processes (struck or molded) means that natural wear from use—and these presumably were handled more frequently than gold coins—is compounded by deterioration of the metal. Therefore, the state of preservation in bronze coins often makes them partly or completely illegible.

A quarter of the coins in the database (26.5%, or 6095) are illegible, and thus neither their mint nor even their type may be identified. This is, in large part, due to their

[181] Rathbone's 1991 analysis of the Heroninos archive from the third century CE concluded that Egyptian society was wealthy and highly monetized during this period. I am assuming, based on the evidence presented in this article, that the heavy dependency on a large quantity of coinage must have continued well into the fourth century.

state of preservation, as mentioned earlier. However, as I have already argued in the previous section, I believe a substantial amount of these illegible coins were never very legible to begin with, as they were manufactured in clay molds that produce blurry details and were not struck in official mints with a die.[182] As we have seen, it is not always possible to differentiate a coin that has been molded, and was never legible, from a struck one that has lost its legibility due to usage and erosion. Only 881 coins out of the overall 30,086 have been categorized as non-official Egyptian bronze coinage. We do, however, know that a large amount of molded coins were produced. Therefore, I propose that while we may never know with certainty how many of the 6095 coins with unprovenanced mint are simply eroded and how many of them were manufactured using coin molds, we can assume that a portion of those dating to the first half of the fourth century, perhaps even a good percentage of the whole, were made by coin molds in Egypt.

Throughout the period specified, 297/298-388 CE, the mint distribution of the coins found in Egypt is as follows. As seen in Fig. 2, the further away a mint is from Alexandria, the less its coins are represented in the archaeological record. While Alexandria represents the highest percentage of the mints, it still provides only about 28% of the coins with an identifiable mint. Next is Antioch with 19.3%. The local Egyptian unofficial mint "Aegy" represents 4.5%. For the Aegy mint, it is important to keep in mind that this percentage represents the number of coins that have been identified as imitations, not the "unknown" mints that I have suggested could potentially also be cast, imitation coinages.

For geographical reasons, I would consider the Propontic mints, Constantinople, Heraclea, Nicomedia, and Cyzicus as one geographical unit, since they are so close to each other and collectively produced nearly 26% of the coins, almost the same as Alexandria.[183]

[182] Soto, forthcoming.
[183] Grouping the Propontic mints together is also the practice of Fulford 1976; Duncan 2007, and DeRose Evans 2011.

Thus, about 72%, or nearly three quarters, of the bronze coins with an identifiable mint and a secure chronology come from outside of Egypt, although predominantly from the nearest mints, such as Antioch and the Propontic mints. The notable exception to this regional trend in the circulation patterns is Rome, which is located further from Alexandria than any eastern mint, and at 6.55%, has the highest representation of any western mint.

Alexandria

As the only imperial mint in Egypt, Alexandria was responsible for providing coinage to the whole province. The mint had up to five different officinae.[184] During the imperial period it remained separate and, as described earlier, continued to mint tetradrachms based on a Greek system of currency. These coins bore the portrait of emperors, however, and it is through Alexandrian coinage that historians have reconstructed the full portrait iconography of emperors. During the first century CE, state authorities maintained close control of the metal content in coins and were therefore able to manipulate the precious metal percentage in times of strong need, such as during the reign of Nero, when a coinage reform was carried out and the mint operated in a surprisingly autonomous manner. [185] Two centuries later, there is even evidence that the mint anticipated the coinage reform of Aurelian in 274.[186]

Gold

Both Diocletian and Maximinus were depicted in two series of gold aurei issued by the mint of Alexandria during 306 CE.[187] The last Alexandrian gold coinage to be issued during the fourth century was struck for Licinius' *quinquennalia* in 314 CE. Remarkably for

[184] *RIC* VII.
[185] Geissen 2012.
[186] Estiot 2012.
[187] OCRE: http://numismatics.org/ocre/id/ric.6.alex.96

such an important province, no gold coinage was minted at Alexandria between Licinius and the second half of the sixth century. The fourth-century gold coins found in Egypt all date to after 337 CE, and the earliest deposit date for any of the hoards is 364 CE. Therefore, from the hoards themselves there is no evidence of solidi or aurei present in Egypt during the early fourth century. There have been no published single finds of solidi from fourth-century Egypt either, to my knowledge.

Bronze

Throughout most of the Graeco-Roman period, Alexandria minted billon and bronze currency. The quantity of Alexandrian bronze coins in the database is expected and can be compared to what other studies have yielded. Looking at the whole period from 297/298 to 388, 18.52% of the datable bronze coins come from Alexandria. Breaking the data down into separate periods, the mint is represented more prominently in the post-reform period after 354 CE. After this period Alexandrian coinage can also be found in the Danube provinces and Palestine.[188] The majority of the hoards containing nummi from the mid and late fourth century also contain nummi from the fifth century, attesting to a long circulation of the post-reform nummi. The recall of coinage by Constantius seems to have been effective, as few pre-reform nummi are found in tandem with later pieces.[189]

Ermatinger has also noted the changing activity of the mint during the fourth century in his analysis of hoards, which he ends in 337 CE, right before what seems to have been a numismatic horizon for Egyptian hoards. He summarizes: "The situation in Egypt is the most dramatic. During the Tetrarchic period the Egyptian hoards contained only 37% from the mint of Alexandria but for the post-Tetrarchic period 73%." His post-tetrarchic period ends in 337 CE, and therefore his conclusions for bronze percentages do not include

[188] See Duncan 2007 and Bijovsky 2012 in the discussion below.
[189] Noeske 2000, 112.

later periods, during which other mints played a very prominent role in supplying nummi to the Egyptian territory.[190]

The output of the Alexandrian mint found in other provinces is not substantial. Already in 1976, Fulford concluded that Alexandria represented a consistent 10-15% of the fourth-century hoards in the assemblage from Kourion. This is the highest percentage outside of Egypt; however, Kourion is located in the southwestern coast of Cyprus, which is close to Egypt. A little further away, in Antioch, Alexandria represents 5% of the coinage, while in Athens and Corinth it represents between 1 and 2%[191] Therefore, we can infer that the mint was moderately effective in producing coins for use within Egypt throughout the century, but that it had little impact on currency patterns outside of the province. In this regard Alexandria is extremely different from other mints around the Mediterranean. It did not supply enough bronze coinage for the highly monetized economy of Egypt, so its production had to be supplemented by imitation cast coinage produced in the province as well as a significant amount of bronze currency absorbed from other mints. The mechanism by which these coins entered into circulation in Egypt will be discussed in the concluding remarks of this chapter as well as in the final conclusions of this dissertation; nevertheless, I will briefly note that the various debasements and demonetizations, such as the one during the reign of Constantius, did not seem to anticipate the scale of coinage required for the needs of the province. Here we see an important asymmetry: demonetization on the part of the central State without a corresponding increase in production of the lower-denomination currencies by the Alexandrian mint. Whether or not the minting authorities were expecting to rely on outside coinage remains uncertain, although undoubtedly there must have been a certain level of confidence in the ability of the broad marketability of Egyptian products to bring in revenues into Egypt.

[190] Ermatinger 1990, 116.
[191] Fulford 1976, 85.

Antioch

Besides Alexandria, the mint at Antioch is consistently the most-represented mint in fourth-century coinage found in Egypt. This is not surprising, for three primary reasons. First, it is the mint closest to Egypt (at about a week's trip from Alexandria). It had also been one of the most important metropoleis of the eastern Mediterranean since its foundation in the Hellenistic period. Finally, Antioch has been categorized as the largest fourth-century mint.[192] Throughout the Roman period, the city underwent substantial structural development that fostered urban growth. During the fourth century in particular, the emperor Valentinian initiated significant building programs in the city. Located next to the Orontes River and close to the Mediterranean, it was a well-connected trading hub and a key location for the army. The presence of the army in Antioch defines its coinage output, certainly in terms of the distribution of gold. During the fourth century, even emperors were known to have spent substantial amounts of time in Antioch; Julian used it as a major base of operation. This had a strong impact on the coinage produced in the city for the payments of the imperial office and the army.[193] As Alexandria produced no gold coinage during this period, the closest mint and supplier of gold coinage for the eastern Mediterranean in general was Antioch.

Antioch's bronze coinage was certainly important in sites around the eastern Mediteranean, as we will see in the section regarding comparanda from sites around the region. In Kourion, the mint represents 20% of coins, but in Athens and Corinth its percentage falls to 5%.

The Constantinian Hoard

One hoard that has been added to the database but is not featured in the

[192] Liebeschuetz 1972, 71-72, 92.
[193] See Destephen 2016 on imperial voyages during Late Antiquity in this region.

quantification of the previous graphs was published by Milne in 1914. The hoard as published contains 6,141 coins. Most of them date to the period between 330 and 337 CE, but Milne places the deposition of the hoard between the years 343 and 345. The publication and analysis of the hoard predates the RIC series, so the coins were not given an RIC typology and consequently were not included in the quantification provided earlier in this chapter. Because the hoard has such a well-defined deposition date and its composition of mints matches the percentages observed for the coinage evidence within Egypt, I believe it should be analyzed specifically in order to show the monetary relationship this region could have had with Egypt. Furthermore, as it belongs to the early fourth century, it can show the swiftness with which coins from other mints began circulating in tandem with coins from Egypt.[194]

Of the 6,141 coins, both Alexandria and Antioch are represented nearly equally in the hoard, showing the immediacy with which Antioch supplied part of the currency of Egypt. The percentages shown in Table 3 also match the ratio of the mints seen in Fig. 2. The other mints, such as Cyzicus, Constantinople, and Nicomedia, are known to have been quite active during this period, in part due to the presence of military troops around the new capital. The strong connectivity to Egypt can be seen in these percentages as well. When observed from a chronological point of view, most of the coins were minted during the first decade that Constantinople was the capital. Already at the end of the decade, its coins and those of its nearby mint at Cyzicus combined represent one quarter of the total mints, the same ratio as Alexandrian and Antiochian coins.

The traffic from Nicomedia and Rome was considerable. Both cities continued to be centers of military and commercial power during the fourth century, though, so their connections to Egypt are unsurprising. If we combine the percentages of the Propontic mints,

[194] Milne 1914.

the overall percentage (37.6%) surpasses that of the coins provided by the Alexandrian mint. The date of deposition of this hoard is within a decade of the founding of Constantinople, and the expenditure and activity of the mints in the region is already evident in the hoard.

Table 8 Mint Distribution of Constantinian Hoard

Mint	Total	%
Alexandria	1592	25.9
Antiochia	1611	26.2
Cyzicus	845	13.7
Nicomedia	539	8.8
Constantinopolis	698	11.6
Heraclea	220	3.5
Thessalonica	196	3.2
Siscia	42	0.7
Aquileia	23	0.4
Roma	285	4.6
Arelate	56	0.9
Lugdunum	13	0.2
Treviri	19	0.3
Tarraco	2	0.03
Total	6141	100%

Comparison to other provinces

In order to better understand how typical or distinctive the currency circulation patterns in Egypt might be, we must look at other regions of the Empire.

Currency patterns from other provinces should be able to provide comparanda for degrees of connectivity relative to mint distance. We should not expect the exact same number of mints represented in the provinces, but rather a similar distribution in which the local and regional mints manufactured the highest percentages of coins. We can extract from the Egyptian patterns two main characteristics of mint representation in the province: distance and mint activity. Not many regions of the Empire have had their fourth-century hoards analyzed systematically. For example, understanding the circulation of coinage patterns in the Italian peninsula during the fourth century would be crucial for our understanding of movement of coins in and out of Rome. Nonetheless, the provinces that have been published provide invaluable comparanda. The figures offered by each publication

vary, so I have chosen to represent them in this table in a way that is clear, but also concise and very much geared towards the core questions of monetary circulation between Egypt and other provinces.

Danubian Provinces

Coinage circulation in the Danubian provinces has revealed interesting patterns that show high percentages of coins minted within the provinces. The hoards and coin finds were also studied using metal as a variable, revealing that precious metal coins do not often occur as isolated finds. The author concluded that "neither metal (gold and silver) played a prominent part in the currency of the region under consideration during most of the fourth century."[195] However, solidi finds do become more frequent as the century progresses, and after the reforms of 366 and 367, the gold coinage becomes more common.

The bronze coinage finds on the other hand reveal a strong dependence on the local mints. In Hungary and Croatia, the regional mints of Siscia and Sirmium produced over 50% of finds from the larger series of bronze coinage. The mints in Italy and east of Thessalonica generally produced between 10 and 15%; Thessalonica produced around 10% while London and the Gallic mints produced less than 5%. Importantly, Antioch and Alexandria produced less than 5% of finds and do not exceed this figure in any Danubian site.[196]

Macedonian Diocese

Within the Macedonian Diocese, Thessalonica is unsurprisingly the most commonly represented mint. But further south, in Achaea, Athens and Corinth specifically, the Propontis-region mints of Heraclea, Constantinopolis, Nicomedia, and Cyzicus produced around 60% of coin finds. Again, Alexandria and Antioch represent slightly over 5% of coinages.

[195] Duncan 1993.
[196] Ibid.

Duncan concluded that coinage circulation seemed to follow patterns that perhaps were influenced more by politics than geography. "There is thus an almost complete lack of movement between the Rhine and Danube, but impressive movements into Pannonia from Italy and from the Balkans."[197] In the Danube provinces overall, the great production of coins in the fourth century was unequally distributed in a manner that was greatly shaped by economic expenditure, namely the presence of the army affecting the activity of the mints.

Palestine

The finds from Caesarea Maritima are particularly important comparanda, not only because of the proximity of the site to Egypt, but also because its numismatic and archaeological finds represent its important role as a port in Late Antiquity, and thus its patterns are reflective of the commercial routes around the region. During the fourth century CE, Caesarea benefitted from considerable imperial attention. Substantial building projects in the port city were undertaken between 300 and 350.[198] The major mint suppliers are again the geographically closest mints: Constantinople (around 25%), Antioch (just below 40%), and Alexandria (around 12%).

Other sites around the region, namely Samaria and Jerusalem, had surprisingly different distributions in the first half of the fourth century: in Samaria 65% of coins came from Antioch, 15% from Alexandria, and 5% from Constantinople; while in Jerusalem 20% came from Antioch, almost 30% from other eastern mints, and over 40% from western mints. Less than 2% of the coins in Jerusalem during this period came from Alexandria. The high quantity of western mints in Jerusalem perhaps indicates its prominence as a religious destination. Nonetheless, it still remains curious that so few coins from Alexandria are found there, especially given the proximity of the cities to each other and their economic and cultural connections.

[197] Ibid, 45.
[198] DeRose Evans 2007, 43.

The situation in Jerusalem and Samaria seems to have changed after the reform of 348, which introduced the *FEL TEMP REPARATIO* type, although the weight continued to drop until about 383. This is where the region's coinage patterns seem to match other regions of the Empire. DeRose Evans summarizes the change and relates it directly to the economic reforms of Diocletian: "A generation after Diocletian's reforms of the coinage, the effects are finally seen on the supply of the coin."[199]

For the fifth century, the comparison between Egypt and Palestine has already been analyzed by both Noeske and Bijovsky.[200] Noeske compared Egypt and the diocese of Oriens and noted similar patterns in both regions. The issues from the Valentinian dynasty (364-378), for example, remained in circulation in Egypt for longer periods than in other areas.[201] What is particularly relevant for this chapter, as has already been stated in the discussion on chronology above, is the consistent presence of coins from the third quarter of the fourth century on, which remained in circulation during the fifth century. For example, Noeske has noted that coins minted between 383 and 395 remained in circulation in large numbers until the reform of Anastasius I. Overall, what is clear about the monetary circulation between Egypt and the Diocese Oriens is that the two regions shared common, if not identical, circulation patterns from the mid fourth century on, a characteristic that we have also observed in Caesarea Maritima. Since these three regions are geographically located close to each other, their consistency attests to the importance of proximity to mints for integrative circulation patterns, though of course with the important condition that the mints are close to the Mediterranean Sea.

[199] DeRose Evans 2007, 16, fig. 14.
[200] Noeske 2000; Bijovsky 2012.
[201] Noeske 2000, 125.

Athens and Corinth

In both cities, the major mints represented are Thessalonica and the Propontic mints. Throughout the fourth century, Thessalonica gains strength in relative representation, from 6% during the first two decades of the fourth century to around 50% in the later periods.[202] Alexandrian coinage in both sites represents less than 2%. Thessalonica itself also supplied around 2% of the coinage in Egypt, but had much more important influence in the Danubian provinces, as discussed above.

[202] Fulford 1976, 83.

Table 9 Percentage of Mint representation in regions outside of Egypt

	Hungary and Croatia	**Macedonian Diocese**	**Athens and Corinth**	**Caesarea Maritima**	**Jerusalem**	**Samaria**
Major mints/%	Siscia and Sirmium, >50%	Thessalonica	Propontic mints >60%	40 % Antioch	20 % Antioch	65% Antioch
Alexandria mint	< 5% (with Antioch)	< 5% (with Antioch)	5% (with Antioch)	around 12%	< 2%	15 %
Italia and east of Thessalonica /%	10 -15%			25%, Constantinople	30%	5% Constantinople
Thessalonica/%	10%		6% (early fourth) 50%(later fourth)			
London and Gallic	< 5%					
Western mints					40%	

Imperial Bronze Mint	***Distance in km/ Days Calculated using ORBIS***	***Percentage of mints in Egyptian finds %***
Alexandria	0	18.52***%***
Egyptian mint/Unknown	0	2.97% /34.16%
Antioch	969 km/ **7 days**	**12.76%**
Cyzicus	1450 km/ **12 days**	**6.56%**
Nicomedia	1569 km/ **13 days**	**3.49%**
Constantinople	1528km/ **15 days**	**3.82%**
Heraclea	1750km/ **18 days**	**3.19%**
Thessalonica	1407km/ **9 days**	1.84%
Serdica	1880km/ 27 days	0.48%
Sirmium	2628km/ 28 days	0.01%
Carthage	2362km/ **18 days**	1.33%
Rome	2334km/ **17 days**	**4.32%**
Ostia	2311km/ **16 days**	0.03%
Siscia	2599km/ 29 days	1.30%
Aquileia	2670km/**18 days**	1.59%
Ticinium	3272km/ 25 days	0.73%
Arelatum	3292km/ 23 days	0.37%
Lugdunum	3549km/ 31 days	0.49%
Tarracona	3301km/ 23 days	0.01%
Treveri	3400km/ 50 days	0.25%
Londinium	5247km/ 42 days	0.01%

Table 10 Percentage of Coins and Distance from Egypt by Mint

From Alexandria to the rest of the Mediterranean

One of the aims of undertaking a circulation study is to assess the level of monetary connectivity with other provinces of the Roman Empire. Since we know the precise locations of other known mints, we can map the distance between them and Egypt. In order to get a real sense of their distance from Alexandria, travel journeys were calculated using ORBIS.[203] The season with the shortest distance and time travel between Alexandria and each mint was selected and then plotted in a graph by days. The majority of the coins came from mints located less than 17 days away, if we assume the most direct and most efficient travel mode.

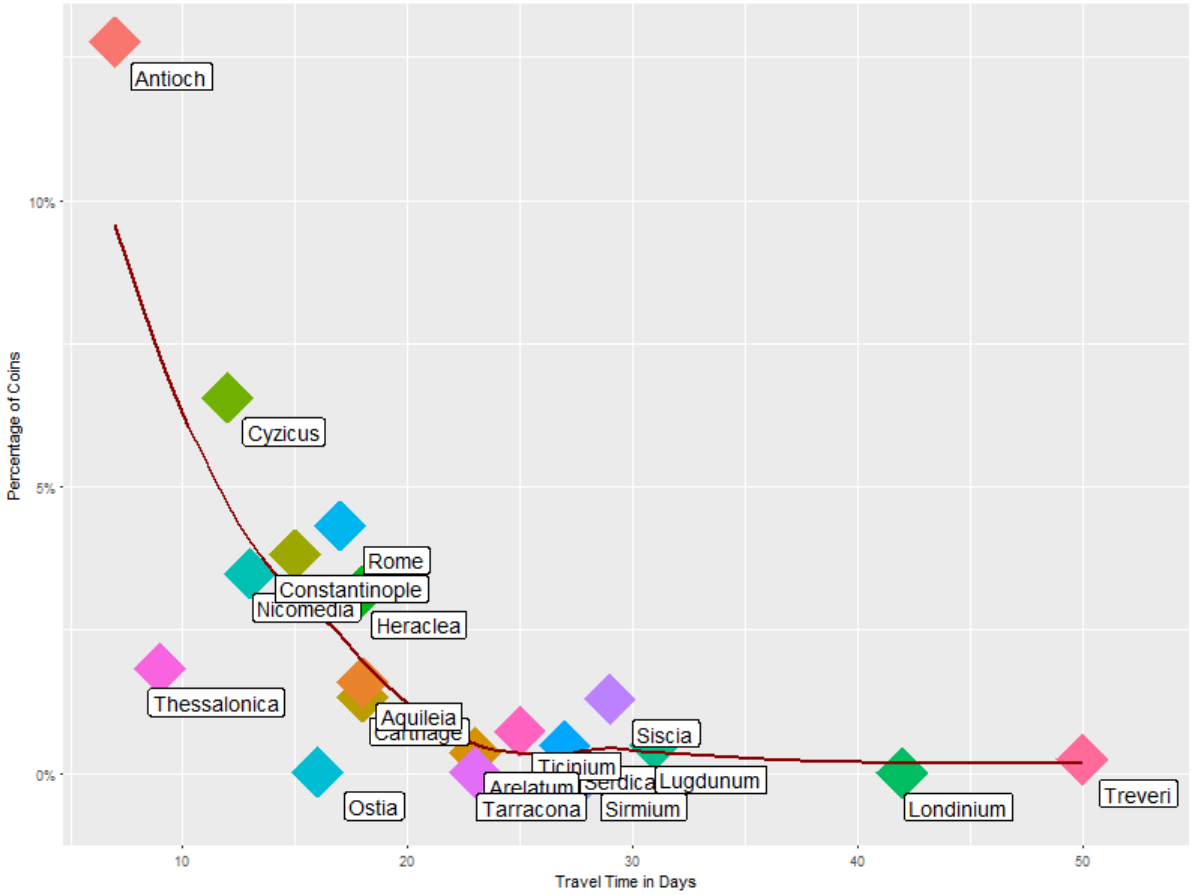

Figure 2 Percentage of Coins by Travel Time in Days to Alexandria

[203] http://orbis.stanford.edu/

According to ancient standards, a two-week journey was not a long one by any means. Even within the Egyptian province, travel from the Great Oases to the Nile Valley by camel caravan, which necessitated more capital investment given the provisions needed, took at least two weeks, and such journeys were done with frequency.[204] Sea transport was even less expensive, as it relied on the wind and the currents of the Mediterranean. As mentioned in the mint discussion, Thessalonica remains problematic. It is close to Alexandria by sea, but very few coins from the mint are found in Egypt. Perhaps the directionality of trade could be the reason. Analysis of the coinage output by mint in the region should shed more light in this regard. Perhaps its regional neighbors absorbed much of its bronze coinage production, as in the case of Siscia and Sirmium. While the majority of the coins come from mints closest to Alexandria, there is still a small presence of other mints from the west, showing a mix of mints from around the Empire. This indicates that during the fourth century Egypt was well-integrated and connected to other important economic regions of the Empire. At this point in the discussion, I will reverse the statement, because it lies at the core of the subject for this dissertation: during the fourth century, Alexandria acted as an economic magnet for other important regions around the Empire. Monetarily, it was arguably the best-integrated region of the Empire during the fourth century CE in the sense of being dependent on importing the highest percentage of the money supply from outside provinces.

Conclusions

The mint distribution reflected in both the bronze and the gold currencies shows that during the fourth century the Egyptian province was actually to a great extent dependent on its eastern Mediterranean neighbors for coinage. If we were to draw degrees of influence

[204] Adams 2004.

with Egypt at the center, we could correlate the time-distance between the province and a mint to the percentage of its coins represented in the hoards and single finds in Egypt. Mints closer to Egypt, such as Antioch and the Propontic mints, are represented more than mints that are further away. The presence of western mints is an indication of the activity of particular mints in nuclear cities, such as Rome, which continued to have an important political, economic, and religious role in the Empire even after it lost its role as the official imperial capital. It would be possible to categorize the degrees of mint influence in Egypt in terms of long-distance, regional, and local networks.[205]

There is a striking asymmetry in mint representation regarding Alexandria and Egypt during the fourth century. As I have demonstrated, the circulation of Alexandrian coinage outside of Egypt was minimal during this period, representing no more than 2% of assemblages at sites beyond its immediate Mediterranean neighbors, such as Kourion.

The sites available for comparison around the eastern Mediterranean also show diverse mint representation, although most of the coins in circulation seem to have come from mints that were local or located within the same administrative region. This is not the case in Egypt, where the coin evidence shows a high degree of outside coinage being used, in tandem with cast coins manufactured with coin molds. The first conclusion we may draw from this is that the production of the mint of Alexandria, whether it minted coinage continuously or not, was not enough to meet the demands of the highly monetized local economy. The fact that it appears in small percentages in sites around the Mediterranean should indicate that the mint was active to some extent, but most of its coinage was being used within Egypt.

[205] Carrié 2012 has a substantial debate on the nature of integration in the Late Roman Economy, and thus this is something I reserve for discussion in the concluding chapter of this dissertation.

Perhaps, though, the most important point we may draw from this asymmetry in Egypt's coinage profile is its swift and abundant utilization of bronze coinage from outside mints being used throughout the Empire. There are two main routes by which these outside coins could have entered Egypt: military movement into the province and trade and sale of Egyptian products.

Military units could have played a role in the types of coinage available in Egypt, as well. The presence of imperial troops, as for example the Legatio Comitatus of Diocletian at the beginning of the century, could theoretically also have had an impact on currency patterns, although it was a short campaign and therefore the likelihood of it having had a major impact on the coinage seems unlikely. The presence of military units also needs to be further analyzed. Evidence from the stationed military units continues to be an important source of information for understanding currency patterns. As we have seen in the case of Dionysias, the army was casting a sizeable amount of bronze currency, presumably for the payment of its troops.

Recently, the Munzkabinett in Berlin has discovered among its collection a hoard of 1,176 coins from the Constantinian period (330-337) found during the late 19th-century excavations at Edfu. The hoard still remains to be analyzed, but we already know some basic information regarding its historical context. First, according to the *Notitia Dignitatum*, part of the Legio II *Traiana Fortis* was camped in *Apollo superior*, which was the Roman name for the town of Edfu. When Dressel first wrote his analysis of the notes for the Münzkabinett (which have not yet been published) after the hoard had been acquired, he remarked upon their freshness and shiny appearance, which presumably meant that they had not been in circulation for long, if at all, before being deposited. In this case one could hypothesize that the coins were shipped to Edfu for the payment of the troops. Various mints are represented

in the hoard.[206] Whether this was the case with most military units we cannot know until more evidence comes to light.

Undoubtedly, though, the high commercialization of Egyptian products such as grain, textile, glass, papyrus, and hemp, some of which have been discussed in this dissertation, meant that these goods were exchanged for money at some point. The goods could have been bought in Egypt, most likely in Alexandria, or sold in the ports of other Mediterranean cities and then the coins brought back into Egypt by merchants.

The coinage produced from the 350s on shows evidence of long circulation patterns, as coins minted during these decades remain in circulation until 495, as Noeske has noted, and therefore the database needs to be further analyzed and more fifth century hoards included in order to determine whether different periods can be differentiated. Nonetheless, we can still draw some important preliminary conclusions for the monetary history of Egypt and the eastern Mediterranean in Late Antiquity. The first point I believe is evident: that Egypt has never been a truly isolated monetary zone. Even before coinage was properly introduced into the province, imitations of fifth-century Athenian owls were made in Egypt in the fourth century BCE.[207] During the Roman period, Erik Christiansen has demonstrated the hoarding and active use of denarii and aurei in Egypt.[208] The numismatic evidence itself shows the close connection Egyptian tetradrachms had with Roman denarii, such as the empire-wide coinage reforms of Nero, which affected the Egyptian province, and the introduction of the Aureliani in 275, which had been anticipated by the Alexandrian mint

[206] Personal communication with Karsten Dahmen. The author and Dr. Dahmen are currently in the early stages of analyzing the hoard for publication.
[207] In the late 1970s T.V. Buttrey analysed a hoard of 347 Owls excavated from the Fayum, Egypt, in 1934/1935 (the as yet still unpublished Fayum/Karanis hoard), spelling out his conclusions in his 1979 article. See more recently Van Alfen 2002.
[208] Christiansen 2004.

with a weight reduction in tetradrachms already in 274.[209]

I am not suggesting that Diocletian's currency reform in Egypt was just a formality (the province did indeed have control over its own minting schedule),[210] but I am suggesting that monetary boundaries are fluid and that it was perhaps only through the opening of the currency system that an interconnection between Egypt and the rest of the Mediterranean that had already been in place before the fourth century CE became visible. If possible, a closer assessment of third century and pre-reform hoards may reveal the degree of permeability of the monetary horizon of Egypt's closed currency system during the Roman period.

It is my hope that in the future this study may be expanded both horizontally, by looking at circulation patterns in other areas of the Empire, and also vertically, by analyzing previous and subsequent historical periods in order to obtain a better understanding of circulation patterns.

