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The Smiths at Pylos: Putting the Jn Series in Context

MA Dissertation

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Introduction

With over 1200 Linear B tablets and fragments excavated, Pylos in Western Messenia has so far proven to hold the largest surviving corpus of Linear B tablets discovered. With the majority of the tablets dated to the final destruction of the palace, the tablets illuminate a final period of the palatial administration through a diverse series of documents (Nakassis 2013, 22). The majority of these documents, at least 767, were found in the Archives Complex in the Southwest corner of the palace. Here, among tablets concerning agricultural and industrial production and manpower, the Jn series recording the elements of cupreous metal production which interested the palace was found (Palaima & Wright 1985, 258). These twenty main tablets and associated fragments, as the "most comprehensive Mycenaean palatial records dealing with copper, bronze, and smiths," provide important insight into the economic and social systems surrounding the metalworking industry at Pylos, and access to and use of bronze in the eponymous Bronze Age in the Pylian kingdom (Smith 1993, 167). This dissertation seeks to review the evidence presented in the texts, evaluating the information from a number of perspectives before combining the different lenses of interpretation which may work to bolster the current understanding of the Mycenaean economy and the use of bronze in particular as it relates to the *ta-ra-si-ja* system and the textile industry, or instead provide a new understanding of these elements.

Chapter 1 will first focus on the physical documents themselves. The very existence of these texts already provides insight into the administrative system governing the industry, and the chapter will introduce the epigraphic and archaeological context of the tablets themselves for any administrative details and as a basis for approaching the actual information which the documents contain. This will include problems present in interpreting the texts which may be answered by other tablets or evidence in later chapters. Chapter 2 will consider the information held in the documents in the context of the palatial *ta-ra-si-ja* system, particularly the textile industry, in which the system is most well-attested, whereby the palace is supposed to have regulated the distribution

of raw materials in exchange for finished goods. Chapter 3 will look beyond the palace to the individual, confronting the prosopography conducted of the Jn and other series in the Pylos archives in order to better discern the roles of the smiths in Mycenaean society and learn more about actors outside of the palatial administration. In Chapter 4, space will be given to the search for archaeological evidence in Pylos and the territory of the Pylian Kingdom that supports the textual evidence for bronzeworking and the palatial industry. All of these different interpretations will be discussed together in the conclusion, Chapter 5. This approach seeks to take a view of the bronze industry that narrows from wider perspectives to very basic questions, seeking answers from the broadest picture of the palatial economy, to the more nuanced details of the smiths' lives, and down to the very existence of the bronze which underpins the current understanding of the texts. Prior work in this field which has been based on the comparisons of the bronze industry as recorded in the Jn series with the *ta-ra-si-ja* of the textile industry has led to more generalized conclusions and disagreements, including highly divergent opinions concerning the associated archaeological evidence. This work is intended to better integrate the evidence the tablets provide with the palatial administration of the *ta-ra-si-ja* system, reconciling the peculiarities of this evidence with the better-known instances of *ta-ra-si-ja* and the archaeological record.

Chapter 1: Document Context, Epigraphy, and Administration

In primary document analysis, the context of the document must first be confronted. In studies of Linear B, work surrounding the research of the physical documents, the archaeological context, and the scribes who created them provides important insight into palatial administration before the more detailed analysis of the information held within the text itself. The palaeographical studies, still so insightful in the modern interpretation of the tablets, began even before the actual decipherment of Linear B in the 1950's (Palaima 2011, 35). This first chapter will discuss these considerations of the Jn series as the first step in gaining a better understanding of the bronze and

copper industry at Pylos and the palatial administration of it. This chapter will describe some of the larger problems in interpreting the texts alone. However, answers found in either larger textual studies or studies of the archaeological record will be confronted in later chapters.

The destruction horizon containing the majority of the tablets at Pylos is generally agreed to be dated to the end of the palace in LHIIIB-C transitional period, and this includes the Archives Complex in which the Jn series tablets were found (Driessen 2008, 73; Palaima & Wright 1985, 257; Smith 1993, 171). The Archives Complex consisted of Rooms 7 and 8 in the palace, containing a diverse collection of 767 tablets, with the majority taking the form of the longer page-shaped tablet form rather than the leaf-shaped tablets typical in other parts of the palace (Palaima & Wright 1985, 258). While the archival designation might be construed as meaning long-term storage, the rooms did not have the space necessary for filing large numbers of tablets, and were likely an "active center for processing records," which included the consolidation of records in newly-delivered tablets in Room 7 into longer records meant for administrative or longer use in Room 8 (Palaima & Wright 1985, 259-261). Long-term, in this case at the Archives Complex, only extends the length of the single year or phase of administrative activity (Bennet 2001, 29). Superseded records in Room 7 or records stored in Room 8 that were no longer relevant to the administrative year could then be recycled (Bennet 2001, 27; Palaima & Wright 1985, 261). While this may be a relatively short period of recorded activity, important studies have been conducted in the chronological ordering of the tablets within the administrative phase as they were received and created in the Archives Complex (Palaima 1995).

In the palace's destruction, the dried-clay tablets stored in the delivery baskets, storage boxes, and on Room 8's archival shelves were fired and sealed within the Archives Complex (Palaima & Wright 1985, 257). Estimates for the amount of Jn tablets preserved in the fire out of the total present at the time of destruction range from 75% to near-100% (Ventris and Chadwick 1956, 356; Lang 1966, 406; Smith 1993, 172). The meticulous excavations in 1939 that revealed the

tablets were not the first intrusion into the rooms since their destruction, with stone robbers removing the surrounding walls and leaving a large "Chasm" of disturbed soil in their place (Blegen & Rawson 1966, 96). Fragments of the Jn tablets were found within both Rooms 7 and 8 and the Chasm, leading to the first potential distinction with which to group the tablets: those found in the apparent processing area of Room 7 or within its vicinity in the Chasm, and those found in Room 8, for finished tablets. Some of these distinctions in precise location will be discussed further below as specific tablets are confronted. All of the Jn tablets and lone fragments found take the form of page-shaped tablets (Smith 1993, 168).

After discussing the rooms in which the tablets were found, attention can now be given to hands which made them. Eighteen of the tablets were written by Hand 2, with two written by Hand 21, leading to another important distinction when grouping the tablets and building an understanding of their place in the administrative system. Besides the Jn tablets, Hand 2 is considered to have written some of the most important texts at Pylos. Hand 2's work can be found on tablets included in the Ma, Mn, Ta, Fr, and Wr series (Palaima & Wright 1985, 259; Palaima 2011, 70). Hand 21's work is similarly extensive, reaching tablets in the Aq, Ab, Cc, and Cn series (Palaima & Wright 1985, 259). While these two scribes are among only 18 attested in the Archives Complex tablets, Hand 2 is considered to have been particularly active and important, working closely with Hand 1, the "master scribe" (Palaima 2011, 70). See Table 1 in appendix for list of Jn tablets and other series by Hands 2 and 21.

Before discussing the format and contents of the Jn tablets created by Hands 2 and 21, it is first necessary to confront the linguistic debate surrounding some of the terms which underpin the identification of the series as that dealing with bronzesmiths. *Ka-ke-u* (*ka-ke-we* in nom. pl. form) was originally identified as the later Greek term *χαλκεύς*, defined as a 'smith' or 'bronze smith' and this identification is still accepted today (Ventris & Chadwick 1956, 22; Smith 1993, 172). The related word appearing in the Linear B texts, *ka-ko*, or χαλκός, is where arguments over definitions

begin. The modern term holds ambiguity in that it can refer to either copper or bronze, extending to ambiguity in the term's use in the Linear B texts (Smith 1993, 172). This has led to interpretations based solely on the context of the terms in the text, or combined with archaeological evidence. The original textual interpretation of *ka-ko* as used in the Jn tablets was bronze, and this extended to the ideogram frequently seen in the same series: AES (**140*), based on their association with objects more likely to be made of bronze, and the symbolism of AES itself as a finished bronze axe (Ventris & Chadwick 1956, 351; Michailidou 2008, 523). This has been observed to be an example of "an assumption automatically gaining validity and becoming fact" (Gillis 1997, 506). However, this definition of *ka-ko* as bronze has been supported over the years by the use of negative evidence in reference to copper and tin. The argument in support of this definition posits that if *ka-ko* were to instead be a reference to pure copper, the administrative records would also contain references to tin so as to track all of the materials necessary to produce the final bronze alloy. As yet, a term in Linear B for tin has not been agreed upon. The proposal of *ka-te-ro,* found in a single entry in KN Og 5515 + 5518 + 5539 at Knososs, as the possible *κασσίτερος* term for tin has been described variously as "potential" and "dubious" (Smith 1993, 173; Michailidou 2001, 87).

Regardless of the notable dearth of entries for tin, a new consensus is growing around the use of *ka-ko* in the Linear B records. Much as the modern χαλκός acts as a generic term for a cupreous metal, either pure copper or its alloy bronze, *ka-ko* could similarly take the form of either copper or an alloy in the Linear B records (Smith 1993, 173-174; Michailidou 2008, 524-528; Gillis 1997, 506). Such ambiguity extends to AES (**140*)'s modification of **167*, the oxhide ingot, in the records at Knossos. This presents difficulties when confronting the texts alone, but context provided by the archaeological record in Chapter 4 may provide a better estimation of what *ka-ko* constituted in the Jn series.

Eighteen of the Jn tablets are deemed "allotment tablets," holding entries concerning AES (**140*), *ka-ke-we*, and *ta-ra-si-ja*. Sixteen of these allotment tablets are attributed to Hand 2, and

two are attributed to Hand 21 (Smith 1993, 180). The allotment tablets of both hands follow a "formula" in the entries in which great care is taken to avoid deviations from the format in certain elements (Smith 1993, 180; Lang 1966, 402; Ventris & Chadwick 1956, 352). All of the allotment tablets begin with a place name followed by the phrase *ka-ke-we ta-ra-si-ja e-ko-te*: smiths having an allotment. This is followed by a list of specific smith names and an amount of AES (**140*), ranging from M 1 N 2 to M 8. M and N (**117* and **116*) have been determined to measure approximately 1,000 grams and 250 grams, respectively (Michailidou 2001, 87). On tablets Jn 431, Jn 601, and Jn 845, this first paragraph ends with an entry mentioning a *qa-si-re-u*, or *g^{w}asileus* (Smith 1993, 182). The full implications of their presence will be discussed in Chapter 2.