[209] Geissen 2012.

CHAPTER THREE

Changing Patterns of Imports and Exports:

The Evidence from Amphorae

The aim of this chapter is to demonstrate oth that the ceramological record in Egypt shows a transition in the scale of production of local amphorae starting in the third century, and that assemblages from key sites show that by the first half of the fourth century fewer imports were coming into Egypt than had during the first two centuries of Roman rule. These observations are important because, first, they show that the local economy in wine and other products carried in amphorae grew during this period, but that this growth mostly reflected internal production and consumption, as will be explained below. Second, it shows that even though imported wine continued coming into Egypt during this time, it did so in smaller quantities than in previous centuries. Around the mid-fourth century, however, assemblages found throughout different parts of Egypt, namely the Delta, the Nile Valley, and both the Red Sea and Mediterranean coasts, began to show both a strong presence of Egyptian amphorae and an increasing number of wine amphorae that originated in Cilicia and Cyprus, reflecting a more complex and varied wine market.

My analysis of the ceramic material is aimed toward understanding the scale of diffusion between different regions in the Empire, as well as the extent of Egyptian local productions. The main products carried in amphorae (wine, olive oil, and *garum*) represent only a small part of traded goods. These ceramic containers, however, are some of the most ubiquitous finds in archaeological contexts. Thanks to reworked typologies and the increasing use of technology in geo-chemical analyses, we now know substantially more about the chronology and provenance of both the vessels and the agricultural goods they carried than in previous decades. Being able to source clay has introduced new economic

questions, as distinct networks of trade can be drawn between a vessel's place of manufacture and its find spot. Furthermore, while pottery does not represent the complete picture of "the ancient economy," its large-scale production is always attached to other kinds of industries. For example, in order to produce these large containers not only clay was required, but also kilns and wood for firing. Often, manufacturing sites were located in relatively close proximity to where the agricultural product they were meant to carry was grown. Thus, the production of ceramics, while it does not in itself necessarily represent a scale of trade as valuable as that of other commodities like grain, does act as a proxy for large-scale agricultural production and food processing.[211]

Analyzing imports is a direct way to approach economic relationships between provinces, and ceramics thus provide an easy tool for economic model building. Various scholars have used pottery as their main indicator for trade patterns in theories concerning the contributing factors that created a Mediterranean Late Antique economy. In 1989, Abadie-Reynal proposed a model in which state involvement significantly influenced the transportation and diffusion of African products, given that fine wares and amphorae from the region had such different distribution patterns. The author proposed that given the separate find spots of North African amphorae compared to North African fineware, the distribution patterns for each seem to show fineware traveling to regions where grain was exported as part of the Annona, while amphorae followed a seemingly more commercial route.[212] This publication was important because it nuanced the different consumer behaviors within pottery, and further solidified ceramics as a fruitful avenue to answer questions for the ancient economy. For example, the identification of redistributive, producer, and consumer centers (or the balance of all three roles within a settlement) should take into consideration not just the archaeological material found within the center itself, but also the proximity of

[211] Dzierzbicka 2012, PhD thesis.
[212] Abadie-Reynal 1989.

these centers to large agricultural production sites and to already-established commercial networks.[213] This more nuanced assessment of archaeological contexts is particularly conducive to research on larger questions of economic patterns within the Mediterranean.

Initial research into ceramic assemblages of the Roman period has shown how Egypt's importation and production patterns changed starting in the third century CE. The province therefore seems to have entered a new economic phase in Late Antiquity, the extent of which I will analyze by mapping how the profile of Egypt's imports fits within the ceramic patterns of the rest of the Roman Empire.

The pioneering work of the typology of Late Antique amphorae introduced by Hayes, along with David Mattingly and Michel Bonifay's work in North Africa, cemented the repertoire of the most popular ceramics during the Late Antique period and their respective chronologies. Asia Minor and North Africa produced a substantial amount of the wine and olive oil amphorae found in major urban centers of the Eastern Mediterranean, as well as in Rome.[214] However, only limited work has been done to fully integrate Egyptian ceramics as a whole into this picture, even though enough Late Antique ceramic assemblages have been published. Pascale Ballet, Michel Bonifay, and Silvie Marchand have presented some initial work that attempts to model the trade routes between North Africa and Egypt.[215] By chronologically mapping the percentage and provenance of imports in available published assemblages, I will introduce Egypt more fully into the economic discussion of traded goods and patterns in the Eastern Mediterranean.

Setting up the argument

Because of their durability and quotidian nature, ceramics are the most ubiquitous archaeological material found in ancient sites. Their use is as varied as their presence is

[213] For some of these discussions see Bes 2007; Lewit 2011; Reynolds 1995.
[214] Bonifay and Tchernia 2012.
[215] Ballet, Bonifay, and Marchand 2012.

common in the archaeological record: they can be cooking pots, transportation vessels, table ware, storage ware, or ceremonial tools, among other uses. Analyzing pottery is important not only because this is often the most common material found, but also because it can tell us a great deal about the nature of a site or settlement. Depending on the archaeological context, ceramics may be able to indicate that a room is a kitchen, a storage area, or a production center. Analysis of the clay can determine whether the ceramic was imported or made within the nearby region, and even the analysis of residue left on the ceramics themselves can provide substantial information about ancient diets and cooking practices.[216]

I will focus here on ceramics that were used as transportation vessels, namely amphorae, kegs, and jars. Because these vessels were mass produced, their clay and shape are standardized within specific production centers. This means that each amphora workshop throughout the Mediterranean world produced a specific kind of shape of vessel which is associated with the clay used in that workshop. There are exceptions to this of course, and we will encounter in this chapter particular shapes of amphorae which were produced in more than one workshop in the eastern Mediterranean or within Egypt itself. Often the clay composition will provide enough petrological differences to be able to differentiate distinct workshops for one type of amphora. The ability to trace amphorae to known workshops means that, much in the same way as a coin with its mint information, they can act as a proxy of commercial connection between two places: where it was found and where it was made.

Amphorae were widely produced throughout the ancient world in order to contain different products and allow them to be transported over local, regional, and long-distance trade routes. Throughout the Graeco-Roman period they are usually associated with the trade and transportation of wine, olive or other oils, and *garum*. Amphorae have also been known to contain fruits, salts, and pigments, and recently it has even been hypothesized that they

[216] Peña 2007 is an important volume for the discussion of ceramics within the archaeological context. See also Malfitana 2006; Humphrey 2009; and Mills 2013.

could transport important minerals such as alum, which was used as a mordant for dyeing textiles and treating leather.[217] What is significant about amphorae is that they were vessels designed to be transported over long distances, and thus they naturally act as, and have often been used as, a good proxy for long-distance trade in the ancient world. Kegs and jars, while also used for transporting goods, seem to have had a more limited reach, as their distribution indicates a more regional distribution. As I will explain in this chapter, in Egypt changes in the presence of imported wares during the third and fourth centuries can be identified through the quantification of ceramics in fourth-century assemblages, therefore allowing us to deduce changes in trade and in production.

Ceramicists have developed well-known studies on the chronology, production centers, and distribution of popular types, and therefore it is possible to map network connections between settlements when it is known where particular vessels were made.[218] Quantifying the amphora types found within a site can also give us relative percentages of different types of vessels, which can help to create a nuanced picture of the degree of economic connection between ancient settlements—that is, something more than an existence proof of connection.

Clay analysis is one of the most important indicators of provenance for ceramics. While the shape of a vessel is often used to determine where it was made, common types of ceramics were often imitated by other production centers. For example, the bag-shape of the well-known Late Roman Amphorae 1, produced in Cilicia and other parts of southwestern Turkey, was also utilized by production centers in Cyprus and in the Mareotic region of Egypt.[219] Usually, the clays are different enough that they can be distinguished by examining a cross section with the naked eye. However, when clays are very similar (for example, if

[217] Picon et al. 2005.
[218] Malfitana 2006.
[219] Pieri and Marangou 2005, Marchand 2007.

they are both pale and made of calcareous soil, which was common around the Mediterranean), then an analysis of the clay composition can be done in order to trace the fabric back to the production center.

Identifying ancient production centers of amphorae or ceramics is not always straightforward, however. Most often, the best indications of ceramic production are wasters, slags, known clay sources, and vitrified kilns.[220] Kilns and clay sources are not always easily found or even extant in archaeological sites, but wasters and slags are present wherever pottery was manufactured, almost without fail. "Wasters" is the term used for misfired ceramics. Inside the kiln, the distribution of heat depended on various factors that were not always easy to control, such as the level of oxygen, the temperature of the fire being produced by the fuel, and the clay itself. Air bubbles and organic material inside the hardened clay could cause deformations and cracking in the vessels during firing, thus breaking the ceramic pot. This was a normal part of the firing process, and often these wasters were even used to seal the doors of other kilns.[221] One key aspect of wasters, however, is that they did not travel far from the place in which they were made, since they were neither sold nor used as transportation vessels. This means that the presence of overfired and malformed ceramics is a good indicator of local pottery production.[222]

As amphorae were manufactured in order to carry specific products, production centers of these vessels are good proxies for industries of food processing, mainly, but not exclusively, those of wine and olive oil, which were the most important liquid products

[220] Kilns were used not only for ceramics but also for bread and other materials; but the vitirification of the interior of the oven itself, caused by the high temperature, is an indication that a kiln was used for firing pottery. Bread ovens could have similar shapes as a kiln, and there is even evidence of kilns being converted from firing ceramics to baking bread, but when bread is made the temperatures are substantially lower, and thus cause no vitrification of the interior walls. For more information on archaeological traces of firing ceramics see Ballet and Dixneuf 2004 and Dixneuf 2011.
[221] See appendix in Dixneuf 2011.
[222] Aston 2011 and Nordström and Bourriau 1993.

traded in antiquity. In some instances, the vessels were manufactured near vineyards, and therefore, even if no remnants of the vineyards survive, the ceramics can serve as an indicator of the scale of production. This fact is important for the discussion in this chapter, as I will show evidence that Egyptian wine production grew at a crucial time when the scale of imports declined.

The use of ceramic analysis of amphorae as evidence of trade, however, is limited by the industries with which amphorae are associated. This is where one must be cautious of generating grand economic patterns from a single source of evidence. Therefore, although the results of this chapter are important for understanding the local economy and the importation of wine and olive oil into Egypt, in order to fully contextualize them within the overall economy they should be analyzed in connection with the numismatic and papyrological evidence. The scale of trade networks that they suggest can be misleading if taken in isolation.

One of the most interesting aspects of the analysis of networks based on different data sets is the sharp contrast they provide when compared with each other. For example, the currency patterns shown in the previous chapter present a large quantity of imported coinage in the fourth century, and especially during its first half, while the opposite is evident in the same century for amphorae. Since each type of evidence addresses different aspects of the Egyptian economy, the ceramics represent importations and the coins show a trade surplus that brought in foreign money, these two data sets actually support each other. These types of evidence concern very different aspects of the economy; therefore, analyzing ceramics in tandem with other evidence is not only interesting but actually imperative for an understanding of overall economic integration.

This chapter uses data that has been quantified. This might seem obvious, but it is not something to be taken for granted. Quantification of ceramics is a fruitful endeavor but is

also time-consuming. In past decades, ceramic analyses have increasingly started to quantify ceramics by weighing and counting the number of sherds, as well as by separating them into fabric groups, thus moving away from earlier publication practices, in which the pottery was typically catalogued only qualitatively. This quantitative approach is still not used in all excavations, however, and there is a limited amount of published material. I have included in my discussion all of the ceramic assemblages from fourth-century Egypt that have, to my knowledge, been quantified.

Quantification methods also vary by site and should always be subject to scrutiny, and therefore in this chapter I will analyze percentages of amphorae and other transportation vessels from a relative point of view. By this, I mean that I will discuss scales of trade and of production not in absolute terms but by comparison with other ceramics in the assemblages.

While I present various ceramic assemblages, and discuss known production centers, this chapter does not aim to offer a comprehensive study of Egyptian amphorae. Such studies already exist, including those by experts such as Dominique Pieri, Pascale Ballet, Silvie Marchand, and more recently by Delphine Dixneuf.[223] For example, for the specifics of stratigraphic layers, typological progression, and workshop organizations I refer to previous scholarship. My aim in this chapter is to contextualize the Egyptian trade and importation of amphora within the fourth century, and to tie this narrative, which is essentially one of wine production, transportation, and consumption, to the other patterns of exchange treated in other chapters. I will first discuss the ceramic production centers that are known to have operated during the fourth century in Egypt. Then, I will analyze fourth-century ceramic assemblages from sites that have quantified their ceramics by ware category in their reports, which will allow us to explore the relative percentages of imports and local production. Once we have looked at the importation profile of assemblages in fourth-century

[223] Dixneuf 2011.

Egypt, I will explore the distribution of Egyptian amphorae outside Egypt. In the conclusion to this chapter, I will analyze what information the limited exportation and importation of Egyptian ceramics might indicate, particularly regarding the wine industry, and how the development of the wine industry in Egypt during this time might provide a glimpse into the development of the broader economy. Lastly, I will explain how the production, consumption, and distribution patterns of amphorae made in Egypt show that even within a particular region, economic integration was nuanced by industry and geography, and that an understanding of industries that had a limited impact can shed light on those that created long-ranging degrees of connectivity.

Ceramic production in Egypt: Production centers during the third and fourth centuries CE

In this section I will present the major known production centers for Egyptian amphorae during the third and fourth centuries CE. I will refrain from extensively analyzing and describing each type of amphora, because the analysis and description of each type of vessel is complex and has been done already. Therefore, while I will offer a general description, I refer to the cited publications for more information on their exact chronology and fabric composition. In this chapter I will also provide an overview of the production and importation of amphorae into all of Egypt by examining the available data on a site-by-site basis. There is also papyrological evidence available for how some of these local workshops might have been organized, but these deal primarily with local ceramic production and not strictly with amphora production.[224]

[224] For an extensive discussion on the papyrological evidence for the ceramic industry and its organization see Cockle 1983 and Dixneuf 2011, 183-195. For amphorae production see Dzierzbicka 2012.

Mareotic region Amphora Egyptienne 3 and Amphora Egyptienne 4 as precursors to Late Roman Amphora 7

The Mareotic region is the zone located around Lake Mariout on Egypt's northwestern coast, where in the Hellenistic and Roman periods its connectivity to the Nile through canals, its proximity to Alexandria, and the availability of key natural resources provided an ideal environment for the production of wine and the amphorae in which it was carried.[225] Although amphora production around this area ceased (or at any rate decreased markedly) during the third and first half of the fourth centuries and only resumed thereafter, I include it in the discussion of production in this chapter because its products were the precursors to the types produced in other workshops during the third and fourth centuries. M. El-Falaki first observed the number of amphorae scattered among the remains of the area in 1872, but the proper exploration of the Mareotic region did not begin until 1977, with surveys undertaken by Empereur and Picon and excavations by Polish archaeologists. The region encompasses various production centers for AE3 and AE4 amphorae. Empereur and Picon identified 28 different regions of production.[226] The Mareotic region had been producing wine since the Pharaonic period, as attested most tangibly by the recent discovery of a well-preserved wine press dating to the Saite period, and it continued to thrive during Hellenistic and early Roman times. Tomber has identified some of these vessels in the Eastern Desert at Mons Claudianus, and they have been found at Kane (Yemen) and Ras Hafun (Somalia).[227] Panella has identified some Egyptian Dressel 2-4 at Pompeii.[228] The uniqueness of the marl clay from the Mareotic region used for Egyptian Dressel 2-4 means that products from this region are easily traceable in the archaeological record compared to other Egyptian productions, since they make a strong contrast with the dark-chocolate brown alluvial clay

[225] Dixneuf 2011, 98.
[226] Empereur and Picon 1998, 76 fig. 1, see reference to El-Falaki 1872, 93.
[227] Tomber 1996.
[228] Panella 1986.

used to produce vessels in other centers. During the third century, clogging of the canals caused Lake Mariout to shrink, thus reducing the supply of water to the agricultural establishments, and especially vineyards.[229] This did not end amphora or wine production around the region but caused it to diminish significantly during the third and fourth centuries; it would become revitalized in the fifth century by the production of Late Roman Amphora 5/6 in Abu Mina and its environs.

Amphora Egyptienne 3

Amphora Egyptienne 3 (AE3) is a "bi-tronconic" vessel, so called for its broad sholders and broad body that tapers down, produced throughout Egypt during the Roman period. It seems to have been modeled on Aegean vessels, which were common in Egypt during the Hellenistic period. Production centers include Margham, Marea, and Borg el-Arab, which are all in the Maerotic region, and Bouto in the Delta; Kom el-Khamsin, Kom Medinet el-Nihas, and Kom Aliun, among others in the Fayuum.[230] Potential workshops have also been identified between Zawiyet el-Maietin and Antinoopolis (Sheikh Abada) in the Nile Valley; and Coptos and Eileithyias polis (ElKab) in Upper Egypt.[13] Production centers for this amphora were thus numerous; their number grew during the Early Roman period, and the distribution of this amphora type went beyond Egypt into the immediate Mediterranean basin, such as Cyprus, and the Levant.[231] From early Roman times, AE3 vessels are known to have been produced in calcareous clay from the Mareotic region. Its presence in archaeological assemblages is marked throughout Egypt and indicates the continuity of the wine production in this area. Thus, the sudden disappearance of these calcareous vessels from the third-century assemblages indicates at least a diminution in distribution, if not the end of

[229] Haas 1997, 58.
[230] Dixneuf 2011, 97-123.
[231] Ibid., 215.

production altogether.[232] The great number of workshops that produced these vessels has resulted in the existence of numerous variants. Furthermore, its morphological resemblance to its successor, Late Roman Amphora 7 (LRA 7), which even overlapped with it in some production regions, means that the chronology of this amphora type is complex.

In spite of the large quantity of workshops and their slight variations in vessel production, Dixneuf has noted two major regions of production for AE3 that stand out: the region around Lake Mariout and regions in the Delta, and the area of Coptos. The different types of clay that distinguish these two regions make the division visually straightforward for ceramicists. Although it has been argued that the Mareotic region discontinued production during Late Antiquity, Dzierzbicka has noted the large quantity of wine presses located along the southern coast of the lake that date to the fourth and fifth centuries.[233] While the textual sources make no mention of Mareotic wine during this period, the archaeological evidence seems to indicate a continuation of wine production.[234]

Amphora Egyptienne 4

This type of amphora is the Egyptian version of the well-known Dressel 2-4, produced throughout the Mediterranean. Its main production center in Egypt was the Mareotic region, and it was usually made with calcareous clay. Some versions of the vessel exist in alluvial clay, which would indicate a workshop in the Nile Valley or the Fayum, although the precise location is unknown. The vessel was produced from the first through the third centuries, and its distribution was essentially limited to Egypt, though some examples have been found in Sudan.[235] The chronology of this amphora seems to overlap little with the

[232] Ibid., 244.
[233] Dzierzbicka 2010
[234] Dzierzbicka 2012, 52.
[235] Dixneuf 2011, 133.

time period covered in this dissertation, as its production stopped towards the end of the third century CE.[236]

Late Roman Amphora 5/6

Located about 50 km southwest of Alexandria, the well-known monastery and pilgrimage site of Abu Mina produced the bag-shaped Late Roman Amphora 5/6 in calcareous clay. During Late Antiquity this was one of the main production centers in Egypt, but its phase of important production began only in the fifth century CE, slightly outside of the fourth-century focus of the present investigation. I mention it briefly here because I believe it was the boom in local Egyptian wine production, influenced by the pilgrimage trade at Abu Mina from the latter half of the fourth century on, that enabled its wide distribution and consumption.[237]

Middle Egypt cluster: Amphora Egyptienne 2, Amphora Egyptienne 3, and Late Roman Amphora 7

Among these newly emerging amphorae in Late Antiquity figure those designated as type AE7, also known as Riley's Late Roman Amphora 7.[238] Late Roman Amphora 7 is an elongated, carrot-shaped vessel of small proportions; the amphora is always highly ribbed through the body. Its capacity is 6-7 liters, and its fabric is an alluvial clay of a dark brown color, typical of the Nile valley. This amphora is the wine container that was most widely distributed throughout Egypt during Late Antiquity, until the beginning of the Arab period. A rounded back is indicative of the earliest phases of production, while versions with more angular shoulders represent the later periods, as excavations in Fustat have

[236] Ibid.
[237] Engemann 1992; Ballet 1994, fasc. 138, p. 353 –365.
[238] Dixneuf 201, 184.

revealed.[239] Archaeological teams are still investigating the production centers for LRA 7, though it is evident that major production took place at Hermopolis Magna, Oxyrhynchus, and Antinoopolis. Hermopolis Magna was also a producer of a variant of AE3 during an earlier phase.[240] There is a variant of AE3 (AE 3T), which represents a continuation of that type into Late Antiquity. Dixneuf has in fact hypothesized that LRA 7 is a direct copy of the LRA 3, which began to be imported into Egypt at the end of the fourth century. Archaeological evidence at Amheida (Trimithis), however, has found LRA 7 in secure contexts dated to the middle and third quarter of the fourth century.[241]

It seems more likely that the development of LRA 7 had to do with the cessation of wine production of AE3 in the Mareotic region, and the continuation of AE 3 in alluvial clays alone, reflecting a shift of wine production away from the area of Lake Mariout to the Nile Valley and Fayum. This is an important issue, since it deals with the changing geographical patterns of wine production in Egypt during the fourth century, a point to which I will return in the conclusions. The morphological relationship of these two vessels is clear, and the sharing of some production centers indicates that the potters were influenced by what was present in the market. LRA 7 continued to evolve, and a similar version, though of a different type, was produced through the medieval period; many production centers of a later date (fifth-eleventh centuries) have been found throughout Egypt. For the fourth century, however, it seems that Hermopolis Magna and Oxyrhynchus, along with Antinoopolis, were the main centers. Oxhyrhynchus (Behnasa) is a problematic site, at which the destruction of the surface by looters and *sebakhin* has meant that most of the evidence of production centers comes from papyri.[242] The lack of archaeological excavations in rural sites has also meant

[239] Ibid, 154. Also more generally on pilgrims' flasks see Anderson 2004.
[240] Bailey 1998, 125.
[241] Caputo et al., forthcoming.
[242] For some interesting texts on pottery workshops see Cockle 1981.

that we have a limited view of the industry, since wine and amphorae would not have been produced in urban centers.

According to Empereur and Picon's survey of production centers in Egypt, there is no trace of production of the LRA 7 in Alexandria or the Mareotic region, while their overwhelming presence in Middle Egypt signifies their immediate distribution and production around the three centers mentioned above.[243] By 286, Antinoopolis had become the capital of the Thebaid, and its strategic position, which connected various economic activities, perhaps fostered the intensification of production of pottery. Following Donald Bailey's chronology, the production of AE3T (named this way since it is the later (*tardive*) version of AE3), seems to have started around the third century,[244] which, as I mentioned earlier, was a time when the AE3 vessel was produced in the Delta and Nile Valley but seems to have no longer been produced in its marl form clay, which came from the Mareotic region. Although not always present in high numbers in assemblages, the consistent presence of LRA 7 in Late Roman Egyptian assemblages means it is hard to pinpoint its exact production center, as described by Pascale Ballet: "À ce jour, aucune autre région d'Egypte ne semble détenir l'apanage de cette production."[245] Recently though, an Italian mission working in Antinoopolis has uncovered Late Roman Amphorae 7 dumps, which seem to be the remnants of production.[246]

[243] Empereur and Picon 1989.
[244] Bailey 1998.
[245] Ballet 2007, 484.
[246] For an analysis of the proto-byzantine amphorae, see the very recently published Marchand and Pieri 2017. The volume came out after the defense of this PhD dissertation and was therefore not included in the present analysis. The material from Antinoupolis will be included in the published version of this ceramological study.

Fourth-century Assemblages within Egypt

Schedia

Excavations at Schedia, an ancient city located 30 km southwest of Alexandria, have revealed a decrease in the quantity of imported amphorae and an increase in Egyptian amphorae starting around the second half of the second century. Furthermore, the pattern seen in the site's ceramic assemblages matches the pattern shown at Coptos in the rise in the number of amphora sherds from the fifth century onwards.[247] The following graphs, borrowed from Archer Martin, who analyzed the ceramics from the site, show the quantity of Egyptian and imported amphorae present at Schedia during different chronological phases, though there is much overlap between them. Phases 1-7 seem to correspond to a chronological period between the second and the third centuries, while it is unclear if phases 11-14 are contemporary or slightly later than phases 1-7, as it has mostly fragments belonging to the second and third century CE. Phases 8-10 provided an insufficient quantity of ceramics available for quantification.[248]

Phase 11-14 was contaminated between excavation seasons by some Late Antique fragments, which were not tabulated in the count, but do make the overall assemblage somewhat unreliable. The next phases depicted are 15-18 which he attributes again to the second to third centuries though slightly later, as some fragments seem to indicate a date closer to the late third century. Phase 28 seems to belong to the sixth to seventh centuries. While Martin does not present a graph for the fourth century (phases 25-27), he notes that among the amphorae there are only few examples of imported vessels and that in subsequent phases these same types became numerous.[249] No specific percentages

[247] Martin, *www.schedia.de/schedia_pottery.pdf*
[248] Ibid., 5.
[249] Ibid, 8.

were presented by Martin but his numbers allow for the composition of the tables and figures below.

Table 6 Figures and Percentage by Wares for Periods 1-7

Type of Ware	Number of Vessels	Percentage of Total
Imported Fine Wares	14	0.67%
Egyptian Fine Wares	34	1.63%
Imported Utilitarian Ware	18	0.86%
Egyptian Utilitarian Ware	1306	62.74%
Imported Amphorae	325	15.6%
Egyptian Amphorae	385	18.5%
Total	2083	100%

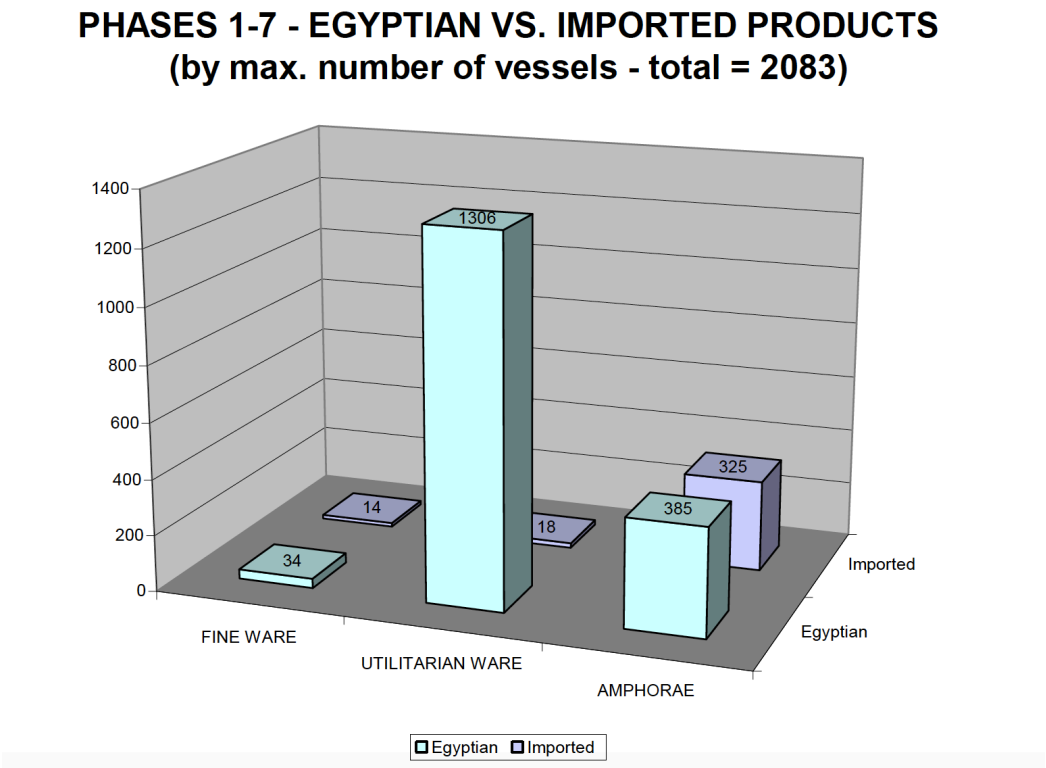

Figure 3 Total number of imported vs Egyptian vessels for Periods 1-7

Table 7 Figures and Percentages by Wares for Periods 11-14

Type of Ware	Number of Vessels	Percentage of Total
Imported Fine Wares	13	0.8%
Egyptian Fine Wares	0	0
Imported Utilitarian Ware	6	0.38
Egyptian Utilitarian Ware	731	46.2%
Imported Amphorae	180	11.38%
Egyptian Amphorae	635	40.14%
Total	1582	100%

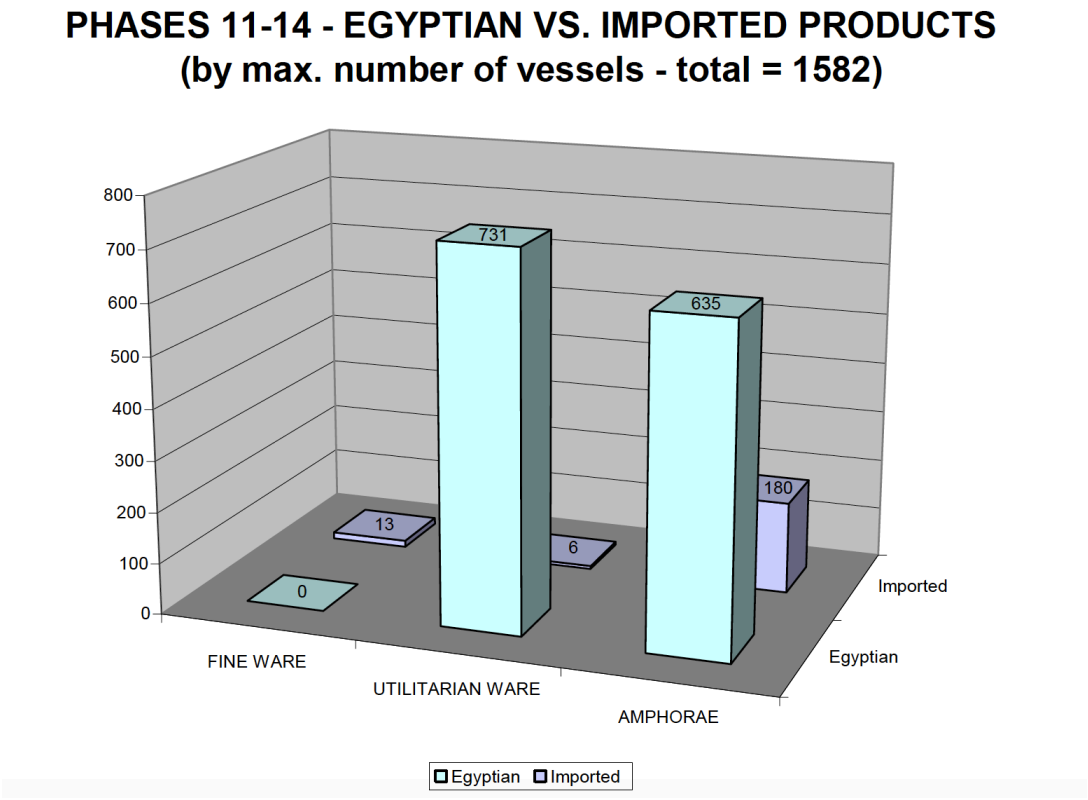

Figure 4 Total number of imported vs Egyptian vessels for Periods 11-14

Table 8 Figures and Percentages by Wares for Periods 15-18

Type of Ware	Number of Vessels	Percentage of Total
Imported Fine Wares	16	0.6%
Egyptian Fine Wares	42	1.6%
Imported Utilitarian Ware	8	0.3%
Egyptian Utilitarian Ware	1018	39.4%
Imported Amphorae	190	7.4%
Egyptian Amphorae	1307	50.6%
Total	2581	100%

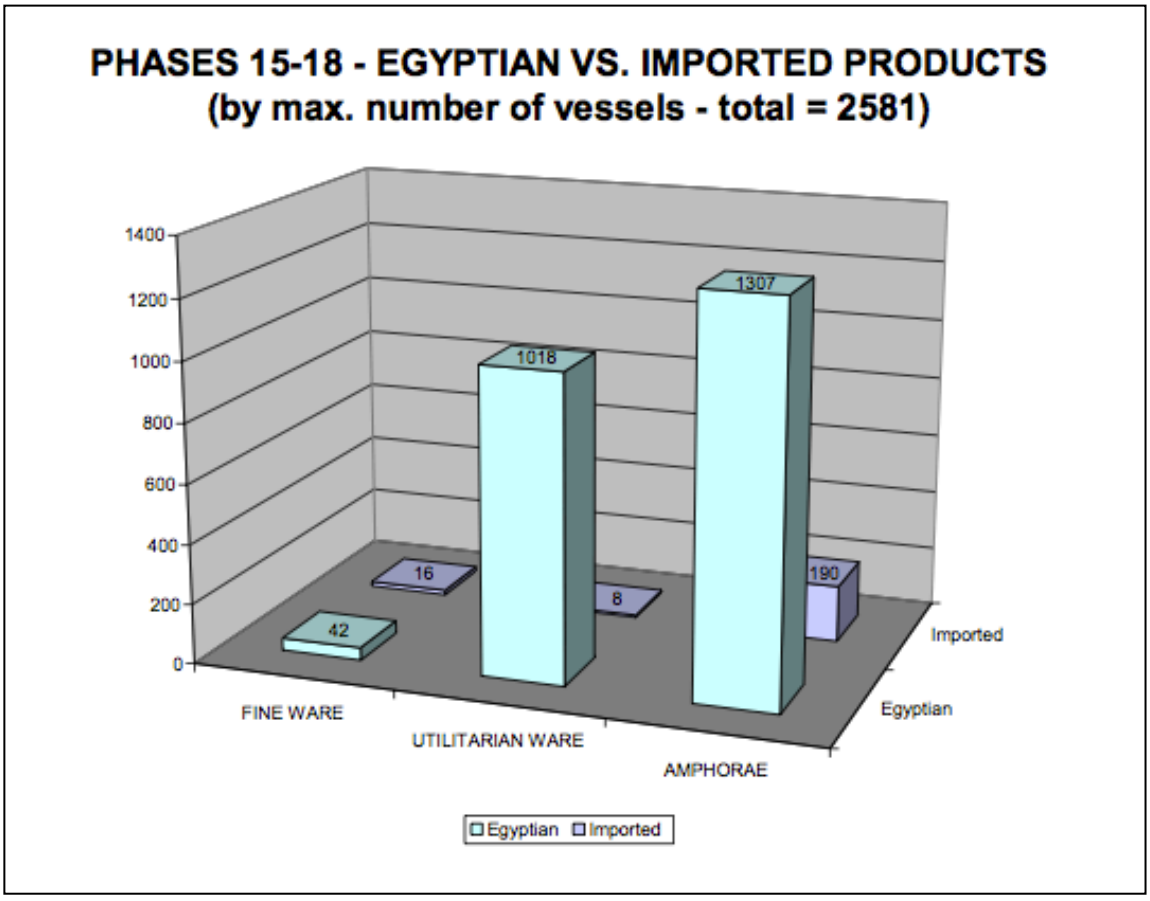

Figure 5 Total number of imported vs Egyptian vessels for Periods 15-18

Table 9 Figures and Percentages by Wares for Period 28

Type of Ware	Number of Vessels	Percentage of Total
Imported Fine Wares	8	0.3%
Egyptian Fine Wares	17	0.7%
Imported Utilitarian Ware	23	1.0%
Egyptian Utilitarian Ware	525	21.7%
Imported Amphorae	544	22.4%
Egyptian Amphorae	1304	53.8%
Total	2423	100%

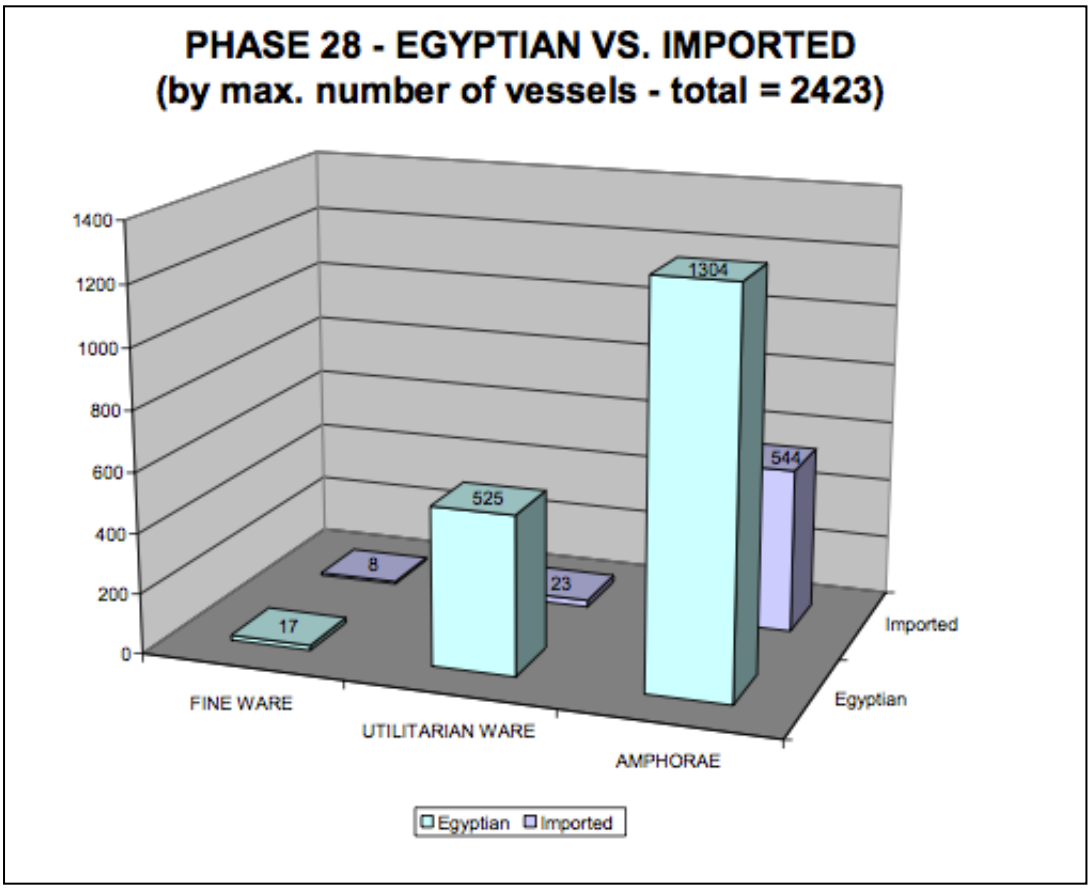

Figure 6 Total number of imported vs Egyptian vessels for Period 28

To clarify the quantitative aspect that we are seeing in the phases, imported amphorae represent 15.6% in phases 1-7 (second/third century), 11.38% in phases 11-14 (second/third century), a decline to 7.4% in phases 15-18 (mid third century), and then a rise to 22% in phase 28 (at least in the sixth century). Egyptian amphorae represent 18.5% in phases 1-7 (second/third century), 40.14% in phases 11-14 (second/third century), a rise to 50.6% in phases 15-18 (mid third century), and then a rise to 53.8% in phase 28, already in the sixth century. All the percentages discussed are of the overall ceramic assemblage, not specifically of the amphorae. The grand picture shows us a consistent rise in the percentage of Egyptian amphorae compared to the percentage of imported amphorae. Imported amphorae decline from the second and third centuries but seem to recover slightly by the sixth century. Given the inability to be more precise on the fourth and fifth centuries, overall conclusions should be taken with caution, yet the assemblage quantified by Martin seems generally to match the situation in other sites in Egypt.

Martin hypothesizes, based solely on the ceramic evidence, a certain detachment for Schedia, which he applies to all of Egypt: "The province was in effect a separate domain with its own monetary system; grain was owed as tribute; the granite and porphyry quarries were in imperial hands. The generally low percentage of amphorae and the lack of Roman style tableware until late antiquity (defined as fifth and sixth centuries CE) could reflect Roman Egypt's detached position."[250] Martin's assessment of the importation profile could be applicable for sites in the rest of Egypt, located further up the Nile Valley and in both the Eastern and Western Deserts. Overall though, one should always keep in mind that this assessment refers to the amphorae evidence, which means it is a commentary on the wine market more specifically. Nonetheless, the position of and excavations at Schedia are

[250] Martin, *15.*

significant, as they are proper excavations using modern stratigraphic methods and the quantification of ceramics. Furthermore, the site is located very close to the heart of Alexandria, where excavations are much more problematic.

Alexandria: Kom el-Dikka and Surveys from Salvage Excavations

Perhaps the greatest trading hub of the Mediterranean during this period, and undoubtedly the economic center of Egypt, Alexandria is incredibly challenging to study from an archaeological perspective. The first reason is that it remains an important city in modern Egypt, with a population of over 4.5 million inhabitants living in an area that covers the entire footprint of the ancient city and most of its suburbs. Therefore, excavations in the city have to be limited to salvage excavations or state-initiated ones. The exception to this is the central Late Antique civic and production area at Kom el-Dikka, built over earlier houses, which remains an active excavation while also serving as a visitor park. The second reason has to do with its topography. As a port city, its coastline has changed, and in some cases the sea has completely covered ancient islands, as in the case of Herakleion. Canals around the city have also changed substantially, affecting the state of archaeological remains.

Kom el-Dikka

Although dated to a slight later period, the assemblages from Kom el-Dikka show the popularity of Eastern amphorae in Egypt. The assemblages in these cases start around the beginning of the fifth century, but they show the same patterns already observed in the mid fourth century in other sites discussed in this chapter. To reiterate the nature of the site, which I discussed in the introduction, Kom el-Dikka is the most important Late Roman archaeological site in Alexandria, and one of the few active archaeological sites in the city. A joint Polish-Egyptian team has been actively excavating on the site since the 1960s, uncovering important urban structures, notably the baths, theater, and auditoria, or

classrooms.[251] Domestic architecture, both late antique and earlier, has also been uncovered, and in the late antique structures different workshops have been identified, offering a glimpse, albeit limited, into urban production of goods.[252] The Late Antique assemblages span from the early fifth until the late seventh century. To stay within the chronological range of this dissertation, I will only present the data available for the fifth and sixth centuries CE, which is the first period analysed by Majcherek, designated W1N-III. The assemblage from this area of the site seems to come from the occupation layer of a domestic quarter and is constituted by about 3,233 fragments of amphorae.[253] According to Majcherek, the amphorae from this period represent 58-60% of the total assemblage going up to the seventh century, so we know this era must have been quite active in wine importations.

What is evident on the figure below, is that the imported eastern amphorae are about four times as high as the Egyptian amphorae present.[254] What is also important to note is that while LRA 4 from Gaza was mainly a wine container and represented 31% of the amphorae, in this layer we can observe a large percentage of LRA 1 from Cilicia (18%), believed to be an olive oil vessel, though some of its production regions are also well-known centers for viticulture.[255] Combined they constitute half of the assemblage, as seen from the table below, borrowed from Majcherek 2004. Egyptian amphorae during this same period represent 15% of the assemblage, showing that during the fifth and sixth century Egypt was consuming a good quantity of foreign wine.

[251] Kiss 2010.
[252] Majcherek 2010.
[253] Majcherek 2004, 230.
[254] Ibid., 231.
[255] Pieri 1998, 104-105.

As evident from the graph below, also borrowed from Majcherek 2004,[256] by the fifth century in assemblages at Kom el-Dikka, the wine market seems to have been dominated by eastern products, mainly from Gaza and Cilicia. We will see how this change already started towards the middle of the fourth century. As I will demonstrate, this strong connectivity between Egypt and Gaza and Cilicia during the Late Roman period is also evident in assemblages in other areas of Alexandria.

Figure 7 Relative Frequency of Amphorae in group W1N-III

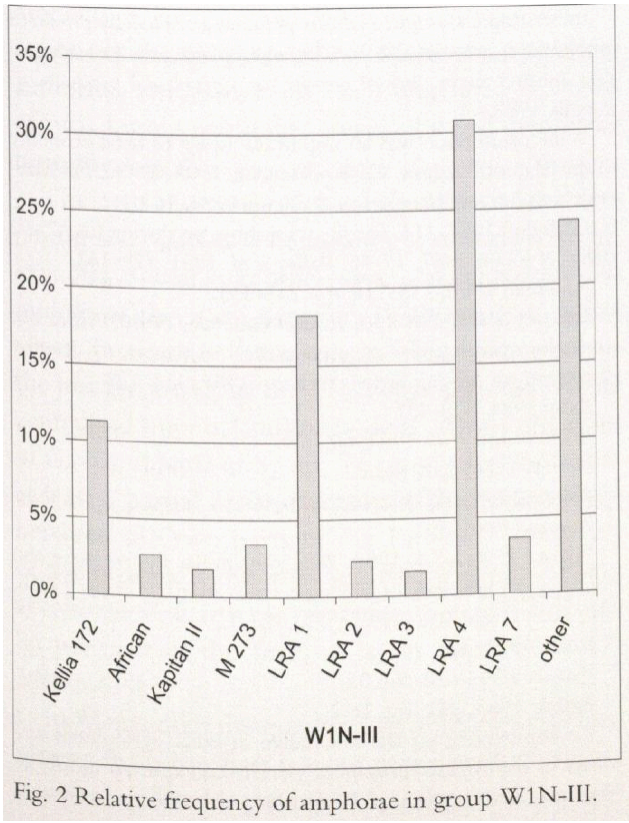

Fig. 2 Relative frequency of amphorae in group W1N-III.

[256] Majcherek 2004, 233.

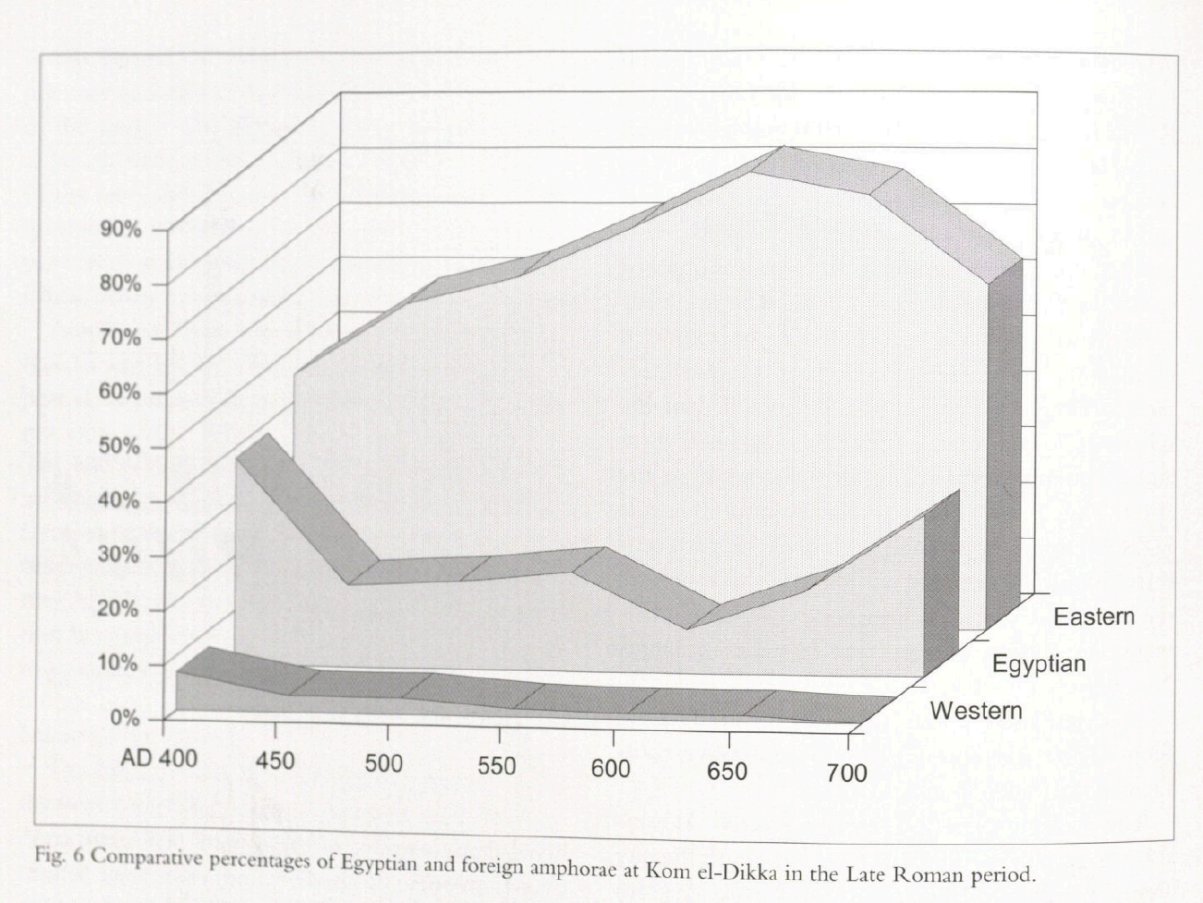

Fig. 6 Comparative percentages of Egyptian and foreign amphorae at Kom el-Dikka in the Late Roman period.

Figure 8 Comparative Percentage of Egyptian and Foreign Amphorae at Kom el-Dikka in the Late Roman Period.

Sponsored by the French government, the Centre d'Etudes Alexandrines, a research institute founded in 1990 for the study of the history of Alexandria, has been able to finance and cooperate with salvage excavations around the city. The amphorae from 8 different salvage and active excavations in Alexandria have been compiled and analyzed by Kaan Senol in a very clear and useful study. While he analyzed all amphorae present from the Hellenistic to the early Islamic periods, it is possible to extract the ceramic material known to have been produced from the fourth century on. The long life of specific amphora types means, however, that there remains uncertainty in pinning the amphorae to a chronological period tighter than about 30 years when the ceramic evidence is considered in isolation.

Nonetheless, the evidence from Alexandria seems to match the patterns visible in the imports and local amphorae from other regions in Egypt.

The statistics presented by Kaan Senol are not without problems. As I mentioned in the introd meant to represent an overall view of Alexandria. I have taken the liberty of borrowing Kaan Senol's useful diagrams in order to better represent the percentage of amphorae coming from each site. Over half (54.6%) of the amphorae analyzed come from two sites: the Old Diana Theater and the Necropolis of Gabbari; and these are the sites on which Kaan Senol focuses and for which he offers figures.[257]

Table 10 Number of Amphorae Fragments per Site in Alexandria

Site	Number of Amphorae Fragments
Gabbari	68,745
Fouad Street Excavation Complex	26,536
LU	3,694
Old Billiards Saloon	52,272
The Majestic	21,339
Old Cricket Ground	13,137
Garden of the Old British Consulate	17,448
Diana Theater	92,926
TOTAL	296,097

[257] The author did not offer the names of the other abbreviated sites mentioned in the charts.

The quantification methods used by Kaan Senol remain unclear, although it seems that the author joined amphorae whenever possible and counted toes and rims, as is done in most traditional quantification practice.[258]

Old Diana Theater

The following table and graph, taken over from Kaan Senol, show the distribution of imported amphora fragments from the Old Diana Theater salvage excavations, dating specifically to the first three centuries of the Roman Imperial period. The author makes little mention of the local Egyptian amphorae in his discussion of this assemblage and only offers a percentage of imported wares at 55.3%, leaving the reader to figure out that 44.7% therefore must be local Egyptian amphorae.[259] He does then present the percentages for the imported amphorae by type.

The layers from the mid third century coming from the Old Diana Theater also show a majority of Late Roman Amphora 4 vessels coming from Gaza, although the percentage is lower than in the Necropolis of Gabbari. Almost 27% of the material is LRA 4 from Gaza, followed by 18.9% of LRA 3, coming from Western Asia Minor, near the region of Ephesos.[260] Combined, the majority of products come from come from North Africa, with an overall 35.33% represented by the vessels Dressel 30 (10.2%), Tripolitan (10.86%), and African I (14.27%).

After the late fourth century, the number of amphorae associated with Cilician and Gazan wine, represented by shapes LRA 1 and LRA 4 respectively, experienced a boom. LRA 7 is present in surprisingly small numbers (0.7%) before the fifth century, but much

[258] See Peña 2007; Kaan Senol 2007; and Majcherek 2004 for some quantification studies and approaches.
[259] Kaan Senol 2007, 69. Overall the discussion of the Old Diana Theater assemblages is hard to follow, but the discussion of imported wares remains useful for understanding the regions that supplied wine to Egypt during the Graeco-Roman period.
[260]Ladstätter 2000.

more abundantly in later contexts.[261] This is quite interesting for understanding the directionality of trade of Egyptian wine in Late Antiquity, since LRA 7 are found quite readily in Red Sea ports. The low quantity of LRA 7 vessels found in fourth-century Alexandria stands in contrast to their presence at the port of Aila (modern Aqaba), where their numbers are quite high.[262] This suggests that the vessels travelled from Middle Egyptian production centers to Myos Hormos, and from there by sea to present-day Jordan and Palestine.[263]

[261] Kaan Senol 2007, 70.
[262] See discussion for Aila further in this chapter.
[263] Parker 1990.

Table 11 Number of Vessels and Overall Percentage per Type of Amphorae in the Old Diana Theater Excavations.

Type of Amphora	Number of Individual Vessels in DI	Overall Percentage %
LR 3	362	18.7
LR 4	521	26.9
DR 2-4	61	3.15
DR 5	1	0.05
DR 6	15	0.77
DR 7-11	14	0.72
DR 20	4	0.20
Pompei VII	3	3.1
DR 21-22	4	0.21
DR 24	9	0.46
DR 30	197	10.2
Tripolitan	210	10.86
African I	276	14.27
Crete	107	5.53
L.Rhodian	9	0.46
L.Cnidian	11	0.57
M 254	39	2.02
K 113	87	4.50
Gauloise 4	3	0.15
Total	1933	100%

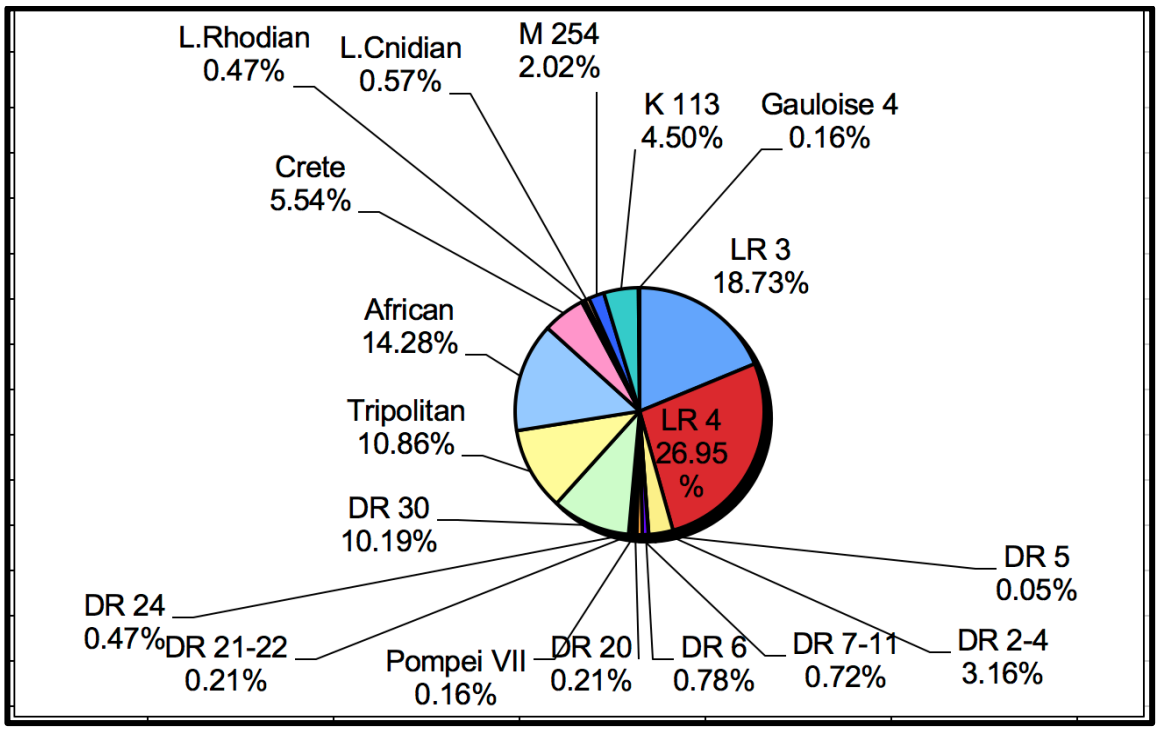

Figure 9 Percentage Composition by type of Amphora in the Old Diana Theater

Necropolis of Gabbari

The ceramics dating to the fourth century at the Necropolis of Gabbari come from the latter half of that century. The chart below shows the highest percentage of amphorae coming from Gaza and from within Egypt itself. A 44.54% of the assemblage is LRA 4 from Gaza; a high percentage from this particular provenance will be a common trend shown in the amphorae evidence in this chapter. The presence of AE3, with 43.77%, is also common during this period and shows a healthy consumption of Egyptian wine. These two vessels make up nearly 90% of the ceramic assemblage. While the rest of the 10% of the assemblage is of mixed provenance, a combined 4% is from wares that come from North Africa, namely Tripolitanian, African 1.