Just as every allotment tablet contains an entry concerning smiths with a *ta-ra-si-ja*, the second entry on the majority of the tablets concerns smiths who are *a-ta-ra-si-jo*, or without an allotment (Smith 1993, 181).

On eleven of the tablets, *to-so-de ka-ko* AES (**140*) provides a total allotted to the smiths between the *ta-ra-si-ja* and *a-ta-ra-si-jo* entries. It was first suggested that the totaling lines were omitted on the other allotment tablets so as to allow for the inclusion of the entry concerning the smiths without an allotment within the same tablet (Lang 1966, 402). However, later proposals draw attention to the amounts enumerated in the totaling lines. Smith classifies the totals into two categories: totals at or above M 26, and those equaling M12 (1993, 182). Also notable is that a number of the totaling lines do not match the actual totals of the allotments as listed (Smith 1993, 190). Further adding to these totaling discrepancies is the presence of *e-pi-da-to* metal, defined as 'distributed' and considered here to mean yet to be allotted, on two tablets: Jn 601 and Jn 389 (Smith 1993, 190). See Table 2 for list of tablets with totaling lines. The census of smiths having *ta-ra-si-ja* and *a-ta-ra-si-jo* are common to almost all of the allotment tablets and appear to be the core concern. Jn 845 provides an example of all of the attributes of the allotment tablets so far mentioned:

PY Jn 845 **(S310 H2)**

.1]ḳạ-ḳẹ-we , ta-ra-si-ja , e-ko-te
.2 ṗọ-ru-qo-ta AES M 1 N 2 sa-ri-qo-ro AES M 1 N 2
.3 pu-ke-se-ro AES M 1 N 2 re-qo-we AES M 1 N 2
.4 qe-ta-ra-je-u AES M 1 N 2 du-re-u AES M 1 N 2
.5 a-pa-je-u AES M 1 N 2 pa-pa-ra-ko AES M 1 N 2
.6 *vacat*
.7 e-ri-ko-wo , qa-si-re-u 1
.8 to-so-de , ka-ko AES M 12
.9 *vacat*
.10 to-so-de , a-ta-ra-si-jo
.11 po-so-ro 1 na-pu-ti-jo 1 ma-ta-ko 1
.12 ku-ke-re-u 1 a-ti-ja-wo 1 wa-ra-ko-no 1
.13 qe-re-me-ne-u 1

The totaling line is particularly important on a tablet like Jn 725, in which the individual *ta-ra-si-ja* allotments are listed simply as "1" for each of the smiths, an unusual format in the series (Montecchi 2012, 188). This is construed to have meant that the set amount in the totaling line was divided equally among the listed smiths, for a calculated allotment of M 3 each (Smith 1993, 195).

PY Jn 725 **(S310 H2)**

.1 e-ni-pa-te-ṿẹ⌊ ⌋ka-ke-we , ta-ra-si-ja , e-ko-te
.2 te-pe 1 pa-qo-ta[1]e-ka-no 1 au-ta-mo 1
.3 we-we-si-jo 1 pe-re-qo-no 1 ti-ri-[•] ḷ[ ]ḳọ-no 1
.4 ma-ka-ta 1 o-na-se-u 1 wi-jo-ro-jo 1
.5 wa-tu-ta 1 o-tu-wo-we 1 po-ro-ko 1 po-ro-u-jo 1
.6 pe-re-ta 1 o-wo-ta 1 o-pe-ra-no 1 o-ru-we-ro 1
.7 a-tu-ko 1 re-u-ka-ta 1 o-wa-ko 1 wo-wi-ja̩-ta 1
.8 ko-ma-do-ro 1 *po-so-ra-ko 1* wa-ti-ko-ro 1 i-*65-qe 1
.9 *vacat*
.10 to-so-de] , ka-ko AES L 2 M 18
.11]*vacat*

.12 *vacat*

.13 *vacat*

.14]-nu-we-jo , a-pi-jo 1 AES M 5 ne-qe-u AES M 3

.15]ne-u AES M 1[ ]e-u-me-ne AES M 3

.16 e-ru-ta-jo AES M 4

.17 *vacat*

.18 *vacat*

.19 *vacat*

.20 *vacat*

.21 *vacat*

.22 *vacat* [ ]*vacat*

.23 a-ke-re-wa , ka-ke-we , e-u-ko-me-no 1[ ] *vacat*

.24 di-nu-wa-ta 1 wa-du-ri-jo 1 o-wi-da 1 [

.25 to-so-de , ka-ko AṆEṢ M 12 [

.26 *vacat* [

Secondary entries present on some tablets list a class which *never receives allotments* in the extant series: *do-e-ro, /dohelos/*, Classical *δοῦλος*, or 'slave' (Ventris & Chadwick 1956, 123). The term appears in a number of series at Pylos and Knossos, with a large number appearing in the PY E-series (Efkleidou 2004, 76). The *do-e-ro* in the Jn series are always listed by the name of another man in the genitive, which has been taken to mean that this individual is the *do-e-ro*'s master and support their designation as slaves, but their mention in the context of bronzesmiths may indicate special skills or a different status for the *do-e-ro* in this context (Efkleidou 2004, 110; Smith 1993, 183). A second group with special designation are the *ka-ke-we po-ti-ni-ja-we-jo*, whose allotments follow the same formula as the other *ka-ke-we*, regardless of their association with the goddess they are purportedly serving (Smith 1993, 184). See Table 3 for lists of tablets with secondary entries.

Two tablets, Jn 750 and Jn 832, hold unique modifiers of *a-ke-te-re* and *pa-ra-ke-te-e-we* in the headings to describe the nature of the work assigned. Without mention of AES (**140*) or *ta-ra-si-ja* in Jn 832, the *a-ke-te-re*, or "finishers" are simply listed with a "1" (Smith 1993, 201). Smiths

in the entry below are still designated as *a-ta-ra-si-jo* in the same tablet. In Jn 750, *pa-ra-ke-te-e-we* modifies the standard *ta-ra-si-ja* header. This term has been variously defined as an "active smith" or as a "helmet-maker." These smiths receive AES (**140*) allotments, as does the sole smith with the same descriptor in Jn 831 (Smith 1993, 201).

Tablets Jn 658 and Jn 706, the only two by Hand 21, are notable first for the use of *e-ko-si* rather than the *e-ko-te* used in assigning allotments in the other tablets (Lang 1966, 412). More conspicuous is the similarity between many entries in Jn 658 and Hand 2's Jn 725 (Lang 1966, 407; Smith 1993, 204). Unlike many of Hand 2's tablets which were found in or near Room 8, fragments of Hand 21's tablets were found securely in Room 7, the alleged processing room of the Archives Complex (Smith 1993, 203). Each of the allotments in Jn 658 are for M 5, while the allotments in Jn 725 to the same names, although not written explicitly, are calculated to be M 3 based on the totaling line. This led first to the proposal that Jn 658 served as an interim record, setting aside future allotments with the deliberate use of the term *e-ko-si* (Lang 1966, 412). After the allotments were set aside, new information arose which led to a final allotment list in Jn 725 (Lang 1966, 412). While some studies have proposed that Jn 725 preceded Jn 658, Hand 2's activities, particularly those intertwined with supervisory Hand 1, make it likely that Jn 658 and Jn 725 were in fact interim records later absorbed into Hand 2's work (Smith 1993, 204).

It is at this point that brief attention must be paid to the non-Jn tablet attributed to Hand 2 which has been used in the prior calculations of tablet survival rates and other economic details of the bronze industry and smiths.

PY Ja 749 **(S310 H2)**

to-so-pa L 34 M 26

The single entry in the complete, leaf-shaped tablet holds a total of M 1046, or at least 1,046 kg The entry does not contain any indication as to what commodity the total is referring to, but it has long been proposed that the amount is not only referring to *ka-ko*, but referring specifically to

the total amount allocated in the Jn series (Ventris & Chadwick 1956, 365; Killen 2015b, 815; Nosch 2006, 163). This leaves a discrepancy between the total amount of *ka-ko* found in the Jn tablets, estimated to be at least 600 kg, and the amount found in Ja 749 (Killen 2015b, 815). It was based on this discrepancy that calculations were first made in regard to the survival rate of the Jn tablets as a series, as mentioned above. This has been taken further in work based on average allotments to calculate, if Jn tablets are indeed missing, how many total smiths fell under the *ta-ra-si-ja* system beyond those listed in the surviving tablets (Killen 2015b, 815). The simplest argument against this is the most obvious, that neither AES (**140*) nor *ka-ko* are mentioned on this totaling tablet (Smith 1993, 172). Further issues arising from the methodologies surrounding the use of Ja 749 in the context of the Jn series will be mentioned further in the discussion.

Two tablets attributed to Hand 2 are known as the "collection tablets" and deal with terms such as *do-so-si* and *ka-ko na-wi-jo* without mention of *ta-ra-si-ja,* and take a considerably different format. The most complete tablet, Jn 829, describes future offerings of *ka-ko na-wi-jo* in a list of place names followed by AES (**140*) offerings by officials with titles of *ko-re-te* and *po-ro-ko-re-te* (Smith 1993, 209). The majority of the offerings by the *ko-re-te* and *po-ro-ko-re-te* are of the same standard weight.

PY Jn 829 **(2)**

.1 jo-do-so-si , ko-re-te-re , du-ma-te-qe ,

.a -e-we-qe

.2 po-ro-ko-re-te-re-qe , ka-ra-wi-po-ro-qe , o-pi-su-ko-qe , o-pi-ka-pe-

.3 ka-ko , na-wi-jo , pa-ta-jo-i-qe , e-ke-si-qe , a3-ka-sa-ma

.4 pi-*82 , ko-re-te , AES M 2 po-ro-ko-re-te AES N 3

.5 me-ta-pa , ko-re-te AES M 2 po-ro-ko-re-te AES N 3[ ] *vacat*

.6 pe-to-no , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.7 pa-ki-ja-pi , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.8 a-pu2-we , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.9 ą-ke-re-wa , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.10 ṛọ-ụ-so , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.11 ḳạ-ra-do-ro , ko-re-te AES M 2 po-ro-ko-re-te AES N 3̣

.12 ri-]jọ , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.13 ṭị-mi-to-a-ke-e , ko-re-te AES M 2 po-ro-ko-re-te AES N 3

.14 ra-]wa-ra-ta2 , ko-re-te AES M 2 N 3 po-ro-ko-re-te AES N 3

.15 sa-]ma-ra , ko-re-te AES M 3 N 3 po-ro-ko-re-te N 3

.16 a-si-ja-ti-ja⌊ ⌋ḳọ-re-te AES M 2 po-ro-ko-re-te N 3

.17 e-ra-te-re-wa-pi , ko-re-te AES M 2 po-ro-ko-re-te N 3

.18 za-ma-e-wi-ja ., ḳọ-re-te AES M 3 N 3̣ po-ro-ko-re-te N 3

.19 e-re-i , ko-re-te AES M 3 N 3̣ po-ro-ko-re-te N 3

.20 *vacat*

.21 *vacat*

.22 *vacat*

Jn 881+896 is fragmentary, but appears to include five offerings of AES (**140*), with only two of the same weights. Just as debate surrounds the simple term of *ka-ko*, there are two main proposals for the definition of *ka-ko na-wi-jo* which have been supported over the years. The first proposal connects the term to the sea, first as bronze meant for ship construction and in a later interpretation: copper coming by ship (Ventris & Chadwick 1956, 357; Gillis 1997, 508; Michailidou 2008, 526). The more accepted interpretation is that of "temple bronze" (Ventris & Chadwick 1956, 357; Smith 1993, 205). Much like the original *ka-ko*, answers to the *ka-ko na-wi-ja* debate will be confronted further in this paper with regards to the *ta-ra-si-ja* system and archaeological evidence.

After these broader classifications of the tablets based on the attributable scribes and basic "allotment" versus "collection," work combining the numerical and geographical attributes led first to the proposal that *ka-ko* allotments were doled out in M 108 installments, and that the records were organized to reflect as such (Lang 1966, 400; Ventris & Chadwick 1956, 355). This was based on the totals of M 108 found on tablets Jn 601 and Jn 725, smaller totals on other tablets appearing

to be fractions of M 108, and the ability to add some of these fractional tablet totals, based on epigraphic evidence, for group totals of M 108 (Lang 1966, 399). Lang referred to these M 108 assignments as "corporations," and proposed the potential for geographic proximity within these "corporations." The separation of the same place names between tablets and, in turn, the "corporations" was explained as the outcome of listing so many locations within geographic proximity. Taking this M 108 standard further, Lang grouped disparate tablets with little geographic certainty into a fifth "corporation" (1966, 405).

Smith first, based on the aforementioned totaling lines at or above M 26, brought the unit of central measure down from M 108 to M 26 and M 12. Further epigraphic and archaeological analysis led to Smith's groupings of eight allotment tablets, all found in Room 8, into a "Group A" which was further divided by geographic considerations (1993, 191). Smith's "Group B" concerns tablets found in Room 7, which contain totaling amounts centered around a standard of M 12, rather than M 26. The link between Jn 750 and Jn 832 based on their special content concerning *a-ke-te-re* and *pa-ra-ke-te-e-we* was further strengthened by the proposal that Jn 750 was written on a portion of clay cut from Jn 832 (Smith 1993, 199). An important note to make about Smith's tablet groupings is some of the limits it may enumerate in the available data. With certain tablets by Hand 2 and both tablets Hand 21 considered superseded by later tablets in the series, this brings down the total number of tablets which might be used to render a detailed picture of the palatial administration of the industry. This also points out the potential redundancies which, when used in the calculations mentioned earlier concerning how much of the Jn series survived, present flaws in these original tabulations. Beyond the original calculations of the tablet survival rate, this also may affect earlier conclusions drawn about the industry itself and provides a new formulation of data which can be used in economic discussions. The administrative implications of these groupings will be discussed below, as the paper now turns to the information contained within the tablets and the economic context.

Chapter 2: The Palatial Economy and *ta-ra-si-ja*

With the context of the documents discussed in the previous chapter, this discussion will now confront the content of the documents and the information that has been proposed by past scholarship to fit into the current understanding of the *ta-ra-si-ja* system as it is attested in other documents. *Ta-ra-si-ja* was originally identified as *ταλασία* "an amount allocated by weight for processing," derived from *τάλαντον* for "weight" (Ventris and Chadwick 1956, 352). The Classical use of the term was specifically related to textile production (Nosch 2000, 43). This Classical association with textiles appears to have held true in the earlier Mycenaean context, as *ta-ra-si-ja* can be found on tablets related to the textile industries at Mycenae, Pylos and Knossos (Nosch 2006, 175). However, the term has also been found in a broader array of economic endeavors: on a tablet concerning wheel-making at Knossos and, of course, in the Jn series (Killen 2015b, 801). This definition of *ταλασία,* combined with its context in the Linear B tablets, has led to the understanding that this Mycenaean palatial system concerned craft production through the provision of raw materials in exchange for finished goods. No records suggest that the *ta-ra-si-ja* system was involved in food production or the broader "subsistence economy" (Nosch 2006, 162). Further, the system is proposed to follow a model of decentralized production using a large workforce, intermediaries acting between the palatial administration and the workforce, and "an elaborate mechanism whereby the (typically very small) amounts of raw material allocated to each of the many workers in the industry were weighed and recorded: a system designed to ensure that what had been issued to each worker was returned to the center" (Killen 2015b, 817). Importantly, Killen notes that this system was imposed over industries over which the palace would not otherwise have full control (2015b, 817). This chapter will consider the industries in which *ta-ra-si-ja* is most directly and heavily attested, along with what might be termed intermediate tablets which have been strongly correlated to the production cycle.

The tablets at Knossos concerning the textile industry provide the most thorough picture of the *ta-ra-si-ja* system and its cycle. Textile production through *ta-ra-si-ja* at Knossos was aligned into three administrative stages by Killen, represented through three tablet series (Killen 2015b, 804). In the Lc(1) series, which explicitly mentions *ta-ra-si-ja*, "production targets" are set for quantities of textiles to be produced by specific work groups. These workers are designated by an ethnic title, by their occupation, or by their status as a "collector group" (Firth and Nosch 2003, 127). The broadest distinction of textiles produced in the Lc(1) series of concern in this paper is that between *pa-we-a ko-u-ra* TELA (alternatively TELA+*PA*) and TELA+*TE* (Killen 2015c, 222). A number of these units is seemingly assigned to a work group, followed by a number of LANA units, the amount of raw wool required to produce the textile (Killen 2015a, 185).

KN Lc(1) 526 **(H103)**

.A] 'pe-ko-to' TELA;1+TE 1̣0 TELA;2+TE 14[

.B]ḍạ-wi-ja / tu-na-no TELA;1 3 LANA[

These assignments of raw materials appear to follow explicit ratios, with 7 units of LANA required to produce 1 unit of TELA+*TE* and 1.5 units of LANA required to produce 1 unit of TELA (Killen 2015b, 804; Killen 2015a, 184). After this *ta-ra-si-ja* assignment, the Od(1) tablets record the actual provision of the raw wool to named individuals at workshops in ratios consistent with those in the Lc(1) records (Killen 2015b, 804).

KN Od(1) 562 **(H103)**

.1]ọ-pi , no-nu-we , 'a-ti-pa-mo' pe-re LANA 91

.2]si-da-jo , pe-re 'po-ro-to' LANA 42

.3 a-po-te , pe-re LANA 69

The link between the Od(1) and Lc(1) has existed from the beginning by the attribution of both sets to a single Hand, 103 at Knossos (Firth & Nosch 2002, 126). However, this has also been seen as a difficulty in classifying and analyzing the Od(1) series. The tablets it contains are generally disparate in their contents, and were grouped together as a series due to their mentions of

wool and having the same author. Further epigraphic work has allowed for some confirmation of the tablets' association and the classification of sub-groups within the series (Firth & Nosch 2002).

The third and final step, after the textile production, is the receipt of the final product and this appears to be recorded differently according to the aforementioned distinction in textile type. In the Ld(1) series, where *ta-ra-si-ja* is not specified in the extant records, the tablets record the receipt of finished *pa-we-a ko-u-ra* TELA. While not sharing the term *ta-ra-si-ja* with Lc(1), it does share the *pa-we-a ko-u-ra* TELA entries with Lc(1) and holds terms related to entries in the Od(1) series as well (Killen 2015c, 233).

KN Ld(1) 575 + 580 **(H116)**

.a ẹ-qẹ-si-ja

.b pa-we-a , / pa-ra-ku-ja TELA;1 30 *158

Separate from the Ld(1) series, the Le series records the delivery of the TELA+*TE* produced by the work groups who are assigned such work in the Lc(1) series, and includes explicit mentions of *ta-ra-si-ja*.

KN Le 642 + 5950 **(H103)**

.1]ra-wo , de-ko-to 'ṭạ-ra-si-ja' ne[

.2]ja TELA;1+TE 2 ri-jo-ni-ja TELA;1+TE[

.3]ri-jo TELA;1+TE 6 da-mo-ko[

.4] *vacat* [

Both the Lc(1) and Ld(1) series include what appear to be totaling tablets which, while not matching exactly, are close enough to be considered "reconcilable" (Killen 2015c, 221-222; Nosch 2000, 52). It has been proposed that, at least for the Lc(1) series, the *totaling tablets* like Lc(1) 535 and Lc(1) 536 actually represented the first assignment of the *ta-ra-si-ja* textile production (Nosch 2011, 496). In the proposed "top-down" approach, the total target would first be set, which included planned ratios between simpler textile products and those requiring more raw material. The specific assignments would then be made, based on these totals, to the designated work groups. Even more

administrative calculations may have followed this, as it is further suggested that a link exists between the target number of textiles assigned and the number of workers in the assigned work group (Nosch 2011, 500-501). This could illustrate that after the total targets and necessary raw materials were calculated, some textile manufacturing was assigned to work groups on a specific product to worker ratio, in a number of cases as a ratio of 1:1.