Table 12 Number of Vessels and Overall Percentage per type of Amphora in the Necropolis of Gabbari Excavations

Type of Amphora	Number of Individual Vessels in GAB	Overall Percentage %
LR 2	245	0.6
LR 3	522	1.3
LR 4	16813	44.5
AE 3	16522	43.7
Crete	211	0.56
DR 30	125	0.33
Tripolitanian	694	1.8
African I	947	2.5
Zemer 41	678	1.8
Keay 52	442	1.17
M 254	15	0.04
M 273	4	0.01
K 109	4	0.01
K 113	322	0.85
K 114	92	0.24
Undetermined	108	0.28
Total	37,744	100%

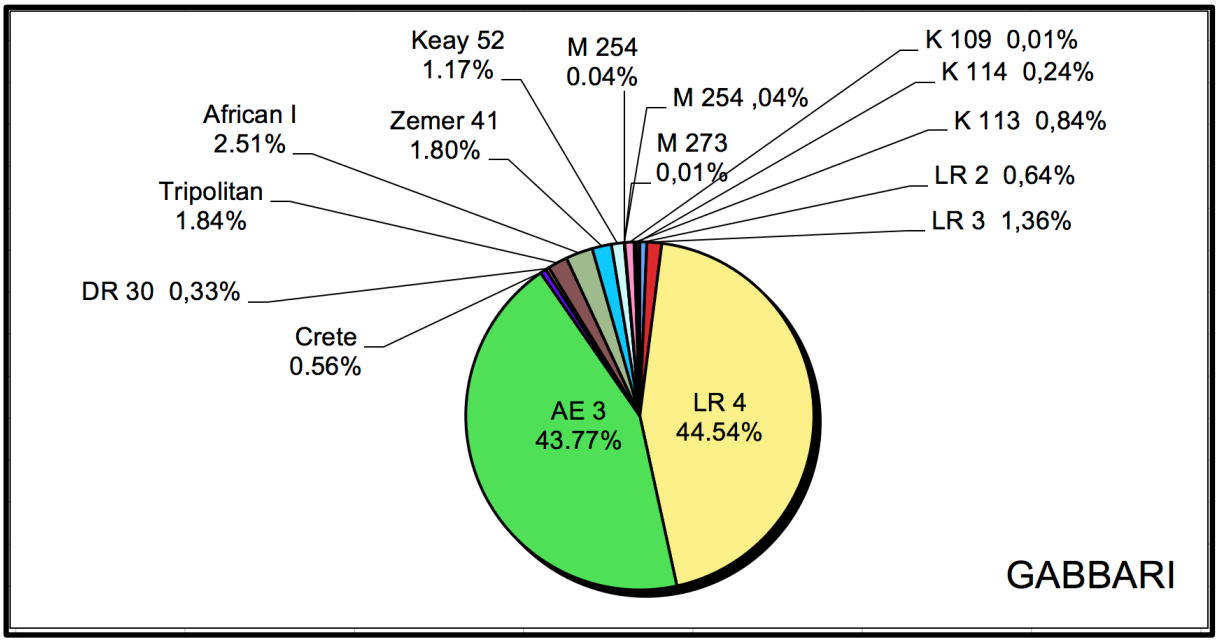

Figure 10 Percentage Composition by Type of Amphora in the Necropolis of Gabbari

It is important to remember how fragmentary the Alexandrian data is because of the archaeologically challenging nature of the city. Comparatively speaking, however, the bulk of the ceramics data available from these salvage excavations seems to come more from the Roman period (first to fourth centuries) than for the early Hellenistic period or from after the fifth century CE. From the amphora evidence presented by Kaan Senol we can observe an open wine and olive oil market during the high imperial period (first and second centuries CE), with imports from influential production centers in Western Africa, the Italian Peninsula, Portugal, Spain, the Aegean and even the Black Sea. During the third and fourth centuries, Egyptian wine began to be increasingly represented in the assemblages by AE3 and LRA 7 amphorae. The high degree of importations during the first centuries of Roman rule, mentioned by Kaan Senol, matches the pattern observed at Marina al-Alamein, and will be discussed in the next section. Starting in the third century, Alexandria showed a high quantity

of Egyptian amphorae, and importations declined until the mid-fourth century, when amphorae from Cilicia and Gaza began to appear regularly and in higher numbers in later assemblages.[264]

Overall, it appears from the amphora evidence that during the third and the first half of the fourth century, Alexandria imported less wine from well-known wine producers around the Mediterranean than it had earlier. Kaan Senol notes that the insignificant presence of Late Roman Amphorae 2 in the assemblages of Alexandria proves that the amphorae were not imported into Alexandria. What is striking is that during the fourth century, LRA 2 commonly appears in assemblages all over the Eastern Mediterranean, attesting to the popularity and wide distribution of wine from southern Turkey.[265]

Marina el-Alamein

Marina el-Alamein, ancient *Leukaspis* or *Antiphrae*, was a port town active during the Roman period, located on the northern coast of Egypt about 300 kilometers northwest of Cairo and 100 kilometers west of Alexandria. The assemblages at Marina el-Alamein present a large quantity of Egyptian amphorae (AE3 and AE4) produced in the Mareotic region in calcareous clay, dating to between the second and fourth centuries. Nile valley amphorae are poorly represented. As far as imported vessels go, fragments representing products from Cilicia, Cyprus, Crete, Aegean LRA 3 and Kapitän II were also found. Notably, third-century Cyrenaican amphorae were also present.[266] No proper quantification by ware type has been published, and therefore I will limit the analysis to the

[264] Ibid.
[265] The known centers of Late Roman Amphora 2 production so far are limited to the southwestern coast of Turkey, around Knidos. Its wide production seems to imply that it was produced in other centers as well. See Kaan Senol 2007, 67.
[266] Czerner et al. 2015, 129-130.

summary offered in the 2015 publication by Gregorz Majcherek. What is perhaps most distinctive about the assemblage at Marina el-Alamein is the high quantity of imported material, rivaling even Alexandria's cosmopolitan assemblages.

Amphorae represent between 75-80% of all ceramics from the site, of which around 60% of the amphorae are imported wares from outside of Egypt. The bulk of the material, however, dates to between the first and the third centuries CE. Thereafter, there are too few fragments available to properly describe an import profile. Therefore, from the amphora evidence of the first three centuries, we can observe a high importation of wine and a very active harbor. The decrease in importance of Marina al-Alamein during the fourth century, therefore, can perhaps be a result of the decrease of wine importation into Egypt and to the utilization of other routes for the export of Egyptian products.

During the first three centuries of Roman rule, the location of Marina al-Alamein allowed ships headed for Alexandria, whether from the distant Western provinces or the Aegean ports, to dock in Egypt. As Majcherek points out: "There is no reason not to believe that some of the commodities exported from this coastal region left Egypt by this route."[267]

Coptos

The site of Coptos is located on the eastern bank of the Nile, about 43 kilometers north of Luxor. It was an important administrative center since Pharaonic times and during the Graeco-Roman period it was an important trade route point, as two major Eastern Desert routes started there, one to the port of Berenike and the other one to Myos Hormos. Mark Lawall sorted the amphorae from the site of Coptos into 7 discernable phases, ranging from the early third century BCE to the fifth century CE. The chronological span and excavation history of the site allow for a clearer and broader analysis of the changing quantities of

[267] Ibid.

imported amphorae throughout the centuries. As noted in Table 3, which is adapted from Lawall,[268] the percentage of imported amphorae drops from 27 percent in the mid-first century BCE to 11 percent by the first century CE, and from this 11 percent to 2 percent by the second century CE. Inversely, one can note a consistent rise in the quantity of Egyptian amphorae (listed as Nile Clay), which came to represent 96% of all amphorae during the fourth century.

Fabric Group	H2 Early 3rd-mid 2nd. c. B.C.	H3 Mid 2nd-mid 1st c. B.C.	R1a Mid 1st c. B.C.	R1b Late 1st c. B.C.-1st c. C.E.	R2 2nd c. C.E.	R3 Late 3rd (?)-Late 4th c. C.E.	R3+ 4th-5th c. C.E.
Calcareous	22 (20%)	162 (55%)	84 (67%)	14 (13%)	2 (3%)	4 (3%)	12 (2%)
Nile Clay	40 (36%)	57 (19%)	5 (4%)	83 (75%)	56 (95%)	140 (96%)	480 (95%)
Imports	29 (26%)	65 (22%)	33 (27%)	12 (11%)	1 (2%)	1 (1%)	11 (2%)
Other	20 (18%)	11 (4%)	3 (2%)	1 (1%)	-------	--------	4 (1%)
Total	111	295	125	110	59	145	507

Table 13 Percentage of Amphorae Fabrics at Coptos

What does this lack of imports mean? Lawall remarks, "Despite the position of Coptos along a major trade route, imports from outside altogether are surprisingly rare."[269] According to Lawall the evidence at Coptos matches other Roman sites in Egypt, where occupation was interrupted in the third century CE. Lawall states that these sites all conform with the commonly-held belief that trade throughout Egypt declined due to the political upheaval of the Roman Empire during the third century.[270]

[268] Lawall 2003,159.
[269] Lawall 2003,180.
[270] Lawall 2003, 187 lists Al-Zarqua, Tell el Maskhuta, Mons Claudianus, Quseir, and Abu Rawash.

The significance of the assemblage from Coptos is that it not only gives an impression of trade between the Nile Valley and the Red Sea coast, since it was a key center in the trade routes between the two centers, but also offers quantification and acts as proxy for the overall investment and traffic of the Eastern Desert activities.

The Eastern Desert of Egypt has provided rich documentation and archaeological material from the Roman period. Substantial quarrying, mining, and trading activities during the Graeco-Roman period are evidenced by the port sites of Berenike, Myos Hormos, Clysma, the quarries of Mons Claudianus and Mons Porphyrities, gold mines, canals, and military outposts, such as 'Abu Sha'ar, among other sites.[271] Most of these sites have been excavated and continue to be researched, as in the case of Berenike; for the ceramics, however, there has been no thorough quantification as for other sites in Egypt. Roberta Tomber has performed substantial analysis on the ceramological record from Berenike, Mons Claudianus, and Porphyrites, which are discussed in a later section of this chapter, and although she does not provide percentages or quantification, she offers helpful descriptions. Nonetheless, in the absence of percentages from Eastern Desert sites, Coptos could presumably act as a proxy for what is going in the importations in and out of the Eastern Desert.

The assemblage composition described by Lawall falls in line with Ballet's impression of the reversal of the trade routes during the mid-third and early fourth centuries described above in the section dealing with Alexandrian assemblages, namely the dominance of Egyptian amphorae in assemblages (and their exportation outwards to Aila, for example), and the nearly complete cessation of importations of wine until the mid-fourth century.

[271] For Eastern Desert sites see Sidebotham 2011; Cuvigny 2003.

Amheida

The Dakhleh Oasis is located deep in the Western Desert, about 900 km south of Cairo. The oasis has been inhabited from the Neolithic period until the present. The ancient Roman city of Trimithis (modern Amheida) lies in the northwestern area of the Dakhleh Oasis. Survey and excavations so far have indicated occupation of the site from the Old Kingdom to the second half of the fourth century CE, when Amheida was apparently abandoned. The reasons for the abandonment are still being investigated but given the perennial irrigation of the oasis and its sustainable crop yield, the abandonment seems likely to reflect a political or economic circumstance. It has been suggested that a decline in the security of the desert roads could have had a strong impact on an oasis that depended heavily on exportation to the Nile Valley.[272] Given the size of the site, the presence of urban villas, public baths, wall paintings, and a school, we can deduce that Amheida was a fairly prosperous city during the first centuries of Roman rule.[273]

At first glance, one of the most striking features about Amheida is the vast amount of pottery scattered throughout the site. An early survey by the Dakhleh Oasis Project calculated the amount of surface pottery at about 330 million sherds.[274] Many of these ceramic sherds come from collapsed mud brick walls and roofs that have been eroded by the strong northern winds blowing from the Saharan plateau. The excavations at the site by Columbia University and New York University have uncovered different sorts of ceramic assemblages: domestic, collapsed architectural features, and discarded material. The methodology employed in the site has allowed for the quantification of ceramic assemblages into different fabric groups, of both local and imported origin.

[272] Bagnall 2011b, 18.
[273] Bagnall et al. 2016.
[274] Amheida Report 2000-2001, 3.

For the local Oasis fabrics, Colin Hope developed the *Dakhleh Oasis Fabric System*, dividing the types of clay into two major groups, both local to the oasis: the iron rich group, designated "A" and the calcium rich group, the "B."[275] The exception to this is the A11 fabric, which initially was categorized as part of the iron rich group, but due to later petrographic analysis has been grouped with the calcium-rich group. In some instances, a clear relationship exists between the fabric and function of a vessel. Such is the case for the A11 fabric, of which all vessels demonstrate traces of soot and burning, identifying them as cooking ware, although cooking ware was also often made in local iron rich fabric. Imported clay, however, normally takes the form of a fine ware or amphora.

In this chapter, I will focus on two contexts excavated during the 2010 season at Amheida, DSU 368 and DSU 395, in order to show the low quantity of imported amphorae present in these units.

DSU 368 is a dump layer in S2 (Street 2), which is a north-south oriented street running in front of the eastern entrance of B1 (the house of Serenos, which was excavated from 2004-2007).[276] The architecture shows that S2 was most likely used for some part of its life as a private passageway rather than a public street, given the presence in part of it of gates and of a private dining couch, a *stibadium*. DSU 368, which consists entirely of material dumped before construction of B1, and thus before about 330, was particularly rich in pottery finds, yielding about 150 Greek ostraca and a vast amount of pottery (see table 1).[277] So far the ceramic assemblage has only been separated by fabric, counted, and weighed. Nonetheless, a quantified analysis of the ceramics retrieved from the context shows a sharp contrast between the presence of both iron- and calcium-rich fabrics and the near absence of amphorae, whether Egyptian or imported. As shown in Table 1, combined there

[275] Dixneuf 2009, 1. For the Dakhleh Oasis Fabric system see Hope 1979, 1980, 1981, 1990, 2000, 2004.
[276] Amheida Report 2007.
[277] Amheida Report 2010, 2.

are about 483 kg of the iron-rich fabric vessels, 3 kg of calcium-rich fabric, and less than 1 kg of imported amphora fabric.

Table 14 Weight, Numbers, and Percentage by Fabric in DSU 368

Category	KG	# of Sherds	Percentage of Total Weight
Iron rich fabric A1a	176.34	7599	36.27%
Iron rich fabric A1b	247.81	9573	50.9%
Iron rich fabric A5	39.85	1575	8.19%
Iron rich fabric A4	18.89	103	3.8%
Calcium rich fabric A11	0.08	12	< 0.1%
Calcium rich fabric B10	0.53	45	< 0.1%
Calcium rich fabric B3b	2.28	172	0.5%
Calcium rich fabric B	0.04	1	< 0.1%
Amphora Egyptienne 3	0.27	15	< 0.1%
Late Roman Amphora 1 (?)	0.01	1	< 0.1%
Marl clay from valley	N/A	7	< 0.1%
Other Imported amphora	0.07	1	< 0.1%
Total	486.17		

This proportion of wares evident through the fabrics is found again in DSU 395, part of Street 3 (S 3). Also excavated in 2010, S3 runs north-south along the west side of B1 and seems to have been originally planned as an alley connecting southern and northern buildings and later annexed to the abutting building and turned into a private space.[278] Again, the material from this stratigraphic unit consists of debris dumped in preparation for building. As shown in Table 2, there have been recovered about 124.26 kg of iron rich fabric, 0.46 kg of calcium rich fabric and 0.17 kg of amphora fabric.

[278] Amheida Report 2010, 4.

Table 15 Weight, numbers, and percentage by fabric in DSU 395

Category	KG	# of Sherds	Percentage of Total Weight
Iron rich fabric A1a	42.64	2194	34.1%
Iron rich fabric A1b	65.95	2740	52.8%
Iron rich fabric A5	9.53	270	7.6%
Iron rich fabric A4	6.11	55	4.8%
Calcium rich fabric A11	0.15	2	0.12%
Calcium rich fabric B10	0.13	17	0.1%
Calcium rich fabric B3b	0.18	14	0.144%
Oasis Red Slip Ware	0.03	4	< 0.1%
Amphora Egyptienne 3	0.17	26	0.136%
Total	124.89	5322	100%

Both of these dump levels have a date of deposition belonging to around the first quarter of the fourth century CE, and both show a cohesive picture of the fabric patterns occurring at dumps in Amheida.[279] The mere quantity of ceramics at the site indicates strong local production, which may be further understood once the kilns at the site are excavated. The manufacture of kegs and jars evident in the site signal a strong local production of wine and other products, perhaps olive oil for example, supplying the local demand for with local products. This could partially explain the low quantity of imported amphorae from the Nile Valley and beyond.

Kysis-Kharga Oasis

For the Kharga Oasis, the site of Douch is perhaps one of the best sites for understanding the ceramics from the Roman period. Bagawat is another important site, but

[279] Amheida database http://www.amheida.org/index.php?content=db

the ceramics there belong to later periods, namely the fifth century and after.[280] Amphorae in Douch represent less than one percent of the total ceramic material recovered from the excavations between 1985 and 1990. There have been no statistics published, but Pascale Ballet has made some remarks on importations, which I present below.[281]

Most of the imported ceramics identified from the site, whose chronology spans from the Ptolemaic to the Late Roman period, come from the phases belonging to the mid-to-late fourth and fifth centuries CE. This period saw two important changes in the ceramic assemblages. The first is the production of Kharga Red Slip Ware, a type of fineware with limited distribution in the oasis and Aswan, and the second is the presence of a "modest," though regular in occurrence, quantity of Late Roman Amphorae 7 from Middle Egypt. The commercialization of both of these products must have acted in tandem to some extent, strengthening the perennial trade routes and economic ties between the Great Oasis and Middle Egypt.[282] Besides LRA 7 from the Nile Valley, importations are few: there are two examples of Late Roman Amphorae 3 which date to the late fourth and fifth centuries and were produced in the region around Palestine, and some fragments of a form of Late Roman Amphora 4 produced in Gaza, which could date between 300 and 450 CE. Around the same chronological horizons there is evidence of types of Late Roman Amphorae 1 produced in the Eastern Mediterranean, but in very small quantities.

Furthermore, finewares common in Mediterranean assemblages from the fourth and fifth centuries, namely Cypriot sigillata and Phocaean Slipware, are completely absent. It should be noted that these two finewares are also extremely rare in Alexandria and the Thebaid region, but are commonly seen in Middle Egypt. Ballet remarks that the absence of

[280] Many of the ceramics from Bagawat are currently in the Medieval Department at the Metropolitan Museum of Art and are being analyzed by Andrea Achi. For some preliminary remarks see Drummond 2013.
[281] Ballet 2003.
[282] Ballet 2007.

these imported finewares is, however, made up for by the strong presence of Tunisian finewares (*Sigillée Claire C* and *Sigillée Claire D)* starting during the second half of the fourth century. Therefore, at Douch we may observe that the Oasis of Kharga was probably well connected to the distribution of products from North Africa, much like the Bahariya Oasis.[283]

Bahariya Oasis

The amphorae present in the Bahariya Oasis dating to between the second and fourth centuries clearly show that the oasis was linked into the Saharan region, the extent and implications of which remain to be understood, because the presence of Tripolitanian amphorae at Mons Porphyrites in the Eastern Desert suggests a trade route via the Nile.[284] The table below, borrowed from Bonifay 2008, clearly shows the quantity of imported amphorae from North Africa.[285]

[283] Ballet et al. 2012.
[284] See discussion of Mons Porphyrites below.
[285] Bonifay 2007.

Table 16 Number of Amphorae by type in the Bahariya Oasis

Type	Khabata	Bir Shawish	Bir Shawish	Qaret et-tub	Total
Tripolitanian I	ll	ll			4
Tripolitanian II ?	l			l	2
Tripolitanian III ?	l				1
Ostia XXIII ?	l				1
Ostia LIX ?	l			l	2
Undetermined	ll				2
African I B	ll				2
African II A	l			lll	4
African II C			l		1
African II D			l		1
Keay 26				llllllll	8
Keay 55		l			1
Total	11	3	2	13	29

The Ostia XXIII and LIX amphorae, as well as the African I, belong to an earlier phase in the third century, but the rest of the vessels represented, with the exception of the Tripolitanian amphorae, date to the fourth century. The quantities are not high, but they do show connectivity to the North African production centers and hint at the possibility of a non-Nile trade route into Egypt.

Berenike

Berenike is perhaps the best-known excavated port site in Egypt. Founded by Ptolemy II mainly for the importation of elephants from East Africa, its importance shifted to long-distance trade during the Imperial Roman period. Ongoing excavations and publications on its various materials have provided a rich body of ceramic data, although there has been no quantification for the fourth century. Since there is so much information available about

Berenike from nearly the entirety of the Graeco-Roman period, I will address specifically what the scholarship has concluded for the fourth century CE.

After a decline in the second half of the second century, the site experienced a small burst of activity during the late second and early third centuries. At that point there began a hiatus in archaeological evidence that lasted until around the mid-fourth century, when trade seems to have been revitalized throughout the Late Antique period.[286] Once again, as in Schedia, Coptos, and Alexandrian surveys, the mid-fourth century acts as a chronological marker. We should not isolate Berenike as the only port city, however, since it seems that the role of emporium of the Indian Ocean that the site had played was taken over by other port cities on the Red Sea. Sidebotham summarizes: "Enigmatically, Myos Hormos and Aila have more evidence of contact with southern Arabia, especially in the latter case from the fourth century CE on, than has been demonstrated at Berenike."[287] The importations present at Berenike during this period, however, do include a small number of Axumite ceramics, coinciding with the period in which Axum became a major economic power in Indian Ocean trade.[288]

Mons Porphyrites

The site of Mons Porphyrites, a settlement for porphyry quarry workers in the Eastern Desert of Egypt, was mainly active during the Roman period. The nature of the settlement here is unique. There are no large natural water sources around the site, which requires the importation of everything that is needed for survival. This means that a high number of imported amphorae, at least from within Egypt, are to be expected. Again, there are no absolute numbers offered, and therefore I will present the data described in the

[286] Sidebotham 2011, 259.
[287] Sidebotham 2011, 231.
[288] Ibid., 277.

publication of the ceramics by Roberta Tomber. Given the remarks on toes, handles, and rims, it seems that importations from the rest of the Mediterranean were found in small numbers. In fact, a notable aspect of the site is that in Porphyrites, imported amphorae represent only about 0.2% of the total corpus of amphorae.[289]

The stratigraphy of the site reveals types of amphorae that are dated beginning in the mid-Roman period and continuing into the late Roman period. These include both the Hollow foot and LR Amphora 3. Late Roman types include an early variant of LR Amphora 1 from around Cilicia. The latest amphora type from the excavated deposits is LR Amphora 4 from Gaza, which is dated between 300 and 450.

A single example of a Kapitän II amphora from the Aegean region, normally associated with the third and fourth centuries, was also found.[290] Its distribution suggests an Eastern Mediterranean, and probably Aegean, production source, and we know that it was a wine container. Examples of diagnostic fragments of LRA 1 were also found, though in small numbers.[291] The fabric of these specimens suggests that they originated in Cilicia or Cyprus, and the deeply grooved handles are probably from a variant dating to the fourth or early fifth century.[292] From modern day Turkey, there were also fragments of LRA 3 from Western Asia Minor, possibly from the region of Ephesos.[293]

From Gaza, the assemblage presents LRA 4.[294] All the surface and excavated vessels belong to Majcherek's Type 2, having a broad shoulder and grooving between the handles, and are dated between 300 and 450. A few fragments could point to a possible

[289] Tomber 2006; 2007.
[290] Panella 1986, 617.
[291] Peacock and Williams 1986, 185-7, Class 44; Empereur and Picon 1989.
[292] Reynolds 2005, figs. 26-9; 31. Egloff 1977, Type 169, see Reynolds 2005, fig. 33a.
[293] Peacock and Williams 1986, 188-90, Class 45; MC, 168, MC Amphora 54.
[294] Peacock and Williams 1986, 196-9, Classes 48-9.

Egyptian imitation of LRA 4, but this remains uncertain.[295]

Tell el-Makhzan

Located in the Northeastern Delta region, next to Pelusium, Tell el-Makhzan is a church complex with three naves, a baptistery, crypts, and graves. The ceramics from this Late Antique site are particularly interesting because they provide a glimpse of consumption patterns in this buffer region, located between Palestine and the Egyptian Delta and coastline.

The amphorae assemblage consists of local Egyptian amphorae as well as imports from Palestine, Asia Minor, and the Aegean.[296] The Egyptian productions are amphorae known to have been produced in Middle Egypt. There are some examples of LRA 7 and derived forms, but the majority of the vessels are of the bitronconic variety dating from the late fourth to the seventh centuries.[297]

The importations seem to match the same pattern observed for the Late Antique period at Alexandria, namely an exclusive presence of Late Roman Amphorae 4 from the southern Palestinian region comprised of Gaza, Ashkelon, and Beer Sheva.[298]

According to Dixneuf there are two variants of LRA 4 present in the assemblage at Tell el-Makhzan. The first is type A2 according to the classification done by D. Piéri. This shape is normally associated with the fifth century, but it can be found in assemblages dating to the second half of the fourth century.[299] The most important aspect of this assemblage, for the purposes of this chapter, is that the LRA 4 fragments from Gaza dating from the later

[295] Majcherek 1995, 166-8. Additional unillustrated examples are from FES (516) 1 rim; FES (522) 1 rim; FES (523) 2 handles; FES (524) 1 handle; FES (527) 1 rim; Badia A (8) 1 rim; Badia A (21) 2 rims; Badia B (2) 1 handle. See also MP1, figs. 6.7, no. 32; 6.24, nos 60-1; 6.35, nos 50-1. 161.
[296] Dixneuf 2009.
[297] Ballet et al. 1991, 134-139; Bonnet 1994, 390-391.
[298] Piéri 1998, 102.
[299] Majcherek 1995, 166-168.

fourth century and on represent around 68% of the total assemblage.[300] Among the importations in the fourth-century layers are also two major types of LRA 3, which mainly transported wine. These vessels were produced in modern-day Turkey in the valleys of the Hermos and Maeander, between Ephesos, Sardis, and Halicarnassus.[301]

To summarize the data presented up to this point: the assemblages found throughout Egyptian territory point to an increase in consumption of Egyptian wine during the third century CE, paired with a substantial decrease of imported wine, as compared to the first two centuries of Roman Imperial rule. Around the middle of the fourth century, however, products from Palestine and Cilicia start to appear or reappear in larger quantities, although with the exception of Tell el-Makhzan, they rarely make up the majority. However, something to keep in mind when analyzing the post 350s assemblages is how representative they are for the fifth century as well. Because amphorae typology and chronology span various decades, types of imported products in use in the late fourth century and the fifth century are often not readily distinguished. Therefore, any conclusion one draws from late fourth century assemblages could also be applicable to fifth century assemblages.

Distribution of Egyptian Amphorae outside of Egypt

In this final section of the chapter, I will present the distribution of Egyptian amphorae in fourth-century CE contexts outside of Egypt. In the case of the section on Britain and the western provinces, the publication of the finds spans the Roman period more generally. While there are few published assemblages that show Egyptian amphorae, there is enough geographical variation to offer a good sense of the distribution patterns. Overall, the distribution of Egyptian amphorae during the fourth century is limited to Egypt's immediate neighbors in the Palestinian region and to port cities connected to the Red Sea trade. Some

[300] Dixneuf 2011, 225.
[301] Bonifay and Piéri 1995, 112.

points follow concerning the framework within which the distribution of Egyptian products should be understood. The first is geographical. The fourth-century finds I will deploy here may generally be divided into three regional spheres: the western provinces, the eastern provinces, and the Red Sea basin. There is evidence of Egyptian amphorae appearing in the western provinces, as will be discussed below, but the number of individual specimens is small and does not represent consistent or large-scale trade, while in the eastern provinces closest to Egypt we can observe a greater number of Egyptian amphorae. The Red Sea undoubtedly links Egypt, Palestine, and the Arabian Peninsula, but these regions all share a chronological horizon as well. This brings me to the second point regarding the framework, which is the difference in commercial networks seen in amphora evidence from the mid-fifth century on, a point made by all authors of the ceramic analyses discussed here, and which is also mentioned in the analysis of assemblages from Cilicia and other areas of modern day Turkey.[302]

As is the case with the previous section, the methodologies by which the ceramics were analyzed vary substantially. Therefore, in the absence of quantification, I will describe to the best of my ability what we know about the fourth century distribution based on the publication record.

Aila and the Red Sea

The site of Aila is an ancient port located within the modern city of Aqaba on the Red Sea littoral. Major surveys of the ceramics scattered throughout the area were undertaken between 1994 and 2003.[303] The site was founded in 30 BCE,[304] and it thus was closely tied to

[302] Vroom 2015, 2017; Senol and Senol 2003.
[303] Parker 2009, 79.
[304] See Parker 1997, 20-22 for a summary of literary and documentary evidence on the site.

Roman rule in the region, functioning to service traffic between Rome and the East.[305] While little is known about the activities of the site during the second and third centuries, the fourth century was quite active, and the amphora evidence from the site attests to a close connection with the Red Sea trade and particularly with Egypt.

The most notable importation into the region, and connection to Egypt, appears as early as the third-century layers in which the fineware Egyptian Red Slip (ERS) and Egyptian Amphorae are commonly found in assemblages. Also notable is the appearance of A Ware from Aswan in Egypt and B Ware from the Nile Valley. These ceramics only begin to appear in the rest of Jordan and Palestine several centuries later.[306] Starting in the fourth century, the site experienced a sort of revival in the scale of commerce. The Red Sea trade was completely revitalized during the fourth century, and Diocletian moved in his *legio X Fretensis* in order to fortify the eastern frontier, meaning that provisions for soldiers in this legion would have expanded the market share of Egyptian amphorae. It is therefore no coincidence that a dramatic increase in the relative number of Egyptian amphorae, compared to the overall amphorae assemblage, occurs at this time, as pointed out by Parker.

[305] Parker 2006, 227.
[306] Parker 2009, 82.