Confronting the industry with the smallest amount of direct evidence, So(2) 4442 at Knossos concerns the production of chariot-wheels and can be considered a record dealing with the third stage of production seen in the Ld(1) and Le series:

KN So(2) 4442 **(H131)**
.a [ ] o-pe-ro ,
[b] se-to[-i]-ja , / a-mo-te , pe-ru-si-nwa , / ta-ra-si-ja ROTA .ZE. 1

However, unlike the Ld(1) and Le tablets, So(2) 4442 illustrates a record in which the assigned production targets were not met. The tablet concerns the missed production of chariot-wheels qualified as "last year's" *ta-ra-si-ja*, at a location named *se-to-i-ja.* While this is the only explicit mention of *ta-ra-si-ja* in the records involving chariot-wheel production, it is particularly important as a production assignment in the negative, and the only to explicitly link *ta-ra-si-ja* with the a shortfall from the prior year, providing evidence for the it being an annual assignment of work (Nosch 2000, 51; Nosch 2006, 172).

While *ta-ra-si-ja* may appear as a term in the smaller collection of textile records at Pylos, records at Knossos provide the "the most complete picture" of how the administrative system operated (Killen 2015b, 804-805). This system at Knossos can be projected on Pylos, in part, due to the conspicuous uniformity in the language and format of the records found at the major Mycenaean centers, in turn signaling a uniformity in certain administrative practices (Killen 1987, 61; Nosch 2000, 54). Ambiguity in the records has been admitted, and some have recommended against building a "unified framework" between the textile and bronze industries as recorded in the extant tablets (Killen 2015b, 817; Montecchi 2012, 187). However, it is under the Knossos textile model

that the Jn allotment tablets were proposed to be the "first stage" of the *ta-ra-si-ja* system (Killen 2015b, 805). The allotment tablets list *ta-ra-si-ja* smiths who, under a single location, are listed as having AES (*140) allotments ranging from the aforementioned M 1 N 2 to M 8, or 1.5kg to 8kg. On average, these allotments are M 3 N 2 or 3.5kg (Smith 1993, 179). Considering these as allotment tablets in the *ta-ra-si-ja* system, it is commonly understood that these allotments of raw *AES (*140)* are expected to be returned as finished products by the smiths so named in the tablets (Killen 2015b, 805; Nosch 2006, 170).

The first notable divergence of the Jn allotment tablets from the other *ta-ra-si-ja* tablets is the presence of *a-ta-ra-si-jo*. *A-ta-ra-si-jo* is only used in the Jn series, and thus the Jn tablets are the only which explicitly list the workers, in this case smiths, who participate in the *ta-ra-si-ja* system but in these tablets are seemingly without an allotment (Killen 2015b, 806; Smith 1993, 179).

A second difference is the presence of the *a-ke-te-re* smiths on Jn 832 listed as both *ta-ra-si-ja* and *a-ta-ra-si-jo*. Considering the *a-ke-te-re* term as meaning "finishers" and the fact that the *ta-ra-si-ja* entries do not list AES (**140*) allotments, but assignments of a simple "1," this has been interpreted as an indication that these smiths were assigned finishing work on objects (Smith 1993, 179). These entries are the only Linear B tablets linking direct mention of *ta-ra-si-ja* with allocations of work, suggesting *ta-ra-si-ja* was not limited to the explicit processing of raw material (Smith 1993, 179; Nosch 2006, 165). While this direct attestation of *ta-ra-si-ja* in a record dealing with finishing is unique to the Jn series, *a-ke-te-re* is still strongly linked to the textile industries and, circumstantially, with *ta-ra-si-ja*. At Knossos, *a-ze-ti-ri-ja/a-ke-ti-ri-ja/a-ke-ti-ra2* are attested in textile tablets including the Ln and M(1) series, whose work is linked to the use of wool for finishing in work assigned on the aforementioned Od(1) tablets, as well as the related Lc(2) tablets (Killen 2015c, 229-231). *A-ke-ti-ri-ja* are also well attested in the personnel records dealing with textile work groups at Pylos (Nosch 2006, 166). Curiously, Pylian records of textile-working *a-ke-*

te-ri-ja on Aa 717 and the *a-ke-te-re* of the Jn series intersect at the Pylian locale of *ro-u-so*, located in the Hither Province (Smith 1993, 201).

The general format of the Jn allotment tablets do not match either the "target" tablets like those found in the Lc(1) series, or the end-stage "receipt" tablets like those found in the Ld(1) or Le series. However, attention has been drawn to the similarities between the allotment tablets and the tablets in the Od(1) series allotting wool for processing (Killen 1987, 68; Nosch 2006, 170). This has led to the classification of the Jn tablets as matching a secondary stage of the distribution of the raw materials, after a "target" for production which was already assigned in a previous tablet. The most notable similarity between the Jn allotment tablets and the relevant Od(1) tablets is that the purported receipt of materials concerned separate, named individuals in both contexts. Considering these allotment tablets as the distribution stage of the *ta-ra-si-ja* system, no other tablets have been decidedly identified as matching the "target" or "receipt" stages as illustrated in the Knossos textile cycle (Killen 1987, 69). However, a lone tablet at Knossos may illuminate how the beginning or end of the cycle might look in the *ta-ra-si-ja* system concerning bronzesmithing:

KN K(1) 875 **(H102)**

.1] , qa-si-re-wi-ja , di-pa , a-no-wo-to [

.2 pe-ri-ta , qa-si-re-wi-ja , di-pa , a-no-wo-to , [

.3 wi-na-jo , qa-si-re-wi-ja , di-pa , a-no-wo-to [

.4 i-da-i-jo , qa-si-re-wi-ja , di-pa a-no-wo-to [

.5 sa-me-ti-jo , qa-si-ṛẹ-ṿị-ja , di-pa , a-no-wo-to [

.6 i-je-re-wi-jo , qa-sị-ṛẹ[-wi-]jạ , a-no-wo-to *202VAS 10 po-ti-[

This incomplete tablet contains a list of five complete personal names followed by the *qa-si-re-wi-ja* descriptor, and in five entries an object described as *di-pa a-no-wo-to*, and in the sixth as *a-no-wo-to* *202VAS, both descriptions likely translating to "earless," or handle-less vessels (Killen 1987, 61). The tablet is incomplete, and this means that neither the counts of the objects nor the actual metal composition is recorded in the extant text. Based on the *qa-si-re-u* and potential *po-ti-*

ni-ja descriptors which will be discussed later, it is proposed that K(1) 875 represents the recording of finished bronze products either assigned as "targets" as in the Lc(1) series or received at the palace like products recorded in the Le series (Killen 1987, 70). The absence of raw material required to complete the finished products lends support to the tablet's identification as being in the end-stage of production. Beyond the proposal that Knossos' textile model could be applied to the greater *ta-ra-si-ja* system at Pylos, K(1) 875 has been put forth as the direct link between the bronze industries at Pylos and Knossos, and confirming "how closely similar" they are, including their place in the *ta-ra-si-ja* model (Killen 1987, 70).

The links of the Jn series to both the Od(1) tablets and the *a-ke-ti-ri-ja* require a closer look at the nuances involved in both the Od(1) series and the use and understanding of the term. Certain wool assignments in Od(1) hold qualifiers such as *o-nu-ka*/*o-nu-ke* and *to-u-ka* which, although notably found in distinctive tablet groups, are taken as a whole to mean "decoration" or "finishing" by Killen (2015c, 228-230). The separate series include *o-nu-ke* found in Od(1) and *to-u-ka* found in the *verso* wool entries of the Lc(2) tablets, as well as *o-nu-ka* in the Ld(1) series. These are in turn associated with the *a-ke-ti-ri-ja*/*a-ze-ti-ri-ja.* The wool amounts allotted in the Od(1) series are generally less than those found in the Lc(1) series, though ratios have been suggested between the wool allotments between the Od(1) allotments and those found in the Lc(1) targets (Firth & Nosch 2003, 130; Killen 2015c, 238). It has been proposed that the "finishers," rather than additive decorators to the textiles, are actually the textile workers tasked with the technical edging work involving the loom which both begin and end textile production (Firth & Nosch 2003, 135). From this perspective, certain Od(1) tablets dealing with "finishing" work appear to use very careful language and include not only specific material allotments to the *a-ke-ti-ri-ja*, but specific qualifiers for the type of work to be done by the *a-ke-ti-ri-ja*. These elements do not appear to be immediately present in Jn entries concerning the *a-ke-te-re*. However, a solution to this problem has found support: that the assignments to the *a-ke-te-re* were linked to the work of the *pa-ra-ke-te-e-we* on

the same two tablets (Uchitel 1991, 196). Considering the *pa-ra-ke-te-e-we* as helmet-makers, with specific allotments of AES (**140*), the *a-ke-te-re* would be the "finishers" to this process. This would put, at least administratively in the records, the use of the *a-ke-te-re* in the Jn series into a much more similar model as found in the *ta-ra-si-ja* records in the textile industry at Knossos.

Returning to the Lc(1) series, a potential parallel to the proposed work group assignments consisting of 1:1 work ratios in the textile *ta-ra-si-ja* tablets can be found in the Jn series. The most direct similarity is in the allotments found in Jn 725, in which each of the smiths receives the same amount based on the totaling line which follows, but this can also be found in the many tablets which enumerate the same weight allocation to smiths at certain locations. This has led to the proposal that the AES (**140*) allotments in the Jn series were allotted as whole totals to each of the locations, to be distributed evenly to the smiths designated as *ta-ra-si-ja* (Uchitel 1991, 198). This would explain why, between the "working tablets" of Jn 725 with its equal distributions and the related earlier-tablets of Hand 21 with similarly equal distributions, the size of the individual allotments to smiths at *e-ni-pa-te-we* appears correlated to the number of smiths listed as *ta-ra-si-ja,* while the total amounts actually allotted are practically the same – L 2 M 18 on Jn 725 and L 2 M 20 on Jn 658 (Uchitel 1991, 198). This would also provide a solution to the AES (**140*) listed as *e-pi-da-to* on Jn 389 and Jn 601, as these would be leftover from the larger distribution distributed individually to the *ta-ra-si-ja* smiths. Yet, these same tablets with leftover AES (**140*) have smiths listed as *a-ta-ra-si-jo*, which opens the question of why those smiths were not allotted the extra metal, to which an answer is not readily apparent in the Jn series (Smith 1993, 189; Uchitel 1991, 199).

Attempts have been made to place the collection tablets, Jn 829 and Jn 881+896, directly into a stage of the *ta-ra-si-ja* system as well. One proposal is that Jn 829, using the future form of *di-do-si* (*do-so-si*) and thus looking at future contributions of a relatively uniform amount, is the record of the expected finished products from already allocated raw material, representing the end-

stage of the *ta-ra-si-ja* system at Pylos (Michailidou 2008, 530). This would also construe the *ka-ko na-wi-jo* designation as *ka-ko* meant for a naval purpose, rather than *ka-ko* of religious origin. Overlap does exist between the four towns mentioned in the allotment tablets and those listed on Jn 829 (Smith 1993, 209). However, the list of the contributing locations on Jn 829 is more clearly grouped by the major administrative towns in the Pylian Kingdom (Smith 1993, 209; Michailidou 2008, 531). This, combined with the tablet's format more closely resembling tablets like those found in the Ma series in language and format, has led to the more common understanding that the collection tablets are taxation records outside of the *ta-ra-si-ja* cycle. Yet, proposals differ on whether this was scrap or raw material offered, or finished products (Michailidou 2008, 531; Smith 1993, 206). While not directly linked to the Jn allotment tablets, treating the *ka-ko* in Jn 829 and Jn 881+896 as scrap or unfinished material, rather than finished goods, has led some to propose that this material still eventually ended up in the *ta-ra-si-ja* cycle after being collected by the palace (Smith 1993, 209; Nosch 2006, 107).

After mentioning some Pylian place names in the process of placing the Jn tablets in the textual context of *ta-ra-si-ja*, it is now pertinent to discuss the geographic implications of *ta-ra-si-ja* in the textile industry and how the Jn tablets might meet this format. Once again approaching the industry with the least amount of information early: other tablets relating to the So(2) 4442 chariot wheel tablet and thus assumed to be a part of the *ta-ra-si-ja* system had production locations extrapolated and were found to be at only a select few "secondary-order centers" such as Phaistos, Kydonia, and even at Knossos, decidedly central administrative locations (Nosch 2006, 174; Killen 2015b, 811). This is put forward as evidence that the *ta-ra-si-ja* system's use over decentralized production is a feature, but not a rule (Nosch 2006, 175). This feature is particularly evident in the textile production as recorded at Knossos.

Fifteen locations are found in the Lc(1) and Le series associated with *ta-ra-si-ja* (Nosch 1997-2000, 32). While, like the chariot production tablets, some work groups are located at Knossos

and Phaistos, other locations which have been geographically identified are found to be smaller and farther to the south and west of the island (Killen 2015b, 806). This concentration of specific locations in Lc(1) and Le series is bolstered by the cross-referencing of the textile work group locations in other series (Nosch 1997-2000, 32). The locations with a *ta-ra-si-ja* obligation are found at locations which can offer wool through the holdings of sheep flocks. This suggests that the *ta-ra-si-ja* textile assignments were given to the locations which could provide the raw materials necessary for production. This opens up the possibility that, at least for the textile production at Knossos, the raw material necessary for work may not have been directly provided by the palace for processing, but provided by the locations expected to send the finished products to the palace (Nosch 2000, 54). However, these are not the only locations which hold flocks and, in fact, not the only locations which produce textiles. There are 31 place names recorded in the Da-Dg series accounting for wether flocks, and 13 of the *ta-ra-si-ja* locations are found in the series. While there does not appear to be a direct correlation between the number of sheep and *ta-ra-si-ja* assignments, the extant records do group suspiciously in the range of place names with "middle size flocks" (Nosch 1997-2000, 32). The more conspicuous distinction is that between the textiles produced by the *ta-ra-si-ja* locations and the non-*ta-ra-si-ja* groups. The 15 place names associated with the *ta-ra-si-ja* system are limited to producing a specific set of textile types, including the aforementioned TELA+*TE* and TELA+*PA*, whose production may have been further geographically divided into TELA+*PA* production in western Crete and TELA+*TE* production in central Crete (Nosch 1997-2000, 43). Certain textile types are not attested in *ta-ra-si-ja*, and are found at locations which not only do not relate to the 15 *ta-ra-si-ja* place names, but appear to be involved in other economic endeavors including food and spice production (Nosch 1997-2000, 43). This is particularly evident in Nosch's "triangle" of *ti-ri-to*, *ra-su-to*, and *qa-ra* (1997-2000, 37). These three locations are still listed in the non-*ta-ra-si-ja* production of textiles, but also appear to be contributing to a number of different agrarian sectors of the economy in other tablet series. This strengthens the idea of the

careful geographical administration of *ta-ra-si-ja*, as certain distinctions appear to be present between the locations expected to participate in *ta-ra-si-ja* and those not included. However, it has also been proposed that palatial organization of the industry may have been more haphazard. Under the proposed model in which a grand total for production was created first before being assigned separately as smaller production targets to work groups, it has been offered that Hand 103 simply assigned the targets to work groups until the total production target was met, rendering any purported considerations of economic participation or industrial specializations useless (Nosch 2011, 503). This same proposal also included the possibility that *ta-ra-si-ja* work was rotated among the different locations.

While the textile production under *ta-ra-si-ja* at Knossos appears to be decentralized, the relevant records hold "consistent and repeated associations of place names" (Nosch 1997-2000, 43). The locations not only appear to be under an exacting administrative procedure through *ta-ra-si-ja* records, but they are also well attested in other economic records such as those recording the wool-producing flocks. This second element is not as obvious in the Jn series.

Seventeen locations are found in the Jn series, but these do not include the well-known centers such as the capital *pu-ro* and *re-u-ko-to-ro*, illustrating the decentralized production also found in the textile industry at Knossos (Nosch 2006, 174; Killen 2015b, 806). The majority of the identifiable locations have been found in the Hither Province, with a single exception of *a-si-ja-ti-ja* in the Further Province, which Smith's work found were further grouped into Northern and Southern groups in the palatial records (1993, 191; Killen 2015b, 806). Those towns which are identifiable as being of the nine main towns of the Hither Province appear to have been allotted more than one assignment, including the towns of *a-pu2-we* and *a-ke-re-wa*, suggesting that different or specialized work was further delineated between different work groups at the towns (Smith 1993, 197). From the identifiable locations, the tablets in the Jn series indicate that the *ta-ra-si-ja* system at Pylos involved the careful administration of *ka-ko* allocations to locations

predominantly in the Hither Province, specifically excluding work at Pylos itself and other well-known centers like Leuktron in the Further Province (Nosch 2004,174). These elements of the Jn series geography match those found in the system at Knossos. However, a number of the locations found in the Jn series are not identifiable and are not found in any other records at Pylos (Nosch 2006, 174). This supports the notion of decentralized production, but also takes this further in involving locations not otherwise attested in the palatial economy.

This chapter has so far covered the administrative qualities of the *ta-ra-si-ja* system and its "elaborate mechanism of control" at Knossos and the work to put the Jn tablets within a comparative framework. This led to the discussion of the *ta-ra-si-ja* element of decentralized production as the model was found in the textile industry versus that found in the Jn series. This requires a comparison of how this *ta-ra-si-ja* process was directly supervised and administered over such a dispersed mode of production, or, the who intermediaries as observed in earlier studies were.

The supervisory structure of the textile industry, much like the other details discussed so far, presents a clearer picture than that found in the Jn series and associated metalworking texts. Though the *ta-ra-si-ja* system in textiles is most well-attested in the Knossos records, it is important to note that the supervisory structures in the textile and associated industries there have certain parallels and explicit similarities with extant textual evidence of the supervisory structures of the Pylian textile (and wool production) industry (Nosch 2006, 168-169). The first supervisory distinction is that of "collectors," a modern term applied to a position without a Mycenaean title found primarily in the wool and textile tablets, who are identified by their personal name in the genitive case (Nakassis 2013, 8). Collectors are found in in the records of production starting from the breeding of wool sheep, to the collection of the wool itself, to the production of textiles and are attested at both Pylos and Knossos. Thirty-percent of the economic production at Knossos is attributed to "collectors," while other production work which is non-attributable is considered as "non-collector" (Nosch 2011, 495). This applies to the aforementioned textile tablets enumerating *ta-ra-si-ja* production at

Knossos, such as the Lc(1) series. The exact role and administrative position of the "collectors" is still debated, and while their economic roles have diversified in new studies, their presence in the textile industry, from the production of the raw material to the finished product, is notable (Nosch 2011, 495; Nakassis 2013, 8). At the work group level, personnel records of the textile workers at both Pylos and Knossos indicate that each work group was assigned a *DA* and *TA* supervisor. These supervisors, with *DA* likely having superiority over *TA*, received higher rations than the other workers but are proposed to have been members of those same work groups, just in a supervisory status (Olsen 2014, 77).

Starting at the highest level, "collectors" have not been definitively identified in either the Jn series or in the chariot-manufacturing industry which involved *ta-ra-si-ja* (Nosch 2006, 169). However, the most obvious supervisory presence in the Jn series, that of the *qa-si-re-we,* has been proposed to function in a similar capacity, with a *qa-si-re-u* supervising the allotment of metal to the geographic sub-groups administered and "responsible for the return of the finished products to the palace from a whole group of smiths" (Smith 1993, 182, 190). This broader, less-specialized classification for the *qa-si-re-we* would meet well with the evidence for the involvement of the *qa-si-re-we* in other economic instances including the production of furniture and supervision of "unskilled workers," which forms a catalogue of work designated as both *ta-ra-si-ja* and non-*ta-ra-si-ja*, much like the "collectors" (Montecchi 2012, 188; Nosch 2006, 168). The consistent presence of the "collectors" in the textile production cycle, from the sheep-rearing to the finished textile, provides a parallel to the mentions of the *qa-si-re-we* first in the Jn allotment tablets, and in the proposed later-stage tablet KN K(1) 875. This is activity interpreted to be of a local leader and intermediary with the palace (Nakassis 2013, 13). Yet, this omnipresence in the tablets related to metal production has similarly led to proposals of a more involved, specialized position for the *qa-si-re-u*. The same "unskilled laborers" on tablet As 1516 have been proposed to represent the "industrial work group" led in a similar capacity administratively as those led by the *qa-si-re-we* on

the Jn tablets (Killen 1987, 64). However, the smiths in the Jn series are not directly associated with any *qa-si-re-wi-ja* as mentioned on other tablets (Montecchi 2012, 188). The argument which has carried more support in continuing scholarship is that of the former, that the *qa-si-re-u* held a higher position in the village and acted as an interlocutor with the palace in economic endeavors which included, at the very least, the distribution of the AES (**140*) allotted for *ta-ra-si-ja* processing in the Jn series (Palaima 2014, 88; Montecchi 2011, 188).