Table 17 Numbers and Percentages of Imported Amphorae at Aila

Type/Source	*Sherds*	*%*
Egypt	3122	52.8%
Gaza	1015	17.2%
Class 44 ("LR 1")	193	3.3%
Class 46 (Palestinian)	189	3.2%
Class 45 (Aegean?)	154	2.6%
Class 47 ("Hollow Foot")	97	1.6%
Western Amphorae	65	1.1%
Other/Unidentified	1078	18.2%
Total	5913	100.0%

Table 9:1. Imported amphorae at Aila.

As is evident from the percentages shown in the tables, starting at the turn of the fourth century and continuing into the fifth century, importations reflect the influence of Egyptian amphorae, representing over half of the total assemblage. The second largest percentage belongs to regional Palestinian products from Gaza. The Egyptian products are mostly AE3 amphorae and LRA 7, both produced in the Nile Valley. Undoubtedly these importations arrived at Aila via the Red Sea trade, most likely via Clysma[307] or Myos Hormos, and from Coptos. In this instance, it is particularly interesting to note how the high percentage of Egyptian amphorae (52%) also represented the majority of the amphorae, as seen in the percentages at Coptos (96%) and at Mons Porphyrites (98%) during the fourth century.

As for the fine wares, the majority of red slipped ceramics come from North Africa and Egypt. The African Red Slip could have been shipped up the Nile and then on to

[307] The port of Clysma is one of the most important trade hubs on the Red Sea coast for Byzantine Egypt. Exacavations were undertaken by Bernard Bruyère in 1930-1932 and subsequently published. To my knowledge no specialized publication of the ceramics exists for the site, but its economic importance is attested by various literary sources from Late Antiquity. For more information on its role in the fifth and sixth centuries see Mayerson 1996,119–126; Ward 2007, 161–171. Federico De Romanis argues in favor of a significant role of trade for Clysma during the Roman period, personal communication.

the Red Sea ports or via Trajan's Canal and Clysma, since it also has a wide presence throughout the Egyptian territory, or perhaps it arrived by sea to a Palestinian port and then by land on the Via Nova Traiana.

Kane Harbor, Saudi Arabia

The harbor located on the Red Sea, in present-day Yemen, was well connected to the Red Sea trade, and thus one would expect the assemblages to show continuity with the patterns observed at Aila. There is, however, very little Egyptian material dating to the fourth century, although it is difficult to trace some Egyptian ceramics based on petrology alone in the absence of substantial diagnostic sherds. The Mareotic fabric used for the Egyptian Dressel 2/4, for example, matches the petrology of LRA 1, which was produced in Cilicia, modern Turkey. There is one instance of an amphora with alluvial clay that can be safely tied to an Egyptian workshop.[308]

Unsurprisingly, this simply means that Egyptian wine did not travel very far on the Red Sea trade, which informs our understanding not only of Kane but also of Aila. It seems that perhaps Parker is right to trace the large quantities of fourth-century Egyptian amphorae found to the consumption driven by the army presence at Aila. Dario Nappo also notes a shift in the third-century CE trade:

> "What seems to be clearer is that from the third century AD, there was a shift in the geography of the Red Sea: the southern harbours such as Leuke Kome and Myos Hormos decline, whereas the northern settlements (previously out of the major international routes) start to become preeminent in the region. In this context, we can assume that the northern ports became the terminal of the internal route of the Red Sea, so that Jotabe played the role of toll-gate that had once belonged to Leuke Kome."[309]

[308]Davvide et al. 2000, 88.
[309] Nappo 2010, 174.

Distribution of Egyptian Amphorae AE3, AE4, and LRA 7 in the Eastern Mediterranean

The distribution of Egyptian wines in the Eastern Mediterranean basin was discussed by Dixneuf already in 2011, though percentages and figures are not offered. During the Roman period (first to third centuries), Egyptian wine production and distribution was more limited in scale and scope. AE 3 and AE 4 amphorae are commonly found in assemblages in Egypt, although their distribution in the Eastern Mediterranean is not significant except for Crete and Cyprus. There is evidence for them in these two islands, although the latter presented only two toes.[310] Dixneuf concluded that although Egyptian AE3 and AE4 amphorae are found in the Mediterranean basin during the third and early fourth century, the level of consumption can be characterized as almost negligible, since the evidence nearly always amounts to one or two sherds per site.[311]

Within Egypt, the distribution of Egyptian wine vessels produced in the Mareotic region during the second and third centuries seems to have been restricted to the Alexandrian *chora*, while AE3 and AE4 can be more commonly found in areas of the Nile Valley.[312] Dixneuf reiterates the pattern that has been observed at other sites for assemblages in the fourth century, namely an opening and strengthening of the market relationships of Alexandria to wine products from Cilicia and Cyprus.[313] As for domestic wine consumption, from the late fourth century until the Arab conquest, the Egyptian LRA 7 and LRA 5/6 are commonly found in assemblages in Alexandria, such as Kom el-Dikka and the Necropolis of Gabbari.[314] As we saw from Tell el-Makhzan, this region is well connected to Palestinian markets. Throughout the fourth century, Christian pilgrimage seems to have played a role in

[310] Dixneuf 2011, 219.
[311] Ibid., 215.
[312] Ibid., 221.
[313] Ibid.
[314] Majcherek 2004, 231; Senol 2007, 67.

the distribution of wine vessels to and from Palestine along a northern route, which connected major religious sites such as Jerusalem, Askalon, Maiomas (the port of Gaza), Gaza, Pelusion, Clysma, and Ouyon Mousa (located in the southern Sinai region).

Western provinces and Britain

Tomber and Williams published a brief, yet helpful, overview of the presence of Egyptian amphorae in Britain and the western provinces. Egyptian amphora sherds have been found in Carthage, Peñaflor (Spain), Vicus Bliesbrucken (Germany), Augst (Switzerland), Lyon, Marseilles, Golf de Fos, Arles, and Narbonne. Sites in modern Italy include Milan, Udine, Aquileia, Ravenna, Classe, S. Antonino di Perti, Luni, Rome, Ostia, Naples, Pompeii, and Punta Secca (Sicily). Sites in eastern Europe include Sucidava (Romania), Yatrus (Bulgaria), Dinogetia (Romania), Tomi (Romania), and Histria (Romania). Sites in Britain include York, Towcester, Old Sarum, Poundbury, and London.

While the authors offer no specific quantification of the finds, they do make mention of the low level of frequency of these vessels in the archaeological record, where each find spot represents no more than two vessels. Most of the find spots however, occur in small quantities from the late first to the seventh centuries CE, with a slight majority of amphorae present in archaeological units dating to the third century CE.[315]

[315] For a full list of references and bibliography see Tomber and Williams 2000, 46.

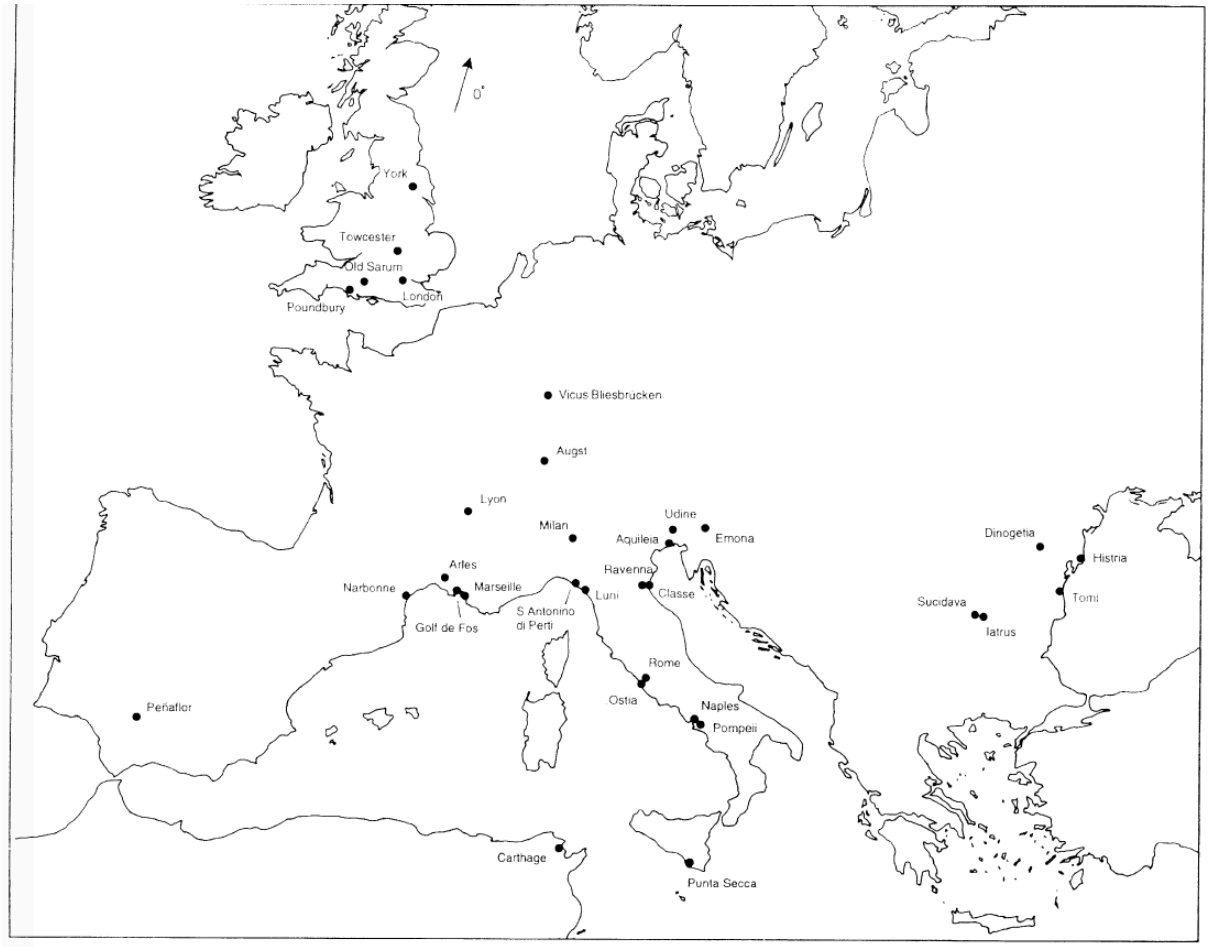

FIG. 3. Location map of Western find spots of Egyptian amphorae.

Figure 11 Location of Egyptian Amphorae Find Spots in the Western Mediterranean

On the map provided by the authors, a first look might suggest a wide distribution of the vessels. However, it is essential to note that the find spots range chronologically over six centuries, and that only rarely may more than a few sherds of Egyptian amphorae be identified in any of the sites shown on the map. Nonetheless, this evidence is important because it shows the commerce occurring with far off regions of the Empire, providing evidence that while these Egyptian vessels and their products, mostly wine, were not widely desired or consumed, they must have traveled with other, more desired, products that have

perhaps not survived in the archaeological record, such as textiles, papyrus, and grain, particularly in the case of the port cities.

Conclusions

The sites of Schedia, Coptos, and Kom el-Dikka, for example, all show similar patterns: at archaeological levels dating from the first two centuries of Roman dominion, a large quantity of Italian wine *amphorae* are found, along with Italian *sigillata* fine ware and other imports from the western Mediterranean. As I have explained, over the course of the third century importations from the West ceased, and local Egyptian amphorae such as the Amphora Egyptienne 3 (a precursor to the Late Roman Amphora 7) began to appear in higher percentages in ceramic assemblages.[316] Starting in the fourth century, however, sites like Schedia started to show a vast increase in Egyptian ceramic products of both coarse and fine ware, such as amphorae and imitation of African Red Slipware shapes, which normally were manufactured in North Africa.[317]

From the late fourth century and on, assemblages from Alexandria, the Delta, the Sinai region, the Nile Valley, and the Red Sea seem to point to a particular relationship between Egypt and Cilicia and Gaza, respectively the centers of production of LRA 1 and LRA 4. These vessels appear in tandem with LRA 7, which dominates most Egyptian assemblages and which is found commonly in Eastern Mediterranean assemblages. This fact is not surprising. Late Roman and Byzantine trade has been analyzed extensively from the pottery record, showing a strongly connected Eastern Mediterranean, while the presence of western amphorae in the assemblage records is nearly non-existent.

[316] Martin 2010; Lawall 2003; Majcherek 2004.
[317] Martin 2010.

In her dissertation on the wine industry of Egypt during Roman times, Dorota Dzierzbicka best summarized the situation for Egyptian wine production and importation:

> "The division of the Roman Empire into the East and West parts triggered further significant changes in the wine trade network. Egypt was cut off from the western suppliers and new routes were established within the Eastern part of the Mediterranean. Rome's eastern trade, in which the Egyptian Red Sea ports played a key role, witnessed a decline. Wine from Italy, Spain, Gaul, and Crete is no longer found in Egypt. The wine-producing regions of Palestine, Cilicia, and Cyprus, which were already present on the market in the early Roman period, but played a relatively minor role, now developed into the leading suppliers of wine to Egypt… During the fourth century, there is a resurgence of activity in the Eastern Desert. By this time Myos Hormos was abandoned and it would appear that Berenike was responsible for the greater volume of trade in this area of the Red Sea."[318]

What does this mean for Egypt? As we have seen from the analysis of coinage it was not an isolated province monetarily speaking, but by taking only the amphorae evidence alone into account one could pre-emptively conclude that the lack of importations during the first half of the fourth century represented an overall economic halt. After the middle of the fourth century, the goods of the Eastern Mediterranean centers infiltrated the wine markets, which were still dominated by the domestically produced AE3 and LRA 7. Beginning in the second half of the fourth century, the domestic products did not cease but were now accompanied by the presence of LR amphorae produced in the Gazan Region and Cilician LR 1 amphorae in the assemblages of the excavated cities showing the Eastern Mediterranean as the primary choice of sources for wine consumption during these years.[319]

While there are regional differences within Egypt, for example between the Alexandria and Amheida assemblages, there is an overall pattern seen in various sites along Mediterranean ports, the Nile Valley, the Red Sea coast, and the Eastern and Western Deserts. The ceramic evidence throughout the sites I have presented seems to reiterate a chronological aspect also seen in the coinage patterns. There is a point in the mid-fourth

[318] Dzierzbicka, PhD thesis, 328.
[319] Doukelis 1995; Liebeschuetz 1972, 61-73; Kauffmann 2004, 332.

century, wherein Egypt produced both more coinage and better local wine and had stronger commercial ties with its Eastern Mediterranean's neighbors in Cyprus and Cilicia, evidenced by its imports. Commercially though, the wine industry does not seem to have represented a surplus production for outside markets at all.

CHAPTER FOUR

Approaches to the Study of Egyptian Textile Trade

Whether based on the use of animal or plant products, the manufacture of textiles, and specialization within it, is ubiquitous to every civilization. The literature on textile production in antiquity is, accordingly, quite extensive, and therefore analyses have been most commonly based on regional and chronological approaches.[320]

Textiles were a central part of the ancient economy; they can be grown from plants such as cotton and flax or they are the side industry of the raising of cows, sheep, goats, and horses and as such offer a lot of variety. The potential high price of textiles demand implies a highly organized labor force of the productive landscape and different levels of craftsmanship and specialization associated with its production; it stores social credit in a long-lasting and relatively low-bulk form; it also stockpiles materials which may sometimes be hard to obtain. While the manufacture of ancient textiles in domestic and workshop contexts continues to be studied, in more recent years, more emphasis has been placed on the way in which textiles were traded in the ancient world. A recent edited volume published in 2016, *Textiles, Trade, and Theories: From the Ancient Near East to the Mediterranean,* has brought forth the centrality of textile trade to overall ancient international trade. Though the problem of preservation still remains a central issue, numerous models and utilization of economic theories have been able to shed important aspects of this exchange, such understanding the transaction costs, and the role of the Empire, in the case of Rome, in textile manufacture.[321]

The regional textile industry best represented in the archaeological record is surely that of Egypt. The aridity of Egypt's climate allows for the preservation of valuable organic

[320] For an important overview and extensive bibliography on the manufacture of textiles in different time periods and areas of the ancient world see the following three volumes of proceedings: Cifarelli and Gawlinski, 2017; Gleba and Pásztókai-Szeőke 2013; Droß-Krüpe and Nosch, 2016.

[321] For more on textile production during Roman times outside of Egypt, see Flohr 2013 and Shamir 2013.

material. In 1913, for example, a woven linen garment now called the Tarkhan Dress and housed in the University College London Petrie Museum of Archaeology was excavated in the Tarkhan cemetery south of Cairo. Radiocarbon dating undertaken at the University of Oxford has recently confirmed, with 95% accuracy, that the garment dates to between 3482 and 3102 BCE, which would make the finely woven linen garment 5,000 years old, the oldest surviving example in the world.[322]

With such a long tradition of textile production, the organization and production of linen was well-rooted in the Egyptian economic landscape, and by the fourth century CE, the linen industry in Egypt had long captured the attention of the Mediterranean markets and even the imperial offices of Rome.

The purpose of this chapter is to try to understand the extent of the Egyptian textile trade, with a particular focus on linen, during the fourth century, using papyrological, literary, and epigraphic evidence. Unfortunately, as will be explained in what follows, archaeological evidence cannot contribute to the question at stake. Though the question is simple, there is not sufficient evidence to answer it in a direct fashion, and there will therefore be substantial reliance on models in this chapter. The first main obstacle, and a central reason why archaeological evidence plays little role here, is that textiles, like papyri, rarely survive outside of Egypt. This means that the outside evidence for understanding the export trade of linen is immediately limited to literary accounts and epigraphic texts. Some iconographic evidence in the form of sarcophagi and paintings, for example those from Pompeii, may help us to understand the popularity of Egyptian linen in the Roman world. These images, however, do not offer much more information than what is already evident in literary sources.[323]

[322] www.antiquity.ac.uk/projgall/stevenson349
[323] Barret 2017.

In his 2004 article "Vitalité de l'industrie textile à la fin de l'Antiquité : considérations économiques et technologiques,"[324] Jean-Michel Carrié explores and presents the great importance of the textile industry in the development of economies in the Late Roman Mediterranean. Carrié's analysis of the presence of textile production in the literary and archaeological record shows hints of the essential problem of assessing the trade of Egyptian textiles: preservation. Few climates around the Mediterranean are like that of Egypt, able to preserve textiles and other perishable materials such as those that readily survived in the arid Eastern and Western deserts of Egypt, as well as in the desert fringes of the Nile Valley. Because of damper conditions, Egyptian textiles are nearly impossible to find outside of Egypt in the archaeological record, and thus studies into the extent of the diffusion of textiles require the use of literary sources, which mostly take the form of historical accounts that revolve around key political figures or just touch on Egypt (as is the case with Pliny the Elder's *Natural History* and the *Historia Augusta*).

The second obstacle has two aspects: on the one hand, linen and papyri that mention linen do survive in the archaeological record in Egypt, allowing a glimpse into the workings of the industry within the province, and there have been important studies on how the linen and other textile industries in Egypt functioned, which I will discuss. The problems with analyzing ancient Egyptian textiles are numerous, however. The first is that, unlike coins and ceramics, there is no standard method for quantifying textiles once they have been found in the archaeological record. Some excavation projects have started to weigh them,[325] although this has by no means been done on a large scale, and the methodology for performing this quantification on an archaeological site has yet to be implemented. The ubiquitous and large quantities of textiles present in sites in the Eastern Desert, such as Berenike and Myos Hormos, and in Middle Egypt at Antinoopolis, as well as in the Western Desert oases, mean

[324] Carrié 2004.
[325] See the el-Deir textile discussion in Tallet et al. 2012.

that the methodology with which excavation teams deal with this material is varied and its quantification often non-existent or problematic. But even quantifying the finds would not provide a full picture of the scale on which linen textiles were produced, since the textiles that do survive from Egypt come mostly from funerary and not occupational contexts. Therefore, though they might offer information on type of techniques, styles, and dyes available, and on how textiles were used in burial practices, they cannot provide information on the consumption of textiles in daily life. Calculating the average weight of textile used in wrapping a body for burial could provide a figure for identifying part of the yearly consumption, when matched to mortality rate per year. In order to do this kind of analysis, however, a systematic assessment weighing of textiles found in funerary contexts would need to be done to obtain a relatively accurate estimate.

The second aspect is that, although the papyrological evidence is abundant, the natures of the texts vary substantially. Papyri are perhaps most useful for answering questions of economic transactions and production, but rarely survive outside of Egypt, and thus the available evidence for trade and exportation comes from the production center itself, rather than from the consumption sites of the goods. Literary evidence such as is present in imperial histories, works on nature and agriculture, and travel accounts can supplement the papyrological data, but passages are scarce and hardly intended for economic analysis.

Fortunately, the papyrological evidence for the production of textiles, unlike that for their trade, is abundant and offers small glimpses of the textile economy in the form of receipts for purchases and taxes, orders for manufacture, and even letters requesting the acquisition of certain types of high-value cotton robes. The papyri, however, are offer difficulties in their own right. The extremely varied terminology for textile garments makes systematization difficult, and the patterns of papyrus preservation mean that, while we may understand the scale of the textile industry in third-century CE Oxyrhynchus at some level of

detail, we do not have the same evidence for other areas, particularly in the Delta, during the same time period, where papyri are not preserved. Therefore, our view of the Egyptian textile industry will naturally be skewed toward sites where the present conditions allow for the preservation of textiles and papyri. It is difficult to establish the typicality of these sites. Nonetheless, it is only because of the papyrological evidence that attempting to assess the trade of linen during the fourth century is possible at all.

I therefore attempt to describe and understand the extent of the fourth-century Egyptian linen trade essentially from within this limited evidence coming from within the province. This will undoubtedly generate issues of generalization, over-extension of the evidence, and interpretation of quantification models and numbers. However, given the glimpses of the importance of the Egyptian linen industry observable in the literary and epigraphic sources, I believe it is worth trying to try at least to provide an order of magnitude for the likely scale of production and export, the first being for obvious reasons easier than the second.

Given the particular problems associated with literary and papyrological sources, I have decided to divide them in separate sections in this chapter, although the main research question of the scale of their trade and production will remain at the core of the analysis.

LITERARY EVIDENCE

Literary evidence for textile production in Egypt and its trade beyond the province is not plentiful. The few passages that exist, though, contain valuable information on how the Egyptian linen industry was perceived in the upper echelons of the Roman authorities. In this section I will draw mainly from Pliny the Elder's *Historia Naturalis*, the *Historia Augusta*, and the *Periplus Maris Erythraei*. While the texts may not offer any quantifiable data, I

believe they are valuable for showing the impact and reach of the Egyptian linen industry outside of Egypt.

Historia Augusta

In 1889, Hermann Dessau demonstrated that the *Historia Augusta*, a late Roman collection of biographies of Roman emperors that claims to be the compiled works of six authors writing in the early fourth century, was actually the work of one author writing much later.[326] Since then, numerous explanations, analyses of the texts, and quests to determine what is "authentic" and what is not were undertaken throughout the 20th and into the 21st centuries.[327] While a full discussion of the nature of the text is unnecessary here, it is nevertheless important to acknowledge that the text is problematic and needs to be held up to scrutiny.

The majority of the controversy, however, concerns the sources for the biographies and the intended agenda of its author. I believe that, while the passages I will use may indeed be exaggerations (as we will see in the case of Gallienus), there is still much salvageable information pertaining to the author's impression of the Egyptian linen industry in late Imperial Rome, in fact toward the end of the century that is our focus here. In the following passage, we will see how a cessation of the flow of Egyptian linen into the capital is equated with natural disasters and invasions.

> I am ashamed to relate what Gallienus used often to say at this time, when such things were happening, as though jesting amid the ills of mankind. For when he was told of the revolt of Egypt, he is said to have exclaimed "What! We cannot do without Egyptian linen!" and when informed that Asia had been devastated both by the violence of nature and by the inroads of the Scythians, he said, "What! We cannot do without saltpetre!" and when Gaul was lost, he is reported to have laughed and

[326] Dessau 1889.
[327] For an updated discussion on the different theories as well as an analysis of the sources of the HA see Rohrbacher 2013. Cameron 2011, 718 dates the composition of the HA to 373-382/83. For a detailed discussion and intra textual analysis of the text see Chapter 20 in Cameron 2011.

> remarked, "Can the commonwealth be safe without Atrebatic cloaks?" Thus, in short, with regard to all parts of the world, as he lost them, he would jest, as though seeming to have suffered the loss of some article of trifling service…[328]

I draw attention to this passage for its economic implications. The fact that a revolt in Egypt is tied to a presumed halt of the flow of linen, and that this is the first thing that comes to mind in such a situation, suggests that the importance of the Egyptian linen industry was widely recognized in the imperial offices, and that a disruption in the supply of linen was understood to have Empire-wide repercussions.

The author of this section of the *Historia Augusta* did not necessarily intend to assign equal impact to these events, since it is clear that he was concerned with the character of Gallienus and his response to events that were detrimental to the stability of the Roman Empire. Indeed, in the same passage the revolt is compared to the loss of the entire province of Gaul and to the devastation of all of Asia by the Scythians. One cannot take Gallienus's jokes at face value, but it remains striking to see him equating Egypt with the linen industry, showing if nothing else the awareness on the part of the author of the *HA* of the importance of the linen industry to the Empire, enough that instability in Egypt would have repercussions on the stability of the Empire.

There is another passage from the *Historia Augusta* that is important for the discussion of linen, namely Aurelian's reinstitution of the *anabolikon* tax on linen. However, since there is substantially much more papyrological evidence than literary regarding this tax, I will discuss this in the section dealing with papyrological evidence for the *anabolikon* later in this chapter.

[328] *HA*, The Two Gallieni, 6.7.

Pliny Natural History

While the *Historia Augusta* hints at the impact of the linen supply to Rome, Pliny the Elder discusses the geography of linen production, as well as the quality of the linen produced. We can begin to understand the scale and wide specialization of the Egyptian linen industry from Pliny the Elder's assessment. He makes reference to different flax-growing regions of Egypt by listing the types: Tanitic, Butic, Pelusiac, Tentyric.[329] The first three of these descriptive adjectives refer to the branches of the Nile in the Delta, and the regions each one irrigated as well: Tanis, Buto, and Pelusium. Tentyra (known commonly as Dendera, where the famous Temple of Hathor is located) is located near the modern city of Qena in Upper Egypt. This topographical classification is not exhaustive, but it probably alludes to the best-known flax-growing regions in Egypt. While we have evidence for wide textile production in Alexandria, Oxyrhynchus, and Antinoopolis, we also know that unfinished garments were sent for weaving to Alexandria and Oxyrhynchus.[330] Thus, Pliny was specifically mentioning flax growing regions and not necessarily textile producing centers.

In another passage in the same text, Pliny complains about the poor quality of Egyptian linen, explaining why Egypt was able to make such a profit out of its sale. "The flax of Egypt, though the least strong of all as a tissue, is that from which the greatest profits are derived."[331] Pliny's observation again indicates a widespread familiarity with Egyptian linen production in the Roman Empire, at a time several hundred years before the writing of the *Historia Augusta*, and the popularity of and high demand for the product outside of Egypt.

The reliability of Pliny the Elder's *Natural History* has been the subject of much recent scholarship. In summary, he seems to be regarded at best as the compiler of a

[329] Pliny the Elder, Book 19, 2.14
[330] See Van Minnen 1986 and also the papyrological data discussed in this chapter.
[331] Pliny the Elder, *Natural History*, Book 19.2.14

secondary work, not an original researcher.[332] The author has drawn the attention of well-known literary critics and writers such as Italo Calvino, who has described him as unpredictable and inconsistent, though a critical writer.[333] We should take Pliny the Elder's comments with the usual caution, but nonetheless three central aspects of the linen production can be identified in this passage: it served popular needs, involved mass production, and was profitable, characteristics that are corroborated by other literary and papyrological sources.

Periplus Maris Erythraei

The demand for Egyptian textiles was not, however, limited to regions within the Roman Empire. The *Periplus Maris Erythraei*, a first century CE account written by an Egyptian merchant who sailed from the Red Sea ports of Egypt to various ports along the coast of eastern Africa, southern Arabia, and western India, speaks of a strong demand for textiles and garments from workshops in Roman Egypt. [334]

In the region of Adulis and Axum, for example, the author claims that there was a strong demand for wraps (*stolai*) produced at Arsinoe in the Fayum, a center known for the production of linen.[335]

> There are imported into these places, undressed cloth made in Egypt for the Berbers; robes from Arsinoe; cloaks of poor quality dyed in colors; double-fringed linen mantles; many articles of flint glass, and others of murrhine, made in Diospolis... The most from Egypt is brought to this market from the month of January, to September, that is, from Tybi to Thoth; but seasonably they put to sea about the month of September.[336]

[332] The popularity of the *Natural History* has been related to the rise in interest in the Humanities during the Renaissance period; for more on this see Beagon 2010, 745.
[333] Calvino 2009. For updated essays on the various aspects of Pliny as a historical writer see the recent edited volume by Gibson and Morello 2011.
[334] *Periplus Maris Erythraei* translation by Casson, 6.
[335] Manul Albaladejo Vivero 2012.
[336] *Periplus Maris Erythraei, 6.*

The textiles listed span a variety of types and qualities meant for different economic markets: undressed cloth, cloaks, and mantles. Furthermore, the association with specific regions, such as Arsinoe and Diospolis, echoes (but for different areas) Pliny's geographical description of the types of linen listed in the *Natural History*, as well as the indication that some of them were of poor quality, hinting at the fact that they were mass produced. This regional difference and specialization of textile production within Egypt itself is a key indicator of the scale of the industry and of the demand for different types of Egyptian linen products outside of the province.