Below this level of supervision/administration, a structure for closer supervision over the workers such as that seen in the *DA* and *TA* supervisors in the textile industry is not evident in the Jn series, and it is accepted that the smiths were responsible for their own work and enjoyed more autonomy than the workers in the textile industry (Smith 1993, 182; Montecchi 2012, 187-188; Nosch 2006, 169). This responsibility is evident in the direct accountability of the smiths for their allotments by name, something not found in the assignments to the textile work groups. Further, the smiths themselves are agreed to have held some form of superiority over the *do-e-ro* both explicitly mentioned in the tablets and perhaps the total 47 VIR attested in a similar format in an entry erased on Jn 431 (Montecchi 2012, 188; Nosch 2006, 163). That the smiths supervise the *do-e-ro* is not debated, but their immediate status as "slaves" is in question by some, leading to offerings of a more nuanced position for them including: personnel dependent on, but not owned by, the *ka-ke-we*, as well as positions as assistants or apprentices (Efkleidou 2004, 110; Smith 1993, 183).

This chapter has compared the tablets in the Jn series with those underpinning the current understanding of the *ta-ra-si-ja* system. This brought about comparisons of the broader administrative qualities found in the system, leading down to the geographic implications of the Jn series and those found in the textile industry, narrowing further into the supervisory capacity of the work groups associated with both industries and the potential intermediaries necessary for palatial control. This inevitably leads to discussions of the actual workers involved in the textile and bronze

industries, how they compare, and the implications of these comparisons for the administration of the *ta-ra-si-ja* system.

Chapter 3: Looking Beyond the Palace to the Individual

In earlier studies, the forceful application of the characteristics of the *ta-ra-si-ja* system in the textile industry upon the extant bronzesmithing records in pursuit of a "unified framework" led to certain assumptions made of the social and economic status of the bronzesmiths. This continued to carry weight in later studies, and which minimized some of the economic indicators attesting to higher status for the smiths (Killen 2015b, 815; Nosch 2006, 163). Other studies (see Uchitel 1991) have better integrated the data to allow for more balanced interpretations, but these have led to arguments for a greater separation of the administrative methods involved in the textile and bronzesmithing industries: "On the social status of the workers involved in the *ta-ra-si-ja*, the sharp differences between the records of cloths and wool, on one hand, and bronze, on the other... suggest to desist from the attempt to reconstruct a unified framework, valid both for the smiths of Pylos and for the weavers of Knossos: the similarities between the two categories, in fact, stop, for now, at the collection of raw materials to be processed" (Montecchi 2012, 187). This chapter will confront the obvious differences between the workers in both industries, but it will also utilize research gleaned from newer methodologies in order to draw some parallels, rather than distinctions, in the administration of the two industries through *ta-ra-si-ja*.

As the discussion of the supervisory structures began pointing out, the large textile workforces at Knossos and Pylos appear to have been well-integrated into the fold of palatial authority. At Pylos, at least 325 women are listed in the personnel records as textile workers, divided into 24 work groups, almost half of the female personnel and work groups listed in the extant tablets (Olsen 2014, 86). At Knossos, the textile workers may have dominated the entirety of the personnel records concerning female workers, and numbered at least 1,000 women similarly

tracked as work groups in the majority of the records (Killen 2015b, 814). Strict records were kept of these textile work groups at both Pylos and Knossos, but a purported divergence in the purposes of the records at both sites has led to debate about the standing of the female workers at their respective locations (Olsen 2014, 186; Killen 2015b, 814). At Pylos, the personnel records indicate a focus on the provision of rations to the work groups and their supervisors, where the female workers are never referred to by name (Olsen 2014, 109). That this indicates the textile workers were dependent on the palace is not in question. Rather, it is the degree of dependency which is still debated, with interpretations ranging from a full dependency through slavery, to corvée labor, or dependency only on the compensation received for the work from the palace as "independent contractors" (Olsen 2014, 110). At Knossos, the personnel tablets are more concerned with the size of the work groups, with no evidence of ration provisioning, leading to the earlier suggestion that the tablets were used for the calculation of the *ta-ra-si-ja* targets for the work groups based on size (Olsen 2014, 166). That these targets were the focus is similarly used to argue that the labor of these workers was not a year-round obligation to the palace, unlike the undefined (and thus assumed full-time) obligations at Pylos (Nosch 2006, 173; Killen 2015b, 814; Olsen 2014, 187). Further, the tablet series at Knossos make particular distinction of the workers labelled as *do-e-ra*, and textile workers are entirely excluded from this title in the tablets there (Olsen 2014, 186). While the exact position of Mycenaean textile workers remains up for debate, it is agreed that as generally nameless women in large numbers performing "labor intensive, repetitive, and time-consuming tasks" under palatial supervision, they were of a low status (Olsen 2014, 109-186; Killen 2015b, 814; Nosch 2006, 164). The extensive organization of these work groups in the textile industry emphasizes the "collective character" of the *ta-ra-si-ja* production in this sector (Nosch 2006, 164).

By Smith's count, the Jn tablets record a total of at least 220 smiths at Pylos (1993, 211). This is a substantial number, but less than fifty percent of the estimated textile workforce sizes at either Pylos or Knossos. In studies which operate on the assumption that Ja 749 represents the total

allotments in the Jn series, a calculation of a potential 400 total smiths has received support (Killen 2015b, 815; Nosch 2006, 163). It is based on this estimate of size, combined with the more extensive knowledge of the textile work groups and their work under *ta-ra-si-ja* in particular, that the smiths were proposed to be "of quite low status," albeit with evidence of some smiths holding land (Killen 2015b, 815; Nosch 2006, 163). In the simplest consideration, the smiths' status as men, and as a group not only recorded with personal names, but with over 20% of the extant names in the Pylian records, is evidently higher than the status of the work groups of anonymous female textile workers (Nakassis 2013, 156; Olsen 2014, 61). Further evidence from the Jn series indicative of a higher status is the lack of direct supervision comparable to the *DA* and *TA* positions of the textile industry as discussed, as well as the smiths' own potential possession of slaves (Montecchi 2012, 187). In another piece of negative evidence, none of the texts suggest that the smiths were receiving rations such as those directly provisioned to the textile work groups (Gillis 1997, 513).

The first evidence of smiths holding land, and the most direct, comes from the tablets of the Ma and Na series concerning taxation at Pylos. *Ka-ke-we* are specifically referred to as a group in the Ma tablets which concern the taxation of a number of unidentified commodities (Shelmerdine 1973, 262). In the Na series, concerning flax contributions, the *ka-ke-we* are similarly mentioned on a number of tablets (Uchitel 1991, 202; Smith 1993, 206). Beyond simply signifying the potential landholding by the smiths and their production outside of metallurgy, both the Ma and the Na series actually list the smith groups as being free from obligation regarding the respective commodities (Uchitel 1991, 202; Smith 1993, 206). This will be revisited later in the chapter, but first more evidence of the smiths' status must be confronted. A second indicator of special status for the smiths on a wider scale is the presence of groups designated as *po-ti-ni-ja-we-jo*. This is considered to be a designation for religious work groups serving the goddess Potnia, which is found in other industries including perfume production (Montecchi 2012, 188). Aside from the *po-ti-ni-ja* label, the entries concerning these work groups are otherwise common in comparison to the standard entries found in

the Jn series (Smith 1993, 184). While their exact duties and status when operating under this label are not certain, many propose that this status was special (Uchitel 1991, 196; Montecchi 2012, 188). After discussing the more obvious evidence of the smiths' standing as a group, further analysis requires the activities under individual smiths as elicited from the data by prosopography.

Prosopography is defined as a "collective biography, describing the external features of a population group that has something in common," in this case their profession as smiths (Verboven *et al.* 2007, 390). It has been put forth as a solution to the limits of the straightforward interpretation of the texts with their focus on palatial structures and the palatial economy, looking beyond these limitations of the "the simple palatial elite/non-palatial commoner dichotomy that characterizes much thinking on Mycenaean society," for more nuance (Nakassis 2013, 4). This includes moving past the simple characterizations of low status for the smiths. The texts at Pylos present a number of advantages for prosopographical methods including chronological homogeneity, the high number and length of documents available, and the high number of names which are also a part of a proposed highly particular naming regimen used in the documents (Nakassis 2013, 39). However, the repetition of personal names in the Linear B texts has long been recognized, and the meaning of these repetitions has consequently been consistently debated ever since (Ventris & Chadwick 1956, 102; Smith 1993, 209; Nakassis 2013, 40). A skepticism for the potential of the recurring names in the different tablet series to represent the same individual has existed from the beginning of Linear B's decipherment (Ventris & Chadwick 1956, 352). Although prosopographical methods have evolved through the years in Mycenaean studies, this skepticism has limited much of the research to more conservative approaches, with a particular hesitation in identifying those individuals considered to be of low-status (Nakassis 2013, 40-48). New research and methodologies, while allowing for some uncertainty, not only shed more light on the activities of the individual rather than those of the palace, but produce a number of insights into the smiths in particular.

Picking up from where the discussion of group-wide status began, the potential evidence of landholding, sixteen names from the Jn series are found in the E-series of landholding texts (Nakassis 2013, 100, See Table 4 for full list of Jn and E-series crossover). This is significant not only for providing potential individual indicators of a higher economic status in landholding which was suggested in the Ma and Na tablets, but for the social and economic implications of further cross-referencing these individuals in other series. This includes identifications as *te-re-ta* (land supervisors), religious officials, an officer in the *o-ka* tablets, and herders (Nakassis 2013, 100-102). A prominent identification which has been agreed upon in both prior and new prosopographical studies is that of *a-tu-ko*, who carries the title of *e-te-do-mo* - "armorer," also modified as *wa-na-ka-te-ro* for "royal"- in more than one text concerning landholding (Nakassis 2013, 100-102). Prior evidence of landholding has long been proposed to be the part-time occupation of these smiths as low-status workers (Uchitel 1991, 202; Smith 1993, 210). Yet, these prosopographical identifications of the landholders appear to suggest otherwise (Nakassis 2013, 115). Other prosopographical identifications of the smiths outside of the E-series include officers and *e-qe-ta* in the *o-ka* texts and leaders of *ke-ro-si-ja*, suggesting not only that some smiths held supervisory status over military and labor units, but even positions extending into what is considered to be the sphere of the palatial elite (Nakassasis 2013, 115).