The textiles produced in Egypt accompanied the trade of luxury products which passed through its ports to eastern markets. The *Periplus* lists them among precious stones and special textiles such as cotton, silk, and mallow cloth.

> There are exported from these places spikenard, costus, bdellium, ivory, agate and carnelian, lycium, cotton cloth of all kinds, silk cloth, mallow cloth, yarn, long pepper and such other things as are brought here from the various market-towns. Those bound for this market-town from Egypt make the voyage favorably about the month of July, that is Epiphi.[337]

One of the important aspects of the literary evidence is the specific mention of Alexandria as a main textile trading hub. By describing the connectivity of the port in Arabia Eudaimon, the merchant-author of the *Periplus Maris Erythraei* points out the role of Alexandria as a point of commercial connectivity.

> Eudaimon Arabia, a full-fledged city in earlier days, was called Eudaimon when, since vessels from India did not go on to Egypt and those from Egypt did not dare sail to the places further on but came only this far, it used to receive the cargoes of both, just as Alexandria received cargoes from overseas as well as from Egypt… [338]

Furthermore, both of Egypt's maritime borders, the Red Sea and the Mediterranean, in conjunction with the connectivity the Nile offers to the Sudan and points further south in

[337] *Periplus Maris Erythraei,* 49.
[338] *Periplus Maris Erythraei,* 26.

Africa, allowed Alexandria to act as one of the main central points of commercial interactions between Rome and lands outside of the Empire. Alexandria, the most notable textile production center, was probably also one of the main redistribution centers for the raw material since it is from this Mediterranean metropolis and emporium that outward trade was organized.

As I discussed in Chapter One, while no direct papyrological evidence has been found in Alexandria, there are many texts, especially letters, written in the city and sent throughout Egypt.[339] We also have plenty of indications that the city had its own sector of textile production, and we know that specialized fabrics were also produced there, as it was noted for the manufacture of finely woven tapestries and garments. These urban craftsmen relied on flax production from the Delta.

Outside Egypt, epigraphical and literary sources speak of the desirability of, and extensive trade in, Egyptian linen. In 301 the Emperor Diocletian issued the Edict of Maximum Prices, which listed the highest prices for certain commodities and services. The Edict, for example, enumerates a type of Alexandrian fabric (presumably linen, though it could be also wool) that imitated more expensive woolen garments from Cilicia. Some rabbinic sources from the early fourth century mention a special type of sewing known as "Alexandrian mending."[340]

Christopher Haas notes that in Alexandria "while more common linens could be manufactured easily in the villages of the Nile Valley, the production of luxury fabrics appears to have required more specialized craftsmen who tended to concentrate in the metropoleis." These linen merchants were part of a profitable global market. Christopher Haas claims merchants were leasing their own vessels and establishing themselves in bases as

[339] For a full analysis of the letters and the evidence they provide for connections within Egypt see the recent two-volume work by Reinhard 2016.
[340] Haas 1996: 35-37, though he does not cite the specific source for this.

far away as Sicily.[341] Alexandria thus acted as a place for the production of specialized luxury textiles within Egypt.

To sum up the evidence we have covered this far, literary texts provide information on the scale and sophistication of linen production in Alexandria, of the high volume of total production in Egypt, of the specific taxation of linen in Egypt (to be further discussed in this chapter), of the desirability of Egyptian linen to outside markets, of the high profits to be made, of the diversity of garments produced, and of the well-known regional production centers within Egypt which exported to the Red Sea markets, sub-Saharan Africa, and the rest of the Mediterranean.

All of these descriptions are qualitative and offer no data useful for economic analyses, thought the criticisms of quality suggest the linen market was segmented by quality, being able to reach various levels of the market. Nonetheless, they are important because they show the reputation of the Egyptian linen industry in outside markets, and even a certain dependence on Egyptian linen. This also may confirm the presence of mass-produced, lower quality goods in exportation, showing that the trade of textiles was not only geared towards luxury products.

Papyrological Evidence

In this section, I explore papyrological evidence in order to understand the trade and markets of Egyptian linen from within the sphere of production. The papyrological evidence for the textile industry is vast, but earlier scholars have already described how the textile industry functioned in Hellenistic and Roman Egypt. Scholarship on textile production in the ancient world, and the Graeco-Roman world specifically, has continued to grow in past

[341] Ibid.

decades,[342] and recently many studies on the Egyptian textile industry have come forth. Nonetheless, the overall field of textile studies has not focused on Egyptian production and trade in particular, and I shall therefore start with a brief overview of the last fifty years of scholarship on the subject.

Perhaps no other work on the Egyptian textile industry has been more influential than Ewa Wipszycka's *L'Industrie textile dans l'Egypte Romaine,* published in 1965. Based on her doctoral thesis, Wipszycka's book gathers all of the papyrological evidence from the first three centuries CE pertaining to the textile industry in Egypt. Most of the texts, as she explains, are tax receipts, contracts, requisitions for the army, and account ledgers. This means that administrators, and not the workers themselves, wrote these texts. Therefore, the daily aspects of the industry are challenging to reconstruct. Nonetheless, she is able to extract from the papyri terminology that pertains specifically to the workers of linen and wool. The terms are informative and demonstrate that work in the industry was highly differentiated—from the collection of the raw material to the final tanning and dyeing. The number of jobs she is able to identify (e.g., flax farmers, flax collectors, cleaners, washers, spinners, weavers, dyers—just to name a few), attests to the multiple degrees of specialization required for the manufacture of woolen and linen textiles.

Wipszycka devotes the first chapter to answering the question of the supply of raw material. For linen, we have evidence of flax farmers throughout Egypt; likewise, for wool, to which I will return briefly in a subsequent section, sheep-rearing is widely attested. There is a problem, however, which she addresses immediately: that of lacunae in the evidence for textiles beyond linen and wool. For example, we know of the manufacture of silk garments from Diocletian's Edict of Maximum Prices, and according to Wipszycka we may be sure that it was used and woven in Egypt, even though there is no actual evidence of

[342] See Chapter 1 for references.

silk cocoons, weaving, or threading of the fabric in the papyri.[343] Perhaps the silk was imported already finished and was then attached to nearly completed garments, as can be seen in fine clothing from Antinoopolis dating to the fourth and fifth centuries.[344] The papyrological and textual evidence for cotton is also scarce, but, as I will discuss further on in this chapter, recent papyrological, archaeological, and archaeobotanical evidence from the Eastern and Western Deserts of Egypt points to cotton plantations in operation as early as the second century. Goat and camel hair were used for textiles as well, though not commonly.

The second chapter of Wipszycka's book deals with the organization of the industry itself, including the tools of the trade, the workshops or places where spinning and weaving took place, the ways of obtaining professional status and access to raw material, the manpower available to the artisan, and the relationship between the artisan and the buyer of textiles. Because of the nature of the documentation, the profession of weaver is the one most represented in the papyri (they were the ones who drafted apprentice contracts and leases for looms, and they paid taxes on their trade). This skewed view of the industry means that we actually have little evidence for the other professions on which textile production depended. Recent research has shown that the spinners who produced the yarn to be woven, for example, are hardly mentioned at all. It has plausibly been argued that it was women who did most of the spinning work, at home, hidden from the public and fiscal eye that created the documentary records.[345] We also now have evidence from the site of Kellis in the Dakhleh Oasis, for example, of women spinsters listed in a census declaration dating to the second century CE.[346]

[343] Wipszycka 1967, 38-39.
[344] See Thomas 2016 for the edited catalogue on the exhibition held at ISAW in the spring of 2016: *Designing Identity: The Power of Textiles in Late Antiquity*.
[345] See Gällnö 2013.
[346] Bagnall and Worp 2011.

Textile production occurred both within households and in workshops (often attached to households). The manufacture of textiles was varied and geared towards different markets; perhaps household production supplied domestic need while workshops specialized in producing linen at a larger scale. For the purposes of this chapter, Wipszycka's analysis of the relationship between artisans and clients is perhaps the most relevant. Private correspondence shows that clients could commission specific garments to be manufactured by a master weaver.[347]

As pointed out earlier, the evidence itself, because it has been in considerable part recorded by the administration, shows the relationship between the state and the textile industry through both taxes and requisitions, a relationship that Wipszycka was able to trace from the Ptolemaic period already, thanks to the Zenon archive. While this is interesting and important for the Ptolemaic period, we cannot assume that an organization similarly heavily focused on raw material production existed during the Roman period. The papyrological evidence presented in this work shows a fiscal administration that was directly involved in the production of textiles through taxes targeting groups of artisans, associated by different types of specializations within the textile industry. The presence of such associations, and their long tradition, according to Wypszycka, points to a numerous and durable work force within the industry, but it does not point to any other direct government involvement in production.

Nonetheless, Wipszycka's 1965 extensive analysis of the textile industry of Egypt shows the multifaceted and complex nature of its production, labor organization, distribution, and trade and it was the basis used for more studies discussed below. As with any commodity, the presence of diverse products and professions attests to a strong industry that allowed for different types of specialization within the same economic sector.

[347] Reinard 2016.

During the 1980s, two interesting articles were written concerning textual and papyrlogical evidence. The first one is a brief communication on a wooden writing table from Bordeaux mentioning linen spinners, possibly receiving raw materials by boat from Egypt, but nonetheless active in the linen trade.[348] In 1986, Peter van Minnen published an important papyrus which I have already mentioned in Chapter One, *P. Oxy.Hels.* 40. The article was particularly influential for economic history because the text offers some figures on production output, which van Minnen used to model the yearly output of the city of Oxyrhynchus during the third century CE. I will return to this text later on in this chapter. J.P. Wild responded to van Minnen in an important article in 2003, where he further compiles papyrological evidence available for the output of production in Roman Egypt, concluding in the end that figures "tease rather than explain." Nonetheless, he offers an important contextualization of the garments mentioned in the Edict of Maximum prices. [349] Using the prices listed in the Edict, he concluded that a wool tunic from Laodicea would be more expensive to buy over the counter than to make at home, with a price at 1350 denarii.[350]

Important studies on the papyrological evidence for textile production and the role of flax in the economy of Roman Egypt have been published in the last two decades. Mayerson gives an important overview of the changing role of flax and the textile economy during the Roman period, arguing that its profits led to an Egyptian economy centered on textile production by the time of the Geniza archive. While the narrative is interesting in itself, the article was meant to give just an idea of the contrast between the Roman period and the Geniza Archive. The Geniza archive is substantially later, however, with the earliest texts dating to the late 9th century, and therefore there is a gap in the Late Roman period that is not

[348] Curchin 1985, 34-35.
[349] Wild 2003, 37-45.
[350] Ibid, 40.

covered in the article.[351] Sheridan's 1998 edition of the *Vestis Militaris* codex and her analysis of the *anabolikon* tax, to be discussed more in this chapter, have brought forth substantial evidence on taxation concerning clothing.[352]

Excavations in the Fayum[353] and the oases of Kharga[354] and Dakhleh[355] have also yielded papyrological and archaeobotanical evidence on the textile industry in these centers, contributing to the corpus of evidence available from the Roman period. Notably also in 1990 a contract for a linen-weaving workshop in Panopolis was published by B. C. McGing.[356]

More recently, the study of the textile industry by Kerstin Droß-Krüpe has contributed new approaches and papyrological information for understanding the textile economy in Egypt during the Roman period. In *Wolle-Weber-Wirtschaft: Die Textilproduktion der römische Kaiserzeit im Spiegel der papyrologischen Überlieferung* the author employs papyrological evidence to describe the various aspects of wool and linen production in Egypt, with a reference to silk and cotton fabrics. The majority of the book focuses on aspects of the production itself, i.e., the various stages and professions associated with each step. An important contribution of her analysis is the seriation of papyrological texts both chronologically and referring to particular industries and by geography.[357] The author also offers important and updated insights on the productivity of each worker, and

[351] Mayerson 1997.
[352] Sheridan 1998, 211-217.
[353] Quenouille 2007, 227-250.
[354] Gradel et al. 2012
[355] Bowen 2001.
[356] McGing 1990.
[357] Droß-Krüpe 2011. The graphs and tables presented for different professions and region of Egypt from pages 48-98 are informative for the type of evidence available for each stage of textile production, but the issue remains that the pattern of most representation of a particular profession also comes from regions where more papyri have been found, such as Oxyrhynchus and the Arsinoite nome.

how much raw material could have been required to produce one woven tunic, an aspect I will return to in the section on models of quantifying production.[358]

Another important contribution to the study of flax agriculture and the linen economy has been Katherine Blouin's recent analysis of the economy and topography of the Mendesian nome in the Nile Delta.[359] The nome specialized in linen production, and Blouin argues for its profitability not only for the hinterlands that produced raw flax but also for the city dwellers who could then weave it and export it. Notably, Blouin presents a papyrus from the fourth century CE, in which a weaver pays rent by weaving flax rather than currency.[360] This, she argued, reflects the desirability of the product, especially if the weaver had any difficulty raising cash.[361] In a brief yet insightful discussion, Blouin points out the continuity of the importance of Mendesian flax, apparent from documentary sources dating from the Ptolemaic through the Medieval period. Her study is important because it offers a glimpse into understanding the economic opportunities available through the topography of the Delta. The Mendesian nome benefitted from its abundant wetlands capable of producing high-quality flax, the regional long-standing expertise in turning flax into linen, and its location within fluvial and maritime networks of trade. These features were also characteristic of many of the other known textile centers in the Delta: Pelusium, Tanis, Buto. "The successful 'environmental integration' that the Mendesian flax sector represents was thus based on the pluriform valorization of land that was deemed marginal from the point of view of cereal culture and gardening, as well as on the exploitation of the fluvial and maritime distribution networks in which the nome's capital was embedded."[362] Blouin's analysis paints a picture of

[358] Ibid., 79.
[359] Blouin 2014.
[360] *P.Oxy.* LXVI 4534
[361] Blouin 2014, 237 on *P.Oxy.* LXVI 4534
[362] Blouin 2014, 239.

the popularity and desirability of Mendesian flax, and furthermore can act as an example of the agricultural profile of a region of the Delta.

Wool

Linen was certainly the largest textile industry in Egypt, and as we have seen this industry had Empire-wide effects and played a central role in the provincial economy. Linen was highly profitable and had a long tradition in Egypt. As we have seen from literary and papyrological evidence, it was widely traded and was known in the Mediterranean as a symbol of Egyptian production. Egypt's tradition with linen meant that there was also a subset of the population who were highly trained craftsmen and able to focus on the manufacture of specialized garments, albeit on a smaller scale. Egypt did, however, produce a variety of textiles, both in animal and vegetable fibers, and the production of wool and cotton was not insignificant. There is evidence that wool was produced on a scale sufficient to matter to other regions of the empire, as in the extraction of the *vestis militaris* tax for the benefit of troops in places like Cappadocia.[363]

To the modern mind, the phrase "Egyptian cotton" has become commonplace, but this is entirely a product of the large-scale cotton production of the nineteenth and twentieth centuries. In earlier centuries, cotton production was on a much smaller scale. It is during the Roman period that the initial evidence for cotton cultivation is found. Its production became highly profitable in subsequent centuries, and undoubtedly much of its success as a crop in Egypt stems from the region's long tradition of the trade and production of linen. Nonetheless, evidence for the export of both wool and cotton is not as widespread as that for linen, which no doubt reflects the prevalence of linen during the third and fourth centuries for export.

[363] For more description of the tax see Sheridan 1998.

Wool production intensified in Egypt in the Ptolemaic period due to Greek influence in the region and continued to be used for tapestries thereafter, though it is unclear how much of it was traded out into the Mediterranean. In fact, the documentary evidence points to large flocks of sheep being registered in the Oxyrhynchite nome, and subject to a "grazing tax."[364] Starting with the beginning of the Ptolemaic dynasty, however, as Wipszycka points out, wool had significant cultural importance in the land, undoubtedly through its associations with the Greek Mediterranean economy and identity.[365]

James Keenan draws attention to the Zenon archive, documents within which describe rare breeds of sheep being imported into Egypt for the manufacture of special garments for the rich. This, however, was a special luxury for the Hellenistic rulers and their circles, which should not be considered normal for the rest of the Greek population of Egypt.[366]

Egyptian wool was of no particular fame in the wider Mediterranean, and other regions were better known for their production, such as Anatolia and Greece. Nonetheless, it was still a large and important industry within the province, and there is papyrological evidence for its requisition for outside troops during the Roman period. *BGU* VII 1564, dated to September 9, 138, is a copy of an authorization to a banker by three clothing collectors acting on behalf of the Prefect of Egypt. The collectors instruct the bankers to make a cash payment in advance to the representatives of the weavers in the village of Philadelphia in the Fayum for six textile items meant for the army in Cappadocia. The text describes the highest quality and cleanliness desired for the products, including one blanket.[367] The quantities were not high, and thus we are left wondering how extensive these requisitions of wool products

[364] Keenan 1989, 182.
[365] Bell 1957.
[366] Keenan 1989, 183.
[367] See Wild 2003, 9 for a summary and Lewis, Reinhold 1966 for the edition of the text.

for outside markets were. Extrapolated to all of the villages of Egypt, however, the quantity could have been impressive.

Colorful cloaks and fine tapestries were woven in major textile producing centers like Alexandria and Antinoopolis, and papyrological evidence in the form of petitions concerning stolen sheep and registration of flocks attests to the significance of sheep grazing in Roman Egypt.[368] Dominic Rathbone's analysis of the third-century CE Heroninos archive points to the composition of the flocks of sheep as evidence of an economic rationale geared towards optimal wool extraction.[369] As Keenan points out, "The flocks were, evidently at their owner's insistence, half ram and half ewe, a ratio which points to the owners' imposing a strategy of wool production on lessees who, if left to choose their own strategy, should have preferred a higher proportion of ewes to be exploited for their lamb and milk products."[370] Therefore, we see a clear rationale in which sheep grazing was preferred for the production of wool because of its cash value in the textile market. From the papyrological evidence, Bagnall has also pointed out the importance of rug makers. They formed their own guilds and even manufactured special commissions for visits of the Dux to the province.[371] Thus we know of the sheep grazing, manufacture of woolen goods, and the high prices they commanded.

An industry undoubtedly closely tied to wool is that of dyeing, for which Egyptian products were readily available. Beyond the dyes themselves, which are present in different types of minerals, alum is indispensable as a mordant for the production of multicolored tapestries and cloaks.[372] Archaeological excavations from late antique cemeteries at Antinoopolis yielded woolen cloaks and tapestries of remarkable color

[368] Keenan 1989.
[369] Rathbone 2007, 124-129.
[370] Keenan 1989, 185.
[371] Bagnall 1993, 82.
[372] Preliminary research into the Egyptian production and exportation of alum has been most recently summarized in Borgard et al. 2003.

preservation, which would have required substantial raw material not only in the form of wool but also dyes and mordants.[373]

Cotton

Recent work in Egyptian oases also shows the growth of cotton as an important textile starting in the second century. While cotton did not play a pivotal role in the textile economy of Roman Egypt, its slowly increasing appearance in the documentary and archaeological record points to the use of this commodity during Late Antiquity. The earliest evidence for cotton cultivation outside of the Indian subcontinent dates from the first century CE, in Egypt in Qasr Ibrim. In the Fezzan in Libya, cotton is found commonly in contexts dating from the second century onward, confirmed by radiocarbon dates of the cotton seeds themselves.[374] I present below evidence from settlements in the Eastern Desert and the Red Sea coast, namely Myos Hormos, Mons Claudianus, Abu Sha'ar, and Berenike, as well as archaeological and textual evidence from Kharga and Dakhleh dating from the second to the fourth centuries.[375]

Myos Hormos

Myos Hormos, modern Quseir al-Qadim, is a port located on the Red Sea Coast of Egypt. Excavations there have uncovered interesting archaeobotanical evidence ranging from Indian spices to cotton seeds. The cotton evidence consists of just two seeds, still showing the short light-brown fuzz but with the lint removed, which date to the eleventh or twelfth century. On morphological grounds, it is not possible to determine which species of cotton this is, and therefore its genus and provenance cannot be studied. "Because cotton

[373] Lintz and Coudert 2013 on textile finds from Antinoe.
[374] Pelling 2015 on Garamantian agriculture.
[375] van der Veen et al. 2002, 89.

seeds tend to be found only on sites where cotton was grown and/or processed, they should not be expected at specialist sites such as the Roman ports of Berenike and Myos Hormos, or the quarry settlements of Mons Claudianus and Mons Porphyrites. As a large proportion of archaeobotanical evidence from Roman Egypt originates from these 'specialist' sites, cotton may be well under-represented in the record."[376] This view only extends to the cotton seeds and botanicals associated with the plant itself, since excavations have revealed plenty of archaeological evidence of cotton garments in nearby sites such as Mons Claudianus and Abu Sha'ar.

Mons Claudianus and Abu Sha'ar

One of the main corpora of evidence for actual cotton garments comes from military posts in the Eastern Desert such as Abu Sha'ar and in the site of Mons Claudianus, which was a quarry but was heavily protected by the military. The textiles from Mons Claudianus tend to date to the second century CE, while textiles from Abu Sha'ar date to the fourth century, and more precisely between 310 and 400. From this latter period, 673 fragments of separate garments were found, most of them tunics made of vegetable fibers, such as linen and cotton. Military personnel made up the population of Abu Sha'ar, where many twills are present, while further predominance of twill at other military posts in Maximianon and Krokodilo seems to further suggest a correlation between twills and military garments, which would affect the way textiles of this nature are seen in all archaeological contexts. Quantifying the ratio between linen and cotton within this textile corpus proved challenging for the specialists. As they point out: "The difficulties in distinguishing flax from cottons obscure what may have been a clearer pattern; the increase in reinforced selvedges on textiles of vegetal fibers at 'Abu Sha'ar may perhaps reflect that this type of selvedges was

[376] Ibid. 90.

being adopted by cotton weavers in Egypt or Nubia."[377] More data would be required in order to confirm this point, but the preliminary indications of linen techniques being used for cotton garments could imply the fiber's domestic adoption among the weavers of Egypt, and its integration into the linen production and trade spheres.

Berenike

While the actual textiles themselves are found throughout multiple sites in Egypt, few projects have analyzed them systematically. Useful analyses have come from the Eastern Desert in particular: Berenike, Mons Claudianus, and Abu Sha'ar, which I discuss in the previous section. At Berenike a high quantity of cotton, much of it imported, has been found dating to the Late Antique period. Over 400 Indian textiles were found during the 1994/1995 season, and almost half of them were cotton. According to Wild and Wild the proportion of cotton found at Berenike was equally high in subsequent seasons. Though there is a significant presence of Indian cotton in the textile assemblages at Berenike, there is also important evidence that cotton garments were manufactured in the Nile Valley.

The cottons found at Berenike can be divided technically into two distinct groups: one is woven exclusively from S- or anticlockwise-spun yarns, the other from Z- or clockwise- spun yarns. According to the authors, ancient spinners were highly conservative, and the tradition in Egypt and neighboring Roman provinces was to use the S-direction: Z-spun yarn was only used for special weft. It would be fair to assume, accordingly, that the S-spun cottons were produced in Egypt or at least in the Nile Valley. S-spun cottons are not infrequently found in the Meroitic and X-Group cemeteries along the Upper Nile (first to sixth century CE) and there is archaeological evidence for cotton cultivation in Ethiopia.[378]

In a recent article, Tallet, Gradel, and Letellier-Willemin have argued for the creation of a cotton economy in the Great Oasis, that is, Dakhleh and Kharga. The perennial

[377] Jorgensen and Nosch 2004.
[378] Wild 2007.

agriculture relying on wells, as well as evident investment in fruit crops, shows an economic rationale based on the trade of high-value products such as dates, oil, and cotton. These products were highly transportable and thus marketable, and in the case of dates, we also know they were habitually transported to the Nile Valley since the pharaonic period.

It has been argued that there was a potential connection between the oases and the transaharan caravan routes from the Libyan desert. However, this western desert route still remains to be understood, as many of the products cited as evidence for this connection are also found on the Eastern Desert and near the Nile Valley, suggesting instead a Nile trade route.[379] Nonetheless, sites in Kharga, such as el-Deir, a stately fortress built during the reign of Diocletian, suggest the desire to protect the trade routes for goods coming into and leaving the oases. There, archaeobotanical and archaeological evidence for cotton, paired with the papyrological texts, seem to indicate the cultivation of cotton starting no later than the second century CE.[380]

There is also quite a bit of textual evidence for the role of cotton in the Egyptian economy, specifically from the oases of Dakhleh and Kharga, which has been compiled by Roger Bagnall.[381] First, there are two letters from the second century in the Michigan papyrus collection, published by Winter and Youtie in 1944, *SB* 6.9025. Bagnall restudied this letter in an article in *BASP* 2008 using the new evidence from Kellis and Trimithis that attests to the growth of cotton in the region. According to Bagnall, documents from Kharga and Dakhleh oases present quantities of cotton that seem to indicate significant local production, such as three ostraka from Douch, seemingly dated to the second century. Even larger quantities of cotton were recorded in texts from the fourth century. Ostraka from Amheida, *O.Trimithis* 1.38 and 44, list substantial amounts up to more than 26 lithoi (or possibly lithia,

[379] Gradel et al., 2012.
[380] For more detailed evidence, as well as a list of the archaeological evidence from excavations in Bagawat and el-Deir see Tallet et al. 2012, 128-130.
[381] Bagnall 2008.

the diminutive). According to Bagnall's calculations, their use of fractions makes it possible to demonstrate that the lithos was at least ten Roman pounds, because the fractions are based on a system of units requiring a common denominator of 2,880, or ten times the number of grams in the Roman pound, which would make the lithos at a minimum about 3.23 kg of cotton. This means that one of the Trimithis ostraka reports a total of more than 200 kg of cotton – which, in terms of volume, is a very large quantity of cotton.[382] Continuous work at the necropolis in El-Deir has yielded not only cotton shrouds but even cotton seeds and fragments coming from the workshop of an embalmer. In the Dakhleh oasis, at the site of Kellis, numerous cotton balls and seeds were found in a house, and we have textual evidence of workshops of linen weaving, and even wool production in the village, attested by two letters, *P.Kellis* I Gr. 71 and 72.[383]

The oasis was indeed suitable for the growth of cotton, given its perennial irrigation and the absence of the summer flood, which made the Nile foodplain inaccessible. Furthermore, the seasonality of other of its well-known products, such as fruits like dates and jujubes, worked well with the yearly rotation of summer and winter crops.

The distribution of cotton in Egypt and in the rest of the Mediterranean remains to be explored in full. Tallet, however, has already pointed out the key fact that cotton is found in the port of Berenike and is attested in papyrological texts from Oxyrhynchus as well. The famous "Muziris papyrus," P. Vindob G. 40.822, includes a list of luxury products coming on a ship from India, dating to the middle of the second century. The taxes listed on the textiles show that they represent about 3% of the total value of the merchandise.[384] While the value of the textiles is small compared to the rest of the cargo, it shows the role Egypt played in the redistribution and circulation of textiles from the East.

[382] Bagnall and Ruffini 2012.
[383] Bowen 2001.
[384] Tallet et al. 2012, 140.

Bagnall argues that the high profitability of the cotton (and other high-value crops) compensated for the cost of supplying the Bahariya oasis with the cereals the crops were replacing. The Abu Sha'ar textiles discussed previously are mainly made of cotton, and thus we may see an initial boom of cotton, at least within Egypt, during the fourth century. The magnitude of the cultivation of cotton in the oases or the upper valley remains unclear, but the documentary and papyrological evidence from this region indicates its presence in Egypt already in the second century, with a much clearer boom during the fourth century.

The *Anabolikon*

The papyrological record in Egypt, which is particularly rich in documentary texts relating to economic activities, offers unique opportunities for the study of taxation. A preliminary search on the digital resource papyri.info, for example, yields over 3000 records of tax receipts dating to the Roman period. This abundance of papyrological texts attests to a variety of types of tax: the well-known grain-tax, money taxes on land, taxes on animals, poll taxes, other capitation taxes, taxes on trade, sales tax, and other duties associated with commerce, to name but a few.

The plethora of papyrological evidence poses challenges for a systematic assessment of taxation in the region. When focusing on one particular kind of tax, however, it presents the unique opportunity of linking quotidian, local evidence for the collection of taxes in a Roman province to wider imperial legislation and the historical accounts given in literary and legal sources.

There are three documents from the second century CE that mention duties for a tax in money on the production of linen.[385] Such taxes existed since the Hellenistic period, and Blouin has hinted at a continuation of the levies on flax production from the third century

[385] P.Oxy. XXIV 2414, 11, 16; P. Ryl. II 214, 42-3, 63; SB XXIV 16085; See Blouin 2014, 236.

BCE until the second century CE, as seen through the papyrological evidence. *P. Stras. IV* 299, dated to the second century CE, mentions a tax on linen production called *timē linokalamē.*[386] An updated systematic study of these taxes throughout the Graeco-Roman period might elicit an overall trend of taxation within Egypt, which would be fruitful, though outside of the scope of the present chapter.[387]

Through the study of the history and nature of a specific tax, as in the case of the *anabolikon*, scholars can attempt to get insight into the fiscal goals of the Empire. The analysis of the *anabolikon* in particular lends itself to understanding the logic of the mechanics of extraction as applied in one instance and on the basis of multiple sources. Combining the literary and papyrological evidence does not present a very coherent picture in this case, but it is nevertheless possible to extract valuable information for the economic rationale and the implementation of fiscal systems in the Roman provinces. In this section, I will argue that the *anabolikon* tax was aimed at maximizing extraction from Egypt's most profitable industry–textiles. Rostovtzeff first explained the tax according to the etymology of the name:

> ʾΑναβάλλειν, from which ἀναβολικόν is derived, probably means, as a terminus technicus of taxation, to 'deal out', i.e. to deal out a portion of a certain kind of goods for export to Rome and to the other capitals of the Empire, the portion which was 'dealt out' being a new additional or an old reformed payment imposed on the producers of raw material (flax and hemp) and on the manufacturers (glass, papyrus).

Therefore, according to Rostovtzeff, the *anabolicae species* are the products subject to the anabolicum, a tax in kind or a delivery of goods whose manufacture had been monopolized by the state in the earlier Ptolemaic period (glass, hemp, glass, papyrus). More

[386] Blouin 2014, 237.
[387] For some well-known linen taxes in Egypt attested since the Hellenistic period see also Blouin 2014, 236 note 94, referring to older literature, namely Wilcken 1899, 266-269; Wallace 1969, 440, 483; Préaux 1979, 94-95.

recently, the *Fachwörterbuch* has defined the tax more generally as an "export tax on Egyptian products."[388]

The papyrological evidence for the *anabolikon* was systematically analyzed and published in a 1999 article by Jennifer Sheridan. While the literary evidence implies that the tax was imposed on many industries, papyrological evidence makes it clear that the *anabolikon* in Egypt was a tax specifically on linen and linen products. Following her analysis of the greater portion of the papyrological data, which dates to the third and fourth centuries, Sheridan concludes that the *anabolikon* was essentially a "late antique linen tax, sometimes paid in cash, and sometimes in kind, which supplied some branch of the government, [presumably the army], with its occasional need for linen garments." The tax seems to have been assessed in a manner similar to the *vestis militaris,* a much better understood Late Antique tax, whose purpose was clearly to clothe the army.[389]

The literary evidence for the *anabolikon* is quite limited but well-known among those acquainted with the Emperor Aurelian. *Historia Augusta* 45 refers to the (re)institution of the *anabolikon* tax by the Emperor: *Vectigal ex Aegypto urbi Romae Aurelianus vitri, chartae, lini, stuppae, atque anabolicas species aeternas constituit.*[390] As Jennifer Sheridan has noted, the passage is problematic in both grammar and content. Sheridan points out that the translation by MacMullen implies one tax, but Francois Paschoud's translation in French in 1996 distinguishes two separate actions: the establishment of the tax on Egypt for the benefit of the city of Rome and the making permanent of the *anabolicae species*.[391]

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[388] "Ausfuhrsteuer ägyptischer Erzeugnisse (insbes. Glas, Werg, Papyrus, Linnen)" Preisigke, 1915, 12.
[389] Sheridan 1999, 216.
[390] Translation by MacMullen: "Aurelian permanently established, for the benefit of the city of Rome, a tax on products from Egypt, specifically on glass, paper, linen, and tow, and the anabolic categories."
[391] Sheridan 1999, 215; Paschoud 1996, 209: "Aurélien établit, levé en Égypte au benefice de la ville de Rome, un impôt payé sur le verre, le papier, le lin, l'étoupe et, à titre perpetual, des denrées 'anaboliques'."

Neither Paschoud's nor MacMullen's reading finds confirmation from the papyrological evidence. There is, for example, no evidence of the tax being paid on glass or papyrus paper; only on linen and tow, though it will be conceded that there is in any case little information available on the taxation of glass and papyrus. As for the chronology of the tax, leaden seals found in Lyons and dating to the time of Septimius Severus (193-211) inscribed with the words "Anabolicum" make it clear both that the tax was indeed in place long before Aurelian and that the tax existed outside of Egypt.[392] Papyrological evidence further reinforces the existence of the tax before 270. O. Fay. 49, dating to 19 CE, for example, offers evidence for the *adaeratio* of the tax, which means the commution of tax payments in kind into cash. That shows that the default payment mode was in kind. There are also three more references dating to before 270, two of which also refer to payments of money.[393] PSI VII 779, dated to the third century, lists the tax being collected in kind and shows it to be an assessment on the land that produced flax.[394]

Our understanding of the *anabolikon* is further complicated by what is known about a contemporary tax, the *vestis militari*s, a late Roman military clothing tax. The *vestis militaris* seems to have been collected in continuous, small orders and the fact that they were kept for a long time in family archives, may perhaps allude to the importance of documenting them and keeping the receipts. Sheridan published the fourth-century *Vestis Militaris Codex*, a documentary codex originally composed either in 324/5 or 325/6, recording the payment of the *vestis militaris* by each *pagus* of the Hermopolite nome.[395] Sheridan subsequently traced the history of the tax and its relationship to major empire-wide changes following the economic reforms of Diocletian in 296. Thus, while there is evidence from as early as the second century CE for the government purchase of Egyptian linen for the army, there is no

[392] See Rostovtzeff 1957, 611 on note 26 for specific referenes to stamps on oil and wine jars.
[393] See Sheridan 1999, 211 for a more detailed description of the texts.
[394] 14 pounds of flax collected on 100 arourai of land subject to the tax.
[395] See Sheridan 1998.

evidence for this tax itself prior to the fourth century, which could lead to the assumption that the *vestis militaris* developed out of the clothing requisition system of the previous centuries, as the *anabolikon* has been assumed to have done. The existence of the *anabolikon* well into the fifth century, however, makes it clear that the tax co-existed with the *vestis militaris* and must therefore be a separate exaction.

P.Mich. inv. 4004 is a fourth century account of contributions by 26 individuals (among them 3 women) to the *vestis militaris*. Three entries follow each name, indicating the number of *chlamydes*, *sticharia*, and *pallia* in fractional units. The account includes four toponyms that identify the papyrus as coming from the Oxyrhynchite nome.[396] If we compare this account with that of SB 16.12827 (342/3), a detailed *vestis militaris* account[397] that converts payments of clothing into monetary amounts, it is clear that payments for the *vestis militaris* were very small. R.S. Bagnall and K.A. Worp call the amount a "trifle," the equivalent of a payment of one artaba of wheat on an estate of 156 arouras during the middle of the fourth century, or about 39 liters of grain for an area of about 43 hectares[398]. The *vestis* thus represented an ongoing requisition system that clothed the army, and the purpose of the tax seems to have been immediate use on the part of the troops stationed in Egypt rather than shipment of the products to the Imperial capital, as is presumed to have been the case for the *anabolikon.*

Wallace concluded in his treatise on taxation in Roman Egypt that the *anabolikon* was a special levy made for the Roman armies engaged in actual warfare. Accordingly, the reforms of Aurelian recorded in the *Historia Augusta* represented an insistence on payment in kind, since it was possible for commodity prices to change before the army purchased the goods for which the tax was intended.

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[396] Sheridan 2009.
[397] Bagnall and Worp 1983, 8.
[398] According to Bagnall 2009, 187, 363 arouras of land equal 1 square kilometer, and one artaba is the equivalent of 38.8 liters of grain.

Another key consideration must be added to this picture, namely that of the currency situation in Egypt during the third century CE, as described in Chapter 2. Egyptian coins at this time were not those used in other areas of the Empire, and their intrinsic value was low. What does this mean for the payment of the *anabolikon*? Although we know that the tax was indeed paid in coin occasionally, Wallace makes an important point by stressing the preference for payment in kind. If we assume that the products were indeed destined for the city of Rome or for the army, then we must conclude that the Roman state was more interested in the actual products extracted than it was in collecting Egyptian currency, since the Egyptian coins of the era could not be exported and thus did little to help with Rome's expenses elsewhere.[399] What then was the purpose of the *anabolikon*? Ultimately, the tax demonstrates the intent of the Roman state to maximize extraction of the surplus linen production of Egypt.

Rostovzeff was the first to point out that the products listed in the passage from the *Historia Augusta* were highly valuable for Egyptian trade. Accordingly, Aurelian took from Egypt those products that had a high commercial value and that the Roman state knew Egypt produced in surplus. The evidence from other regions of the Empire of high demand for Egyptian textiles makes it clear that there was an important market for the product.

The passage from the *Historia Augusta* might thus be better understood not only as evidence that the *anabolikon* was used to meet the immediate consumption needs of the Roman state, but also as an assertion of the particular importance of linen, papyrus, glass, and hemp to the highest office of Roman authority – the Emperor.[400] The existence of the *anabolikon* illustrates the Roman perspective on Egypt and its products. The linen industry

[399] For more on the currency system during the third century see Estiot 2012 and also the discussion of third century coinage in Chapter 2.
[400] Wypszicka 1965, 19.

was varied and produced a large surplus, which was widely traded around the Mediterranean and beyond.

We have not yet discussed the breadth of papyrological evidence for textile production in detail, but by looking at Egypt's textile industry through Rome's fiscal eyes in the form of the *anabolikon* and the *vestis militaris*, we can already see what the imperial offices saw: an extractable, useful, and highly profitable surplus.

After the tumultuous last few decades of the third century, the emperor Diocletian launched a series of economic and political reforms intended to stabilize the Empire's revenues and expenditures. Changes to the way that taxes were assessed and collected were integral to these reforms. Diocletian had a particular talent for introducing innovations to old customs, which he exemplified during the reforms. He took the Roman idea of the poll tax and introduced the *caput* system, which concerned not just individuals themselves but also the labor power they represented, taking land into account.[401] Perhaps one of the most well-known papyri of the Late Antique period is P.Cair.Isid. 1, the Edict of the Prefect of Egypt, Aristius Optatus, dated to March 16, 297. In the text, we can see how the new system of taxation is designed to maximize and streamline extraction:

> "Aristius Optatus , the most eminent prefect of Egypt says: Our most provident Emperors, Diocletian and Maximian, the noble Caesars .... having learned that the levies of the public taxes were being levied capriciously so that some persons were let off lightly while others were overburdened, decided in the interests of their provincials to root out this most evil and ruinous practice and issue a salutary rule to which the taxes would have to conform. Thus, it is possible for all to know the amount levied on each aroura in accordance to with the character of the land, and the amount levied on each head of the rural population, and the minimum and maximum ages of liability, from the imperial edict which has been published and the schedule attached thereto, to which I have prefixed for public display the copies of this edict of mine. Accordingly, since in this too they have been treated with the greatest beneficence, let the provincials take care to make their contributions with all speed in conformity with the imperial regulations and in no wise wait for the collector to exercise compulsion. For it is fitting that each

[401] Williams 1985, 120.

> person discharge most zealously the full burden of loyalty, and if anyone should be detected doing otherwise after such beneficence, he will risk punishment…[402],,

The language of the papyrus demonstrates a certain zeal to convince the population that a quest for fairness was behind the restricting of the assessment, but it is evident that the Imperial officials attempted to organize and control tax collection in order to streamline collection and maximize revenue.

Further papyrological evidence shows the expansion of the bureaucratic system for tax collection during the reign of Diocletian. The archive of Aurelius Isidorus, a fourth-century Egyptian farmer in the village of Karanis, shows the ways in which the government instituted a new census and land declaration system.[403] After 297, the rates of almost all taxes were based on landholding, a cardinal principle of the wider taxation reforms of Diocletian.

Sheridan explains that through the *vestis militaris* tax, the state maintained control over the surplus extraction, since it expanded the responsibility of the tax collection to local officials within the villages. The inclusion of these middlemen for supplying clothes to the army essentially institutionalized the tax at a local level. Papyrological evidence dating to the second century CE shows direct requisition from manufacturers and weavers by the central government. Beginning in the third century, the emphasis shifted, and villages and towns were made responsible for the collection of clothes or their equivalent in money. Therefore, the burden of the collection of clothing gradually fell on the citizens, and the proper establishment of the tax required having textiles in kind to be able to pay it, and not necessarily being able to provide their equivalent value in coin. Towards the middle of the fourth century, the collection of the *vestis militaris* and the *anabolikon* in coin seems to have occurred more frequently, perhaps since inflation and dramatic debasement of coinage appears to have subsided after the Constantian reform discussed in chapter two,, giving more

[402] Boak and Youtie 1960.
[403] Boak and Youtie 1960.

purchasing power to the currency in circulation than in previous decades.[404] The main difference between the two textile taxes is the type of textiles they collected. The *vestis militaris* focused on the army's need for woolen garments, which was substantial, while the *anabolikon* focused on linen.

Much in the same way as the scale of the production of grain is evident through the annona, the *esthes stratiotike*, or *vestis militaris*, can speak of the scale of textile production in Egypt. In Mons Claudianus, for example, archaeological excavations have yielded different types of weaves and patterns of textiles, some of which were associated with the Roman Army stationed there.[405] Furthermore, Elizabeth Fentress points to army's importance as the bulk market for clothing in North Africa.[406] This view along with Carrié's analysis of the Edict of Maximum Prices as securing purchasing power for the army cements the importance of textiles not only to the markets but directly to the state and shows a truly wide spectrum of demand throughout the Mediterranean world.

That the army needed, and regularly requisitioned, clothing is not a novel idea. But these two taxes show graphically the dependence of the Roman state on Egyptian textile production. How typical these taxes were remains uncertain, though we do have evidence of the *vestis militaris* being collected in other provinces, as well as finding attestations of the word *anabolicum* outside of Egypt, as in the case of the leaden seals found in Lyons.[407] Through the *anabolikon* and the *vestis militaris* we see how important the extraction of Egyptian textiles was in Rome's fiscal policy for the province of Egypt. A political revolt in Egypt would indeed have had repercussions on the regular supply of clothing for the army, and it would have represented a large expenditure for the Roman state to meet its own textile needs without the proceeds of the *vestis militaris* and the *anabolikon*.

[404] Sheridan 1998, 86.
[405] Bender Jørgensen 2004.
[406] Fentress 1979, 176 and 182-5.
[407] See references in footnote 391.

Production of Linen

Not all papyrological evidence is as obscure as that concerned with the *anabolikon*. Some texts offer figures that point to the scale of production of linen during the Roman period. A papyrus from Oxyrhynchus, P.Oxy. Hels. 40, dated to the second or third century, is a large roll consisting of twelve columns on the recto and nine columns on the verso, and four loose fragments which have been edited jointly with the text. On the recto, there is a list of amounts given to a certain Serenus, followed by a list of textile wares and amounts of money which van Minnen interpreted as customs payments, given that they were divided into five-day periods.[408] Therefore, the text appears to be a customs register listing specific types of clothing to be exported out of Oxyrhynchus in one week, totaling 1,956 garments, most of which were children's clothing. Van Minnen stated that the text is some kind of notebook, which means that the text could have belonged to a private person, not necessarily a customs official.[409] There are eight types of textiles listed totaling 1,956 garments: Adult tunic (χιτῶνες τέλειοι, 584) , child tunic (χιτῶνες παιδικοί, 1036), adult tunic A (α χιτῶνες τέλειοι, 21), child tunic A (α χιτῶνες παιδικοί, 24), adult tunic B (β χιτῶνες τέλειοι, 9), child tunic B (β χιτῶνες παιδικοί, 11)[410], cloaks (πάλλια, 172), (λώικες, 99).

The text originally was identified by the editor as the accounts of a laundry, yet van Minnen argues that the amounts listed coupled with the use of a six-obol drachma throughout the text and the five-day period point to a customs register. Van Minnen concludes that the clothes are being taxed because they are being exported but is unclear whether the clothes are being

[408] van Minnen 1986 points out the introduction of five-day periods by Hadrian for "tax purposes", see footnote 4 on p. 88.
[409] van Minnen 1986, 89.
[410] See p. 89, footnote 8 for more information on the division of types of textiles into A and B. Van Minnen lists the Edict of Maximum Prices, and P. Hawara 208 as sources also containing the same differentiation of textiles.

shipped for exportation beyond the nome or out of the metropolis, and whether these were transported by merchants themselves or by people operating on behalf of merchants. [411]

Peter van Minnen attempted to measure the yearly volume of textile production in Oxyrhynchus based on this papyrus and assumed that this would imply 100,000 garments per year for the town alone. This figure is, however, problematic. Comparatively speaking, this figure is incredibly high, Van Minnen himself notes that medieval Florence produced between 70,000-80,000 cloths per year at the height of its wealth. [412] Droß-Krüpe also makes the point that by the medieval period textile spinning technology would have been able to double the production of thread, so 100,000 is even more implausible given the available technology at the time.[413]

Much can be said about the regularity of these shipments as well, but it is clear from the week's figures that the scale of textile production in one town in Egypt in the third century was significant. If one imagines that these figures were common in other textile producing areas in Egypt, there can be no doubt that this was a major industry. Papyri from the Fayum as early as the Ptolemaic period already show the large quantity of linen bundles that one region was able to produce.

P.Cair. Zenon 3 59470 is a letter from Molossos to Zenon that dates to 240 BCE, but is highly relevant for the discussion of potential agricultural output. "Molossos writes that Theogenes had come to Mendes with three bundles of flax, probably samples, and that they were fetching such and such a price. The retail-dealers had assured him that it would be easy to dispose of 10,000 such bundles; hence he urges Zenon to begin at once sending as much as

[411] Ibid, 91.
[412] van Minnen, 1986, 92.
[413] Droß-Krüpe 2011, 79, referring to Wild 2003, 41-43: "Bedenkt man, dass für ein Stück Stoff von einem Meter Breite und zwei Metern Länge je nach Webtechnik zwischen 3.000 und 9.000 m Garn (für Kette und Schuss) notwendig waren, wird eindrucksvoll deutlich welche Expansionmöglichkeit sich in der textilherstellung durch die Verbreitung des Spinnrades auftate."

he can and to write to Promethion the local banker to lend a helping hand. Molossos had already written about the papyrus rolls and now he has sent a message through Kriton whom he met at the Delta; he hopes therefore to get word from Zenon what he is to do about them."[414] These bundles were undoubtedly sent to major textile-processing centers to be spun into thread and then woven, as it is evident from the work-flow of textile production analyzed from the papyri.[415]

Textile Demands- A Small Case Study in Economic Models for Demands

We saw already that archaeological finds of textiles give no basis for estimating potential production. The Oxyrhynchus register gives us a sense that one city might have produced tens of thousands of garments a year. What are the implications for agriculture? We can obtain at least rough estimates of the land required for producing garments for domestic consumption by looking at the size of the population and models of demand.

Many scholars have tried to estimate the size of the Roman population, and specially that of Roman Egypt. Estimates for Egypt usually vary between 4 and 8 million inhabitants during the peak of the Roman imperial period, before the Antonine plague. Elio Lo Cascio's estimate for the population of Egypt at 8 million stands at the high end of the range; other figures are lower, some nearer the range given by Bagnall and Frier, who place the total population between 4 and 5 million.[416] According to the age distributions computed by Bagnall and Frier, around 3 million were adults.[417] I will only calculate the amount of linen clothing required for adults, since for children (ages 14 and below), consumption patterns are less straightforward.

[414] Summary extracted from http://papyri.info/ddbdp/p.cair.zen;3;59470, Aug 15th, 2016.
[415] Droß-Krüpe 2011.
[416] Bagnall and Frier 2006, 104. I have considered as adult the population of 15 years and older. For a much more detailed argument in favor of a lower range from 5 to 7 million, see Scheidel 2001a: 184-250.
[417] Bagnall and Frier 2006, 104, table 5.4.

Flax grows well in marshy, well-irrigated lands, and its seeds are planted densely, which generates a high yield. Flax takes 90 days to grow and the younger plants tend to make a stronger thread, which means a high rate of planting every year. However, the plant itself has many byproducts. For example, hemp, used to make ropes, was acquired after the first cleaning of the flax stem and oil. The seeds could be put to dietary or agricultural use, and the tow was used to make wicks and the bark, as well as functioning as fuel.[418]

Only about 15-20% of the flax plant is actual extractable fine fiber usable for linen. Typical dry flax straw yields today are 4000-7000 kg per hectare. If we calculate about 20% of that, 800-1400 kg/hectare is extractable fiber that is spun into thread.[419] This means, taking the lower figure, about 80 grams of fiber can be extracted from a square meter, in modern times. At first this figure seems quite high. However, flax is also planted very tightly, and its stems, from which the fibers are extracted, measure on average about 1 meter in height. Nonetheless, since this figure is probably too high for antiquity, given changes in agricultural practice. For the purpose of estimating ancient production output I will assume that half of this quantity of fiber, or 400 kg/hectare of flax, could have been extracted in Roman Egypt, which would mean 40 grams of fiber can be extracted from a square meter.

In apprentice contracts for Roman Egypt, there is typically a provision stipulating that the master provide one linen garment per year to the apprentice.[420] People would of course own more than one garment, and perhaps not everyone purchased one linen garment per year; some may have bought more, some less. We know little about how long garments would last. The finest, i.e. lightest, linen weighs about 166 grams per square meter.[421] A

[418] Blouin 2014, 234.
[419] https://www.richters.com/show.cgi?page=InfoSheets/d2701.html
[420] For apprenticeships see Huebner 2013, 76, cf. 85 For the weaver's own apprentice, see P.Mich. 3.171 from 58 CE.
[421] This calculation was taken from measurements of fine pharaonic linen cloth at the Metropolitan Museum of Art, but given the fine quality and the quantity of the material, I

man's tunic during this period would require about 3 square meters of linen, or around 500 grams. However, to account for a higher rate of personal linen consumption I will go beyond one tunic and double the 500 grams, using the figure of 1 kilogram of linen, or about two tunics.[422] This would mean Egypt as a whole would need 3 million kg of linen to clothe its adult population every year.

Three million kilograms of linen garments needed to clothe the Egyptian population for one year, divided by the amount of linen produced per hectare (3 million kg divided by 400kg/hectare), one would need 7,500 ha. or 75 square km or 27,225 arouras of land,[423] which represents around 0.3-0.4% of Egypt's arable land, using the total figure of 7-9 million arouras suggested by Bagnall.[424] Given that this estimate is quite conservative, even if we double this figure, it would mean that less than 1% of Egypt's arable land would be required to grow the flax for its own internal linen consumption.

Using the totals of garden land associated with twenty-three Mendesian villages preserved in *P.Ryl.* II 216, Dominic Rathbone suggests a range of 550 to 9,000 arourai (1.5 to 25 km^2) of tillable land per village, with an average of 3,500 *arourai* (9.65 km^2) per village.[425] Blouin challenged this number with *P.Oxy.* XLIV 3205, a document dating between 297 and 308 CE in which there are two surveys dealing with the Mendesian nome agricultural land. The first deals with "agricultural land belonging to the Phernouphitēs toparchy; the second with the agricultural land of a Phernouphite village, whose name starts

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was comfortable using this figure for illustrative purposes.
http://www.metmuseum.org/art/collection/search/545138

[422] These measurements of course vary by size, but the figure was calculated from Late Antique burials clothing found in burials from Antinoopolis.
http://www.metmuseum.org/art/collection/search/447845

[423] See Bagnall 2012, 185 for the conversion between kilometers and arouras. 1 square kilometer is equal to 363 arouras. One hectare (10,000 sq.m.) equals 3.63 arouras, so one aroura is equal to 2,756 square meters.

[424] According to the estimates given by Bagnall 1993, 110 the arable land of Egypt was between 7 and 9 million arouras.

[425] Rathbone 1990.

with Ψεν- (Psen-)." According to the data provided by the papyrus, the average tillable land per village is around 1387.83 arouras (15,933 31/32 arouras mentioned divided by the 12 villages known in the toparchy). [426] If these calculations are within reason, and in fact they echoe Bagnall's figure of somewhat over a thousand arouras per village,[427] then, in order to supply the yearly requirement of Egyptian linen for its own population, Egypt would need the arouras of about 1.7 toparchies the size of the Phernouphitēs toparchy.

Another input, raised by Carrié, is of the labor required to make flax usable into linen. He suggests that a shortage of spinners producing the usable thread could act as a bottleneck in the production process.[428] But the assumption that all spinning had to be done within Egypt is not supported by the papyrological evidence. Although dated later, between the sixth and seventh century, CPR 7.60 is a report on transactions regarding the sale of tow, the raw material of flax used both for spinning thread and to make ropes, to be sold in outside markets, a fact made evident by the mention off a storm at sea. The quantities of tow listed are 60 litrai (Roman pounds, so about 19.4 kg), which is not a large number, but also not trivial.[429] This papyrus is important because it attests to the existence of an outside market for tow, something not a priori implausible but for which we only now have evidence. This would mean that even if the quantity of spinners limited the quantity of usable linen thread, the fact that raw material could be shipped and sold would mean that the availability of labor would not have limited the quantity of flax grown, as Carrié suggested.

The calculations above help to give an understanding of the scale of production of which Egypt could theoretically be capable. Of course, there are many assumptions in these calculations, and there is much for which we cannot account, for example the rate of fiber loss between processing stages. But these measurements are guidelines within which we can

[426] Blouin 2014, 122.
[427] Bagnall 1993, 110.
[428] Carrié 2004.
[429] CPR 7.60, pp. 197-199.

contextualize the 1,956 garments from Oxyrhynchus within a wider production of flax in the province. How many of these flax fibers were actually used for linen garments (sails and ropes were also made of flax products) we do not know, but it is clear Egypt had the available arable land to be able to produce more than it needed. The notoriety of certain nome garments, such as Mendesian linen, among other regions of the Delta and the Fayum, can act as evidence that each region was able to produce more than it consumed, and therefore to make a profit from the commercialization of linen.

Conclusions- Egyptian textiles within the Roman Economy

This chapter has differed from the preceding two, mainly in the fact that we cannot obtain a quantifiable dataset for the volume of textiles exported from Egypt, and thus I have relied on descriptions of its impact evident in the literary sources, and assessing the extent to which its land was able to produce the quantity of flax necessary for surplus production. The evidence I have presented in this chapter shows that Egyptian linen trade integrated Egypt into the wider textile markets of the Mediterranean, and it featured in long distance trade routes, imperial fiscal policies on taxation, and in geographical descriptions of Egypt by outsiders, as in the case of Pliny.

The vast quantity of Egypt's arable land and the suitability of parts of it for flax cultivation allowed it to focus its textile production on linen during the Roman period. The marshy lands of the Delta were the ideal environment for the plant to grow, alongside papyrus plants, which produced the papyrus paper for which Egypt was also known. While I have not detailed the structure and composition of the linen industry, since it has been done already by Wipszycka and Droß-Krüpe, the mere existence of such a complex and specialized industry points to the potential revenue linen textiles could produce.

As we have seen from the literary evidence such as the *Periplus Maris Erythraei*, Egyptian fine cloaks and linen garments featured heavily in Sub-Saharan and Indian Ocean trade, while the diversity of the linen industry also mass-produced rougher linen garments which were still highly marketable in the wider Mediterranean markets.[430] The diversification of the industry went beyond just garment production. Tow, the rough fibers of flax, which I have not covered in this chapter, is used to produce the much-needed rope for the shipping industry, and there is papyrological evidence of its desirability in Mediterranean markets, as I presented in the previous section.[431] The shipping industry also needed sails, though it is unclear which material was more commonly used for their manufacture. The only published evidence of a linen sail comes from Thebes in Egypt and is dated between the first century BCE and the first century CE and seem to have been manufactured in Egypt. The sails from the port of Berenike, however, seem to all have been made of cotton and were presumably imported from India.[432]

Since we cannot quantify textile exportation, I employed a simple computational model to show that Egypt had the land and capacity to produce far more than it would have consumed itself. Furthermore, while we know that textiles and particularly linen were exported as woven garments, evidence that the raw material was exported means that labor could be outsourced to the rest of the Roman Empire for the spinning and weaving of the fabric, relieving the pressure on using only a local workforce. As most of the long-distance trade would have been done by sea from Alexandria, and internal transportation on the Nile, this would have substantially lowered transaction costs, and made the shipping of raw material a marketable endeavor, fostering its growth regardless of whether there were enough spinners and weavers to process the flax fibers and produce linen.

[430] Shamir 2013.
[431] See selling of raw flax in CPR 7.60.
[432] For more on sails coming from India in Egypt see Wild 2001.

I believe perhaps the most tangible evidence of the revenues Egypt produced from linen is the desire of the Roman Empire to extract its surplus via the establishment of a linen-specific tax. Local taxes on linen production are known from the Roman period,[433] though a tax of the scale of the *anabolikon* strongly makes the point that the Roman state recognized the strength of this industry and sought to extract part of its production. There is still much to be understood of the *anabolikon* of course, but the fact that the papyrological evidence offers but some glimpses of the tax should not color our understanding of the scale of the linen industry. As Blouin has suggested, the flax production in Egypt during the Hellenistic and Roman periods may have been more important than what is pointed out by the papyrological evidence; for example, the Geniza archive, in the eleventh century CE, mentions twenty-eight different varieties of flax grown in Egypt, more than half of which is associated with a specific region.[434]

It has also been argued by Mayerson and Erdkamp, that the hold the Roman Empire had on Egypt shaped the nature of the agricultural economy, evident by the fact that once Egypt was no longer a province of the Roman Empire and the siphoning off of grain ceased, the economic profile of the agricultural production changed. The documentary evidence, for example in the Geniza archive, seems to point to a textile-based economy. [435] This may be true, but since the type of land used for flax is far less productive for grain, it is far from certain that there was as much true substitutionality as this hypothesis would require, though it remains an interesting research avenue, which could potentially also shed light on the structures of trade and textile markets of Late Antique Egypt. The growth of cotton in

[433] Blouin 2014, 236-237.
[434] Blouin 2014, 238.
[435] Mayerson 1997, 203; Erdkamp, personal communication.