An economic sphere not yet confronted, of which much of the large overlap with the Jn series is considered "probable or certain," is the activity of herders as recorded in the Cn series (Nakassis 2013, 87). Thirty smiths' names are found in the Cn series, which contains inventories of a variety of domestic animals (See Table 5 for full list of Jn and Cn series crossover). At least three of the smiths in the Cn series can be found in the list of smiths holding land. However, unlike the other smiths found in the landholding texts, the smiths found in the Cn series are generally not as extensively attested in other activities (Nakassis 2013, 86). Although this might suggest a status differential from the landholders, other herders outside of the group of smiths hold positions which

indicate that some of them were of a higher status as well (Nakassis 2013, 116). These two particular contexts in which smiths are found, the Cn and E- series, lead to the proposal that the smiths were not of a uniformly low status as a group, but included members of the palatial elite (Nakassis 2013, 116). Nakassis also states that "Both smiths with and without allotments occur in the Cn texts, so their role within the Jn series does not seem to be a deciding factor" (2013, 86). It is here that I propose that the opposite consideration might have been made, in that a smith's presence in the Cn texts may have influenced the likelihood of an allotment in the Jn series. First, considering Smith's totals of *ta-ra-si-ja* and *a-ta-ra-si-jo* smiths on the "finished tablets," and discounting the number of those found in the "working tablets" of Jn 725 and Jn 693, approximately 81% of the smiths are *ta-ra-si-ja* (1993, 210-211). Taking all of Nakassis' 30 potential identification of smiths in the Cn series (2013, 88), approximately 63% of these smiths are *ta-ra-si-ja* in the extant Jn series tablets. Similarly, of the 16 potential smiths found in the landholding texts (Nakassis 2013, 102), approximately 69% are listed as *ta-ra-si-ja*. This could be used to suggest that individuals involved in other economic sectors for the palace were less likely to be obligated under the *ta-ra-si-ja* system for metalworking. One could find similarities between this production criteria in assigning *ta-ra-si-ja* and what was found in the administration of the textile *ta-ra-si-ja* system at Knossos, where important locations attested more than once as agricultural centers were entirely missing from the *ta-ra-si-ja* assignments. Of the two most immediate arguments against this, first is of course the small sampling size based on a methodology involving some amount of speculation. The second argument involves the Ma and Na tax remissions, which have been postulated to be linked to the smiths' metalworking responsibilities to the palace (Smith 1993, 206; Montecchi 2012, 187; Killen 1985, 287). One might expect that the smiths with a tax remission for other goods would be more likely to be *ta-ra-si-ja* in the metalworking texts, but this connection is not apparent in the calculations from the landholding and herding records used here.

Even if this proposal is set aside, the information behind it still supports the argument that at least some smiths were of a higher status than has been appreciated for many years in the studies of the *ta-ra-si-ja* system. With this higher status, the smiths likely held more independence than the textile work groups as well. This paper will now consider how that may be reflected in the archaeological record.

Chapter 4: The Archaeological Evidence

The previous chapters, after discussing the Jn tablets themselves, took an approach which intended to narrow the lens as the study moved further, from the broadest elements of *ta-ra-si-ja* to the smaller elements of comparison among the differing industries. This allowed for a discussion focused first on the larger view of the administration of *ta-ra-si-ja* by the palace before moving to the actual workers involved in the industries. This chapter intends to take the same approach in considering the archaeological evidence of bronzeworking in the Pylian kingdom. The chapter will first begin with a look at the general access to the metals necessary for bronzeworking, followed by any archaeological evidence of palatial control over that access, and finally at the archaeological evidence for bronzeworking outside of the palace and any answers that might hold as to how the *ta-ra-si-ja* system influenced the industry.

Looking first at local access to the copper and tin necessary for bronze production, small deposits of copper do exist in the Peloponnese. If evidence did exist of Bronze Age access to these copper deposits, which it does not, "their contribution would have been utterly insignificant compared with other Mediterranean sources," providing "not more than a few pounds of metal" (Cooke *et al.* 1972, 232). Greece is entirely devoid of any sources of tin (Gillis 1991, 5). This, combined with the lack of any copper sources specifically located in Messenia as well as negative evidence of any ore processing, has led to the conclusion that the component metals for bronze were

necessarily imported from outside the Peloponnese, with the closest source of copper being Laurion in Attica (Cooke *et al.* 1972, 232; Gillis 1997, 510).

The well-known oxhide ingot, earlier mentioned for its representation in the Linear B tablets, is one of many forms which exchanged cupreous and component metals apparently took in the Late Bronze Age Aegean. Produced beginning in the 16th century B.C.E., the copper oxhide ingot measured an average of 60 by 40 centimeters, weighing up to 39 kg but with average weights having been put forth in a range of 24 to 29 kg (Bacchuber 2006, 348; Kassianidou 2013, 134-135). Other copper ingot forms include the slab, and, less commonly, the bun-shaped ingot (Smith 1993, 175; Muhly *et al.* 1977, 353). Tin has been found most commonly in the form of the oxhide ingot and as bun-shaped ingots (Hauptmann *et al*. 2002, 3). In terms of these common forms, bronze has been found as bun-shaped ingots and slab ingots in almost all cases (Mangou & Ioannou 2000, 216). A single example of a bronze oxhide ingot has been reported from the Bay of Antalya, but this is not considered in many studies (Bass *et al*. 1967, 70; Gillis 1997, 508; Blackwell 2018, 516).

Looking for the most compelling evidence of these objects in a trade context, one can look to the shipwrecks of Uluburun and Cape Gelidonya, respectively dated to the 14th and late 13th centuries B.C.E. (Blackwell 2018, 513). In the Uluburun wreck, at least 354 oxhide ingots, as well as a smaller number of bun-shaped ingots, made up a combined copper cargo load of approximately 10 tons (Bachhuber 2006, 348). Accompanying this copper were at least 120 ingots of tin, predominantly in oxhide form, weighing almost one ton. It is often noted that the majority of these tin ingots were already cut into fragments at the time of transport, with only three ingots found intact (Bachhuber 2006, 348; Hauptmann *et al*. 2002, 2). This composition of "heterogeneous," fragmented ingots is suggested to be indicative of the trade mechanisms of tin as a rarer element, in which greater distances travelled by the tin meant that it was exchanged several times prior to ending up in the Uluburun cargo (Jones 2007, 164). A second observation that deserves attention is the ratio between copper and tin on the ship, which matches the "desired" ratios of copper to tin for

bronze and the realized ratios found in contemporaneous objects (Bachhuber 2006, 348; Hauptmann *et al*. 2002, 2). The amount of copper, combined with the other finds from the wreck, has led to the proposal that the ship was carrying cargo ultimately destined for palatial elites in the Aegean, holding similarities to the elite gift exchanges recorded in the Amarna archives (Bachhuber 2006, 359; Blackwell 2018, 513).

The Cape Gelidonya wreck held 34 oxhide ingots in differing sizes and shapes of copper, accompanied by 75 kg of oxhide fragements, at least 20 complete and fragmented bun-shaped ingots of copper and bronze, 19 slab ingots of bronze, and evidence of at least one tin ingot discovered in a shapeless form of tin oxide (Muhly *et al.* 1977; Bass *et al.* 1967). Regarding the oxhide ingots, the collection found in the Cape Gelidonya wreck not only vary in shape, but hold quite a large variation in weight with a span up to 13 kg between the lightest and heaviest ingots (Bass *et al.* 1967, 71). This variation extends to the large number of oxhide ingot fragments which accompanied the complete pieces, which hold no discernible pattern in their weights (Bass *et al.* 1967, 71). Beyond this more organized cargo of common forms, the ship was loaded from "stem to stern" with complete and broken bronze items, ranging from tool-heads and utensils to vessel and tripod fragments (Bass *et al.* 1967, 117). This load is considered to have been valuable as scrap bronze for recycling (Bass *et al.* 1967, 117; Blackwell 2018, 513). The size and composition of the ship's cargo have led to the proposal that the ship's mission was one of private entrepreneurship (Blackwell 2018, 513; Muhly *et al.* 1977, 361). These ships provide a glimpse at how metals were traded, not only revealing the forms in which cupreous metals were transported, but possibly indicating different elements of control of these metals in a world of palatial control and distribution versus more privatized circulation. Finding corroborating evidence of this trade in common and uncommon forms at Pylos presents certain difficulties, as will now be confronted.

Looking first for evidence of the trade described above in the form of the various ingots, none of these forms have been found at Pylos, but other locations on the Greek Mainland have

revealed copper ingots and ingot fragments: “an oxhide from the acropolis at Mycenae, one bun and twelve oxhide fragments in the Poros Wall Hoard, Mycenae, two slabs in Tiryns, sixteen oxhides in Kyme, Euboea, three oxhide fragments in Thebes” (Mangou & Ioannou 2000, 216). Bronze has been found as a bun-shaped ingot at Mycenae and as one of the two slab ingots found at Tiryns (Michailidou 2008, 527; Jones 2007, 420). Some of these same contexts contained not only the ingots and ingot fragments, but the kind of scrap bronze which appeared to dominate the shipment of the Cape Gelidonya, as well as well-preserved, fully functional tools (Blackwell 2018, 525). Although such assemblages have not been found at Pylos, other Mycenaean contexts either at palatial centers or purported to be under palatial purview appear to include a number of similar items: complete sets of functional tools, ingots and ingot fragments of copper and bronze, and scrap metal including broken tools -a number of which appear to be deliberately broken (Blackwell 2018, 530). These seemingly standardized toolsets include intact double axes, wide and narrow chisels, knives, and sickles. Double axes also make notable examples of the deliberately broken tools, with a number of axes found severed in half (Blackwell 2018, 525-532). Similar half-pieces of double axes were found in the Cape Gelidonya wreck (Bass *et. al.* 1967, 95). At Pylos, the closest evidence of such storage is the scrap metal found in the Northeast Building (Gillis 1997, 508; Smith 1993, 214). While the ingot fragments at Cape Gelidonya were considered to have been broken in random increments (Bass *et al.* 1967, 71), copper fragments are considered relatively easy to break from the ingot through local heating and beating, and this ease of manipulation is proposed to have still allowed for smaller ingot fragments to be weighed in balance pans when needed (Michailidou 2008, 527). Tin ingots are a rare find, and the closest tin ingot to Pylos found in an archaeological context on land was found in Mochlos and dated to LMIB (Jones 2007, 163, 183).