Egypt, particularly during the Fatimid period, also remains an important avenue for further research on this matter.[436]

Now that more evidence continues to be compiled concerning foreign merchants establishing themselves in Egyptian port cities, such as Myos Hormos and Alexandria, and in cities along the Nile, such as Medamoud, near Luxor,[437] it is important to contextualize Egyptian textiles within the wider trade with the Mediterranean and the East, in order to understand the extent to which the industry permeated the Roman textile economy. The scale of the linen industry in Egypt fostered the long-distance trade of the product, reaching international markets and both the lowest and highest economic tiers of the Roman Empire. Its desirability and marketability must have made it a key player in the Mediterranean textile market, fostering economic connections to the rest of the provinces. Perhaps even some of the many foreign coins which entered Egypt in the fourth century were used to purchase linen.

In his 2004 article, Jean-Michel Carrié definitively centralized and called attention to the crucial role textile production and trade played in the Late Antique economy. Citing multiple archaeological data found throughout the Roman Empire, he placed Egypt among the prime examples, and its manufacture of textiles within a wider context.

Federico Morelli in 2004 pointed out that eleven out of the thirty-two sections in the Edict on Prices with which Diocletian attempted to rein in inflation in AD 301 are devoted to textiles and contain dozens of minutely differentiated items. This means that over 45% of the prices listed on the Edict of Maximum Prices are dedicated to textiles.[438] The Roman army was probably the most consistent consumer for textiles in this period, though clothing is

[436] For more bibliography on this later period see Gradel et al. 2012.
[437] For the inscription of foreign women merchants in Medamoud, see specifically Droß-Krüpe 2013., 57.
[438] According to Morelli 2004, 45% of the EMP is dedicated to textiles and points to the army's importance as a bulk market for clothing.

something universally needed, and the demand for it was constant in antiquity, just as it is today. Though the evidence I have presented is limited, it is clear that the trade of Egyptian linen connected Egypt economically to the rest of the Roman Empire, as well as further to the East and to Sub-Saharan Africa. But we can even go further than this: The glimpses we obtain of the scale of Egyptian linen trade within the Roman Empire make it evident that it was one of the biggest economic players in the textile industry in antiquity, for which we unfortunately do not have more specific production and commercial figures.

Epigraphic evidence beyond the Edict of Maximum Prices could also provide an interesting perspective from outside of Egypt. An overview of inscriptions mentioning linen and linen workers throughout the rest of the Roman Empire could provide a preliminary trade network, for example. There is still much to work to be done in understanding the trade of Egyptian linen. Given the nature of the sources, the limited quantification of textiles in archaeological excavations in Egypt, and the poor preservation of textiles in the rest of the Mediterranean, it is clear that a textual analysis and economic models remain the most compelling research avenues.

CHAPTER FIVE

Conclusions

This dissertation has mostly been organized around the diverse types of evidence, including coin manufacture, wine amphorae production, and texts on the trade of flax, to just name a few. Therefore, before I seek to integrate my conclusions into a wider picture of the overall economy of Egypt, I want to briefly recapitulate what the evidence for each data set has provided for the question at the core of this dissertation: what is the extent of economic integration between the province of Egypt and the rest of the Roman Empire during the fourth and fifth centuries CE?

Coins

The numismatic analysis took the form of a study of published coins found in Egypt, either in hoards or as single finds, which were minted during the fourth century CE. This was important to undertake for two main reasons. The first is that the fourth century is the first time in which we can properly study circulation patterns in Egypt, as before 297/298 CE the province had its own closed currency system, and even though it was part of the Roman Empire, exchange of currency was required at the borders in order to make transactions in Egypt. We therefore could not properly measure the influx of foreign coins or trade into Egypt. This also meant, in theory, that coins minted in Alexandria could not be used outside of Egypt, and therefore assessing the level of monetary fluidity between Egypt and the rest of the Roman Empire was not possible. Some Alexandrian tetradrachms have been found in the Danubian provinces, however, indicating that they may have had some exchange value, even if they were traded at a discount, which would ensure they would leave Egypt very rarely.[439]

[439] Christiansen 2003, 43.

The second reason is that a holistic hoard analysis had never been done before. Noeske compiled hoards and analyzed some of the patterns observed in particular ones, such as the numismatic evidence coming from Karanis, but this is the first time all the published data available has been compiled, measuring quantity and percentages of the issues of outside mints for all available material. I hope that I have demonstrated how necessary, possible, and useful this exercise was, as the results yielded from 30,000 published coins belonging to the fourth century were not only interesting, but also opened up new avenues of research.

This chapter raised further questions and research avenues, especially for future analysis of fifth century hoards and coinages, but it also brought to light important aspects of the Egyptian monetary economy which were not quantifiable before. The first and foremost is that we can clearly see an overall *positive balance of trade for Egypt*. The high percentage of outside coins being used within the Egyptian province stands in sharp contrast to an incredibly low usage of Egyptian coinage outside of Egypt. This should be the most salient quantifiable indication that Egypt was acting as a magnet for outside trade. In addition to being cash-positive, Egypt was also simultaneously providing the annual embole, partly through its wheat contribution which went to Rome and Constantinople.[440] I will return to this point further along once we have summarized the evidence from ceramics and textiles.

The hoard analysis has also brought forth interesting chronological issues. As I noted in the beginning of the coinage chapter, the papyrological and the numismatic evidence points to the early 350s, during the reign of Constantius II, as an era of monetary reform. The mint patterns also show this as a marker for integration. During the first half of the fourth

[440] The Justinianic Edict. 13.8 famously reports that the annual wheat export to Constantinople was about 8 million artabas. According to Bagnall 2009, p. 186-187, an artaba is about 38.8 liters; therefore 8 million artabas correspond to 310,400,000 liters, enough to feed 800,000 (assuming one person consumes 10 artabas of wheat per year, which is 388 litres), and this figure represents only the annual wheat export to the capital, not the overall export to other cities and certainly not trade in the market.

century, outside coinages were also being used within the province, but in a lower scale until the 330s. Furthermore, there is evidence even apart from imported coins that the mint of Alexandria was not producing enough coinage for the highly monetized economy. Before the 350s, there is a complete absence of gold coins in the archaeological record and a substantial quantity of bronze coins that had not been officially minted in Alexandria or in other mints: they were cast in clay molds throughout the Egyptian province. The quantity of molds, in the hundreds of thousands, shows that although the practice was in principle banned, as is shown by laws drafted during the 320s forbidding the illegal manufacture of coinage, it was commonplace in Egypt during this period. Furthermore, the presence of these molds near military camps seems to hint at a quasi-official status of these molded coins.

On the other hand, after the 350s, Egypt seems much more integrated into the monetary patterns of the rest of the Empire, and its hoard evidence matches the analyses done for Palestine and Syria, for example. The coins minted after the 350s also stay in circulation for a longer time, showing up even in sixth century hoards, necessitating further analysis to understand the circulation patterns during the late fourth and fifth centuries. Despite the continuing importation of coinage minted in other provinces, then, Egypt after the 350s presents a more normal monetary appearance.

Ceramics

The analysis of the ceramic evidence was done in several stages. I first introduced the issues, limits, and possibilities of ceramic quantification, as well as the advantages of using amphorae as proxies of trade. In the second part of the chapter, I introduced the known amphora production centers in Egypt during the Roman period, with a particular emphasis on the third and fourth centuries, in order to show a view of the wine production landscape starting in the third century CE. The third stage of the chapter looked at the patterns seen in

the relative quantity of imports and exports in ceramic assemblages throughout Egypt. The fourth part of my analysis looked at the published evidence for the distribution of Egyptian amphorae outside of Egypt, first in the regions nearby, such as Aila and the Arabian Peninsula, then in the Eastern Mediterranean, and finally, in the Western provinces and Britain.

Although overviews of Egyptian ceramic production during the Graeco-Roman period have been published,[441] they are mostly focused on typologies and chronology and not on quantifiable ceramic studies. While there is still much to be done regarding quantification, counting and weighing ceramics, which allows the calculation of percentages and relative quantities of certain ceramic wares, has become more common over the last two decades in excavation and publication of archaeological sites in Egypt, and ceramicists have published assemblages from Roman sites throughout Egypt with quantified wares, helpfully distinguishing imported and domestic amphorae. Important sites representing different areas of Egypt provide a geographical diversity that further strengthens the trustworthiness of the unified patterns observed. Marina al-Alamein, Tell el-Makhzan, Alexandrian sites, and Schedia provide us with a glimpse into the Delta and the Mediterranean coast, Coptos gives us quantifiable data from the Nile Valley region, Berenike and Mons Porphyrites represent the Eastern Desert, and Kysis, Amheida, and sites in Bahariya can act as proxies for patterns observed in the oases and the Western Desert. Thus, I have taken advantage of the published (and unpublished in the case of Amheida) quantified ceramics in order to observe an overall pattern of change starting around the third and continuing into the fourth and fifth centuries CE. I have also supplemented this picture with evidence from assemblages that, although they were not quantified, seem to provide a similar pattern to that observed in the quantified

[441] Dixneuf 2011.

assemblages from other sites, confirming that there is a provincial change occurring in the amphora evidence.

The results of the ceramic analysis show that during the third and the first half of the fourth centuries CE, the importation of wine from outside regions declined substantially compared to earlier centuries. During this same period, we can observe an increasing quantity of Egyptian amphora evidence in the ceramic assemblages. Starting in the mid fourth century, importation of wine resumes. The vessels found are mostly amphorae produced in the Eastern Mediterranean region, namely Gaza and Palestine, but these wines have a wide distribution and popularity in Late Antiquity, so the patterns observed in Egypt are fairly normal compared to other provinces.

The diffusion of Egyptian amphorae outside of Egypt, however, looks very different when set beside other provinces. While there is evidence of Egyptian amphorae throughout the Roman Empire, the quantities never exceed more than one or two vessels per site. The only exceptions to this are the ports of Aila and Kane Harbor in Yemen, which show a large percentage of Egyptian amphorae. These last two sites, though, are on the Red Sea trade route, and therefore are more connected to the commercial trends seen on the Red Sea, where Egypt played a large role, than into the Mediterranean network.

We can therefore conclude from the ceramic evidence analyzed so far that Egypt consumed a substantial amount of its own wine during the third and early fourth century CE and, while not reducing domestic production, resumed importations of wine from elsewhere in the East after the mid fourth century. We can also see that Egyptian wine was not consumed widely in large quantities outside its home province, and therefore seems to have represented mostly a local product.

While the Egyptian wine market was perhaps not immensely influential during this period, the ceramic evidence is particularly important for understanding the overall

economy, since it is one of the few types of evidence that we have for observing importations into Egypt. Other kinds of goods which we know were imported seldom survive in the archaeological record, such as wood, luxury textiles such as silk, and spices. Therefore, although limited, the amphora evidence provides information on an aspect of the Egyptian economy we rarely get to see, let alone quantify.

Textiles

In the last main chapter, I presented the evidence available for the production and export trade of Egyptian textiles. Although textiles survive in Egypt, the finds have not been quantified in the past, with the exception of a couple of sites that I presented in the section on cotton, and therefore it is not possible to do a proper quantitative analysis—which would not in any case do much to help us understand the export dimensions of the trade. Furthermore, Egyptian textiles do not survive outside of Egypt so it is also not possible to quantify them in the rest of the Roman Empire, a much more serious loss. What does survive, however, is literary evidence pointing to the economic impact of Egyptian textiles, specifically linen, in the Roman Empire, as well as papyrological evidence attesting to the wide production and variety of textiles manufactured in Egypt. Papyri also provide evidence for the taxation of linen and the extraction of textiles and raw materials by the Roman authorities, hinting at the recognition by the imperial offices of a profitable surplus.

In the first part of the chapter I presented the literary evidence from three major texts: the *Historia Augusta*, Pliny's *Natural History*, and the *Periplus Maris Erythraei*. The second part focused on the papyrological evidence; I presented an overview of the last fifty years of scholarship on the textile industry in Egypt during the Roman period and their contribution to understanding how the textile industry was organized. All of this work points to a complex, large, and highly productive industry. Nonetheless, none of the previous works have focused

on the long-distance trade of Egyptian textiles. I then presented the limited evidence we have for wool and cotton production, which although an integral part of the textile economy, was not comparable in scale to the production of linen during this period.

Also in the section focusing on the papyrological evidence, I have included a discussion of the anabolikon, a Roman and late antique tax on Egyptian linen, and showed how the reestablishment of the tax during the late third century could be seen as a pointer to the scale of production of linen, on which the Roman state wished to capitalize. I then use papyrological evidence to show the high number of garments evident in the papyri, as well as a particular text showing that flax was sold abroad as raw material in large quantities, presumably to make rope or to be spun elsewhere, showing the flexible marketability of the plant. This was particularly important because it challenges the notion that the labor force available within the textile industry in Egypt was a limiting factor to the quantity of flax grown and exported.

In the final part of the chapter, I have carried out a small exercise in modelling of the amount of land needed in Egypt to supply its own population with linen garments. Even under the highest likely consumption rate for a population between 4 and 5 million people, Egypt would be able to supply its own population by using 1% of its arable land. While this figure seems incredibly low, we have to remember how large Egypt is, and the large quantity of arable land it possessed because of the Nile and the Delta, as well as the fact that given the nature of the flax plant, which grows in tight bundles, one can extract a high quantity of raw material per hectare. These numbers are of course hypothetical, and are meant to function more as a guideline for the type of flax output we could potentially expect from Egypt.

In the conclusions of the textile chapter, I already begin to insert Egyptian textile production into the wider pattern of the overall Roman textile market. We cannot quantify the textile industry, but we can see that, as with wheat, Egypt had the capacity to produce far

more than it would have consumed itself. We know its textiles were exported and featured in long-distance trade, and that even raw material could also be exported. The structural capacity was comparable to that of the grain market, but the profitability of the textile production was much higher, and it not only represented a large part of Egypt's connection to the rest of the Empire during the fourth century, it was most likely one of the most important textile industries in the Mediterranean during this time.

Integrating the Evidence for Economic Integration

In light of the evidence I have presented, there are important factors we can observe from Egypt's production and exportation economy, which not only help contextualize it within the larger subject of the Roman economy; they rightly place Egypt at the center of the interconnection of trade in the Roman Mediterranean, and as one of the major facilitators of economic connectivity. Already in the graphs I presented in the second chapter, which relate the percentage of coins found in Egypt coming from each mint to the distance from that city to Egypt in days calculated using ORBIS, we can obtain a view of a close, regional integration in the Eastern Mediterranean. Only the mint of Rome is an outlier to this, which we can assume continued to have a strong economic pull given its large population, its status as an imperial capital, and the trade it attracted through the port of Ostia.[442] Nonetheless, the economic relationship between Egypt and Rome, as seen from the numismatic evidence after 330 CE, when Constantinople became the official capital, remains a topic to be further investigated. The connections to Antioch and the Propontic mints point to a close communication network within the Eastern Mediterranean, undoubtedly influenced by the annona ships, which from 334 CE were now taking grain to Constantinople.[443] Furthermore, by looking at mint patterns from published hoards in Hungary and Croatia, the Macedonian

[442] Noeske 2009.
[443] *C. Th.* 13.5.7.

Diocese, Athens and Corinth, Caesarea Maritima, Jerusalem, and Samaria, we can see one main difference from the picture we obtain from Egypt: Egypt's numismatic patterns show a much more cosmopolitan coinage composition, hinting at a multiplicity and higher scale of trade connections, undoubtedly fostered by highly desired Egyptian products, such as grain, linen, papyrus, and glass.

An inescapable aspect of the subject is the scale of Egypt's economy. With between 7 and 8 million arouras of arable land,[444] the province was able to produce a variety of products, and on a large scale. This point is not new, of course; numerous papyrological studies and discussions of the grain output,[445] some of which deal in-depth with the textile industry,[446] have already stated this fact. The problem is that, given the evidence that survives to the present, we are not able to quantify most of Egypt's surplus products, such as flax and linen, glass, and papyrus paper.[447]

It is in this light that I introduce the evidence gleaned from the analysis of the fourth-century coins found in Egypt. I have shown that a high percentage of outside bronze coinage stays in circulation in the province, and it seems to do so as soon as the currency reform is instituted, though the total quantity of minted coins in circulation, whether Alexandrian or external, during the first half of the fourth century seems small compared to what we find in later periods. While this might be interesting for understanding many aspects of the monetary history of Egypt and may be somewhat deceptive because of the withdrawal of coins from this period from circulation, for now I want to draw attention to what the patterns of outside coinage can tell us about the economic impact of the province.

Because of all of its widely traded exports, Egypt had the capacity to pull a high percentage of non-Alexandrian coins into its regional circulation patterns. The fact that

[444] Bagnall 1993, 110.
[445] Erdkamp 2004; Temin 2012; Bransbourg 2012;
[446] Most recently for Roman Egypt see Droß-Krüpe 2011.
[447] For some discussion on the papyrus industry see Frank 1934, Vol. 2 on Egypt.

bronze coins minted in Alexandria are found in such small numbers in the other provinces I have covered in the coinage chapter should be a further indication of the strength in outside markets of Egypt's exports. The exception to this is, of course, the port site of Caesarea Maritima, whose bronze patterns as we saw contain about 40% of Alexandrian coins.[448] Given that this site was a major port city in close proximity to Egypt, channeling the substantial trade from Palestine and Judaea, such as the Gazan wine in Late Roman Amphorae 4 containers that we find beginning in the middle of the fourth-century, this high figure does not contradict the overall picture of the impact of Egyptian products. In fact, it is through these same mechanisms of trade that strong communication avenues were reinforced, and that foreign bronze coinage entered Egypt.[449] We just do not have the evidence for most of the goods that moved, given the highly perishable nature of the products exported from Egypt.

The quantity of coins and ceramics treated in the preceding chapters, as well as the probable linen output described by the literary and papyrological sources, demonstrate that the commerce and transportation of Egyptian goods must have functioned quite efficiently. Egypt did not only encompass a large territory, the Nile made it a highly productive land, both in terms of agricultural output and of speed of communication. Patrick Reinard's recent study of papyrological letters, *Kommunikation und Ökonomie: Untersuchungen zu den privaten Papyrusbriefen aus dem kaiserzeitlichen Ägypten,*[450] traces the networks of communication within Egypt, showing a high rate of movement of goods throughout the province and a strong reliance on communication. The letters show the

[448] Derose-Evans 2012.
[449] Furthermore, the relatively low level of militarization in Egypt means that the army could not play as big a role as an importer of coins into the province, as it did in the Rhine-Danube region, for instance. Though this point deserves much more analysis, particularly in light of the high quantity of coin mold and "imitation" coinages production in Egypt.
[450] Reinard 2016.

existence of dense networks of communication, aimed at streamlining the acquisition of information, particularly aimed for commerce and travel throughout the province.

The Nile substantially lowered transportation costs, easing speed and connectivity within the province, and made the Egyptian territory not only an efficient producer but also an effective transporter of goods. If we add to this picture the connections offered to the Red Sea and further down into Sub-Saharan Africa, we can start to understand why Egypt was economically a province unlike any other.

The patterns observed from the coinage show that Egypt was much more intimately connected to the commerce in the Mediterranean than we may have thought. While the impact of other industries, such as glass and papyrus, remains to be understood, there is also the question of what the province *did* buy from other regions within the Roman Empire in exchange. Wood, specifically timber, required for high-quality construction, furniture-making, wood panels for art, and the shipping industry, would have been a major imported good, as the land did not lend itself to growing the forests that we can see in Lebanon, for example. We saw in Chapter Three that the wine market, represented by amphorae, had changing patterns of importations, and there were periods such as the third and early fourth century, when Egypt did not seem to be importing many of its liquids and relied on domestic products.

After a hiatus during the third and early fourth century, however, wine (and to some extent olive oil) started to be imported on a larger scale, and in comparable patterns to the rest of the Mediterranean, starting in the mid fourth century.[451] Coincidentally, or not, this is also the period, in which many more coins from throughout the Roman Empire are found in hoards and single finds, and also the period when gold coins specifically begin showing up

[451] Majcherek 2004 offers the best overview and graphs of this change, though the article focuses on the ceramics from Kom el-Dikka. Nonetheless, this may still be indicative of the imports coming into Alexandria.

in the archaeological record. Solidi also start being mentioned in the papyri after the 350s, having been almost absent from the documents before the Constantian reform. At the moment, it remains unclear what exactly events or trends during this time fostered such integration, but the evidence seems to hint that starting around the mid-fourth century Egypt was much more economically integrated into the rest of the Empire than in the first half of the fourth century.

Of course, there is no comparable evidence for the importation of coins before the currency reform instituted by Diocletian, because the closed currency system kept Egypt monetarily fairly isolated, even if not economically separate. Yet, just focusing on the fourth century itself, we can clearly define the 350s as a second period of change after that under Diocletian.

In order to further understand the economic causes of the changes of the 350s we need further analysis not only into more data from fifth and third century Egypt, but also from other provinces, to see if we can detect similar patterns of connectivity to the rest of the Empire. The advantage of using coins and ceramics from Egypt is that, unlike organic material, these are two types of evidence that also survive readily in other provinces, and therefore this dissertation can be followed up with comparative studies, which can begin to provide more pieces of the puzzle to understand the composition and systems on which the Roman Economy relied, from a provincial level.

The necessity for these kinds of analyses has already been stated by historians of the Roman economy.[452] Fortunately, as I have discussed in the first chapter of this dissertation, quantification approaches to the Roman Economy are becoming increasingly more common.[453] Papyrologists were among the first scholars to begin comprehensive, quantified overviews, such as Rathbone and Bagnall have done for the third and fourth

[452] Reinard 2016, 51.
[453] Bowman and Wilson 2007; Andreau 2002.

centuries respectively.[454] More recently the integration of texts and other types of evidence, such as numismatics, has opened up new research avenues and created more complex and nuanced views of monetary history. For example. In November 2015, an international colloquium was organized by Thomas Faucher and hosted by CNRS-Orléans titled "Money Rules! The Monetary Economy of Egypt from the Persians until the Beginning of Islam." The forthcoming proceedings of this conference are cited in this dissertation, particularly in Chapter Two.[455] The colloquium aimed for each period to pair a papyrologist and a numismatist to present a joint paper, in order to answer a particular historical question. For example, Bagnall and Bransbourg presented the papyrological and numismatic evidence arguing for a monetary reform occurring between 351 and 353, as I have discussed in the coinage chapter. The integration of data seen in this dissertation was very much influenced by this colloquium, and it is clear that these types of integrated analyses are the most fruitful research avenues for understanding the ancient economy.

More than one market economy?

In order to explain how I believe the diverse economy of Egypt functioned, I will draw from Jean-Michel Carrié's 2012 model for the Roman Empire. Carrié suggests that rather than thinking of the Empire as a single market economy, it consisted of various connected markets, influencing each other but still maintaining varying degrees of economic separation.[456] While this model would have to be nuanced further depending on industry and region (we have seen the wide geographical impact linen had, for example), I believe it is the most appropriate way in which we can begin to define the nature of the Roman economy.

[454] Bagnall 1993; Rathbone 1991.
[455] Bagnall and Bransbourg, forthcoming; Blouin and Burnett, forthcoming.
[456] Carrié 2012.

The complex and nuanced ecological and economic systems of Egypt, along with advances in Roman technology, allowed its diverse industries to develop to the extent that they did during Late Antiquity. Carrié's 2004 article on the role of textiles in the Late Antique economy rightly uses Egyptian evidence within the wider domain of the economic importance of textile trade. But what is the driving factor behind different types of textiles and other commodities traded? Studying the various markets of spices, luxury products, and other goods makes it clear that they are part of wider Mediterranean economies at play. Textiles, glass and nearly any other kind of industry produced high-quality products in other areas of the Empire, but it was the difference of scale and efficiency that made Egypt such an economic powerhouse for the Roman Empire. The amount of the arable land available for the cultivation of flax and grain and other agricultural products in Egypt is to be matched perhaps nowhere else in the Empire. The surplus generated by Egypt and the exportation of these basic staples of livelihood propelled the easy transportation of other less essential fellow-traveller goods such as cumin, mustard and glass. In the Roman period, the facilitation produced by the movement of the annona to areas in the rest of the Empire perhaps influenced the trade routes for the diffusion of textiles and other products into and out of Egypt, creating a more cohesive, connected Egypt, than we may have imagined.

The centrality of Alexandria in these trade routes cannot be overstated. In the introduction of this thesis I already discussed the central role of Alexandria, which has been a recurring motif throughout the different chapters. A thorough analysis of the economy of the city during the Roman period remains a *desideratum* in modern scholarship. Numerous descriptions of the variety of commercial and economic activities of the city survive in the literary sources, yet there has been little attempt to integrate these with archaeological and papyrological evidence. To my knowledge there is no overall analysis that takes into account its multifaceted economic profile as a producer of glass, textiles, and medicine, as an imperial

mint, and as a major redistributive port connecting the Mediterranean to the Red Sea, India, and Africa, via the Nile and then Trajan's Canal.

My central aim in this dissertation was to assert two points, one methodological and one historical. The first is the need to utilize large data sets available or derivable from the archaeological record; they are our best tools for nuancing the various aspects of the ancient economy.

One of the methodological gains of this dissertation, I believe, is that it provides a more in-depth view of economic integration. Depending on which data sets we focus our historical question on, we obtain a different degree of economic integration and market dependency. The coinage evidence shows a high usage of coins minted outside of Egypt within the province, which implies that the monetary economy might have needed the inflow of these coinages to supply the demand generated by the high monetization level in Egypt.[457] This idea is further reinforced by the evidence from the thousands of coin molds dating to the fourth century which are found throughout the province, showing the need for coinage which the Alexandrian mint was not supplying. At the same time, however, such an inflow of coins would have been difficult to achieve were it not for a substantial, on-going trade surplus with other provinces.

The evidence obtained from the ceramics, however, shows a higher degree of integration in the wine market beginning only after the 350s. The evidence from the third and the beginning of fourth century seems to imply that Egypt did not depend on outside markets to supply its wine or, presumably, olive oil. The evidence for the textile market, on the other hand, while not quantifiable, shows consistently throughout the Roman period a high trade,

[457] A conclusion first reached by Rathbone for the third century. See Rathbone 1991, concluding chapter.

specialization, usage,[458] and economic impact[459] of Egyptian linen in the Mediterranean and Sub-Saharan Africa,[460] undoubtedly representing one of the products which gave Egypt enough economic power to attract the high level of commerce the fourth-century coinage evidence seems to indicate.

Coins and ceramics not only should be quantified, but they should be integrated with each other in a larger narrative. Using multiple micro-economic and industry-specific analyses is the most solid way to build a more accurate and larger macro view of the economy. If enough regional studies like this are undertaken, an economic overview of the Roman Empire during a particular period is not only feasible, it will accurately show regional and commercial differences. Of course, as always, quantified data is not straightforward; it presents a lot of challenges and requires substantial levels of interpretation. But I believe quantified data is one of the best options we have at the present for exploring questions of market and economic integration. A further advantage, but also challenge, of using these quantification methods is that they naturally necessitate more thorough excavation and documentation methods, which means that, if these sorts of important questions are kept in mind when archaeological excavations are undertaken, the type of data extracted can be analyzed and stored in databases in ways that allow future historians to utilize different methods for analysis.

The second point I will briefly reiterate is a historical one. The goal of this dissertation was not only to insert Egypt more prominently into discussions of the Roman Economy, but also, and more importantly, to begin to place it front and center as the most economically influential province of the Roman Empire. As I have stated throughout this

[458] See section on Pliny the Elder's comments on profit extracted from Egyptian linen as well as different regional specialization.
[459] *Historia Augusta, Divus Gallienus*, and also see the section on the Anabolikon tax in Chapter Four.
[460] As seen throughout the *Periplus Maris Erythraei,* see the section on this text in Chapter Four.

dissertation and in this concluding chapter, many more studies are needed in order to obtain a better view of the periods before and after the fourth century, as well as in other regions of the Empire, for a more thorough comparative approach.

Evidently, Egypt was a main supplier of staple goods of the Roman Empire, not only for grain but also for linen and other luxury textiles such as cotton, which means that the highest offices of the Empire closely assessed its land and production output.[461] The province also acted as a conduit and distributor of luxury products such as silk and spices, meaning that trade routes were closely patrolled and borders carefully controlled, to make sure that the high taxes on the enormous value of the eastern trade were collected. We must not forget as well the role of the quarries in the Eastern Desert, which we know provided granite and porphyry to Rome itself. This turned Egypt into a highly transited province, and the flow of goods meant that other industries benefitted from its connectivity and were closely watched and assessed as well. Therefore, understanding the nature of the control the Roman state exerted over the industries of Egypt can answer questions pertaining to the nature of Roman administration over its most economically important province.

For now, the picture I have drawn from coins, ceramics, and textiles seems to indicate the following: the immense economic output of its diverse agricultural economy, the cohesion of communication that the Nile provided throughout the land, and the role the province played in connecting the rest of the Roman Empire to Sub-Saharan Africa, India, and the lands in between, characterize Egypt as perhaps the most economically potent province of the Roman world.

[461] Bagnall 2014, 209-218.

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