The lack at Pylos of the kind of palatial hoards found at other citadels leads to the fact that Pylos also lacks any evidence of metalworking (Gillis 1997, 508). This dearth of evidence for metalworking activity has been observed in other Mycenaean centers, though evidence of LHIIIC

metalworking has been found in the Lower Citadel at Tiryns (Blackwell 2018, 514; Rahmstorf 2015). Looking outside Pylos to wider Messenia, Nichoria held the remains of a metalworking installation dated to LHIIIB, which included scrap bronze and slag (Shelmerdine 1981, 323). The evidence suggests that the metallurgical activity there only involved the remelting of bronze, rather than any alloying of copper and tin into bronze (Shelmerdine 1981, 323). This is considered to be "low-scale metallurgical production" outside the scope of palatial purview (Blackwell 2018, 515; Aprile 2013, 434). Yet, the data from Nichoria are not only important for this example of non-palatial metalworking, but for the wider evidence of bronze circulation that the site holds: "The curate priority for the material was low enough that scraps, broken fragments, and a few complete tools were lost or discarded in every reasonably well-preserved household series and trial trench deposit, as well as on the surface of the Mycenaean road," indicating independent and continuing circulation of bronze outside of palatial control (Aprile 2013, 434). An analysis of the tin content from these bronze items from MH, LHI-II, and LHIII contexts at Nichoria suggest that "tin was used more efficiently during LHIII than in other periods. The best bronze alloy for most purposes, being neither too soft nor too brittle, contains from 10 to 12% tin. There are not many samples in this range from Nichoria, but the greatest number do belong to the LHIII period" (Shelmerdine 1981, 323). The independent nature of this production and consumption at Nichoria might further be corroborated in the Pylos tablets. Accepting Nichoria as *ti-mi-to-a-ke-e* in the texts, the location is listed in Jn 829 as providing *ka-ko*, and *ka-ke-we* at *ti-mi-to-a-ke-e* are listed on Ma 123, yet *ti-mi-to-a-ke-e* is never listed in the Jn allotment tablets (Shelmerdine 1981, 323). The metalworking at Nichoria (*ti-mi-to-a-ke-e*) appears known to the palace, but the activities are not governed by the Jn series.

Moving beyond the evidence of potential standard forms of trade of raw cupreous metals, and the evidence of metalworking within the Pylian territory, it is now time to look at the evidence in finished bronze products for their potential use in understanding the Jn texts. Because the

evidence offered by the Jn series is based on weight, this discussion will discuss evidence based on artifact weights. However, the weights of metal objects are not typically offered in excavation reports and publications (Michailidou 2008, 528). Starting first with bronze weaponry, the common arrowhead type weighs up to 1.5 grams on average, with swords weighing 350 grams each (Ventris & Chadwick 1956, 356). Though there is some variation in weight, some standardization has been revealed in studies of disparate spearheads and javelin-heads found in relevant contexts, with average weights of 200 grams and 100 grams for each, respectively (Michailidou 2012, 533). A weight of at least 695 grams has been given for a LMII bronze helmet (Ventris & Chadwick 1956, 356). Daggers have been found in Akrotiri with weights ranging from 163 to 303 grams (Michailidou 2001, 97). Looking at bronze tools, chisels from Akrotiri held weights of approximately 130 grams and 273 grams, with an "almost whole" knife weighing almost 43 grams (Michailidou 2001, 97). The double axe, "the commonest tool of the Mycenaean world, occurring almost in every hoard," from the Andrionianoi hoard in Euboea weighs 1213 grams (Paschalidis 2007, 435). It has been observed that the daggers at Akrotiri held a consistent tin ratio, whereas the bronze tools had a wider variation of percentages (Michailidou 2001, 96). In a brief look at vessels, the larger types were more typically produced with copper (Michailidou 2008, 528). A bronze tripod cauldron and copper laver from Akrotiri weigh approximately 2,000 grams and 1,600 grams, respectively (Michailidou 2008, 528). Other vessels range in weight from 55 grams to over 1,100 (Michailidou 2001, 97; Michailidou 2008, 528). While these present only a small number of examples of copper and bronze object weights, they do provide examples of the kinds of vessels which will be discussed in the next chapter, as well as touch upon the two product groups which appear to define Mycenaean bronze consumption: tools and weapons (Blackwell 2018, 514). Further, these provide example weights which can be be used in the interpretation of a number of the tools found in the "standard set" as described in Blackwell's palatial hoards (2018, 533). Here it is worth noting that much of the evidence discussed so far has concerned the evidence for the trade

and working of copper and bronze. Looking to tin, evidence of the metal's trade and use in its pure form can be found in the Mycenaean chamber tombs at Asine, in which a number of ceramic vessels were found to have been tin-covered at the time of deposition, with an Aegean-wide distribution of the vessels totaling at least 150 (Gillis 1991, 16).

This chapter has provided archaeological evidence for the potential forms of bronze and its component metals which could be distributed as alleged in the Jn series, as well as some examples of the kind of products the palace might have expected in return. The evidence of independent bronze circulation lends support to the prosopographical indications of the smiths not being fully dependent on the palace. Looking back to the palace, the following chapter will now consider how this archaeological data have been determined to fit into the *ta-ra-si-ja* system as it relates to the bronze industry, and how it may answer some of the questions which have arisen from a purely textual analysis.

Chapter 5: Combining the Approaches

Even after consideration of the archaeological evidence, debate still surrounds some of the main questions concerning the Jn series, *ta-ra-si-ja,* and the bronzesmiths. This debate, even after considerations of the archaeological evidence, still includes the question of what AES (**140*) and *ka-ko* represented in the texts (Blackwell 2018, 516). Much as linguistic ambiguity extends to the term in later use as either copper or bronze, a growing number of scholars are in agreement that this extends to the use of *ka-ko* in the Linear B texts, and that the term's use was context-specific and can be determined partly by the archaeological evidence, while minority opinions hold that *ka-ko* can only mean copper or singularly bronze (Smith 1993, 175; Gillis 1997, 506; Blackwell 2018, 516). Yet, the same opinions in agreement that *ka-ko* in the texts can mean either copper or a copper-based alloy begin to diverge in consideration of specific cases, leading even to wholly different proposals for the concept of *ta-ra-si-ja* as it relates to the Jn series.

Looking first at the smaller set of collection tablets, the minority opinion holds that the *ka-ko na-wi-jo* as mentioned on Jn 829 describes "ship's copper" in the form the of the ubiquitous oxhide ingot coming from ships like those which sank at Uluburun and Cape Gelidonya, almost always, if not only, made of copper and not bronze (Michailidou 2008, 526; Gillis 1997, 508; Blackwell 2018, 516). However, the more commonly accepted proposal when considering the archaeological evidence is the interpretation of *ka-ko na-wi-jo* as "temple bronze" (Blackwell 2018, 517). Taken to be the end-stage of *ta-ra-si-ja* and the return of finished products, the contribution of M 2 as listed on Jn 829 might be offered as 10 spearheads or 20 javelin-heads, while N 3 would make 3 spearheads or 7 javelin-heads, based on the aforementioned weights for these artifact-types which have been offered (Michailidou 2008, 533). The more convincing argument is that Jn 829 records the collection of "temple bronze" in the form of scrap bronze (Smith 1993, 208; Blackwell 2018, 517). Much as the textual sources at Knossos have been used to project information onto the *ta-ra-si-ja* system at Pylos, the archaeological evidence at other Mycenaean palatial centers has been similarly used by some scholars to estimate how the system functioned at Pylos (Blackwell 2018, 530). Beyond the archaeological evidence of scrap bronze not only circulating as a commodity but potentially being collected by the Mycenaean palatial centers, including the scrap bronze found at Pylos, the concept of "temple bronze" in Jn 829 as collected scrap material may also find parallels with the archaeological evidence in Cyprus which strongly suggests the practice of bronze recycling at LBA temples (Karageorghis & Kassianidou 1999, 184).

Turning to the allotment tablets, Gillis argued that the lack of any evidence of smelting or metallurgical activity at Pylos is enough to rule out the possibility that the *ka-ko* in the Jn allotment tablets referred to bronze allotted by the palace (1997, 508). That Pylos required a smithy in order to distribute bronze is due to two main reasons: the majority of imported material was in the form of raw metals such as copper, and that specific bronze uses required different ratios of tin to copper (Gillis 1997, 508). Both of these conditions necessitated that the palace have a workshop not only to

make bronze, but to make bronze in specific formulas for distribution. The potential for the need of such consistency in the tin ratios in palatial bronze, versus non-palatial products, has been proposed by other scholars (Michailidou 2001, 96). This lack of evidence for bronze smelting at Pylos, combined with the lack of a reliable term for tin in the Jn series -which Gillis considers necessary if the palace was distributing raw copper- and the archaeological evidence for an economy for these component metals independent of palatial control, led to a markedly different conclusion regarding the Jn *ta-ra-si-ja* tablets: that rather than representing the provision of raw material with the expectation of finished goods in return, the tablets represent a solely unidirectional collection by the palace of bronze in the form of finished products from the smiths (Gillis 1993, 511). This is offered as a solution to the noted lack of any description of the expected returned products in these tablets, for the palace was taxing a smith for the respective weight in *ka-ko* in whatever finished form may have been that smith's specialty. The proposal also finds a solution the lack of any tin distribution in the texts to accompany any copper, looking to the evidence of independent exchange like the tin-covered vessels found in the Argolid to explain local sourcing for the metal in order to produce bronze (Gillis 1997, 509). This is admitted to rely more on the archaeological evidence than considerations of the textual evidence (Gillis 1997, 509). While the author acknowledges that the "use of scrap bronzes… should not be underestimated," the premise that the palace was only interested in the collection of finished bronze products and not the intermediate material of scrap bronze is also based partly on the reading of Jn 829 as "ship's copper" rather than "temple bronze," while ignoring the archaeological evidence of palatial hoards with explicitly broken bronze material (Gillis 1997, 508). The proposal may also place too much emphasis on the independent economy and a lack of palatial control, while contradicting the current understanding of the very specific definition and process of *ta-ra-si-ja* as many understand it. As such, it is considered a "controversial hypothesis" (Blackwell 2018, 529).

Looking towards a less radical proposal which maintains the traditional understanding of *ta-ra-si-ja*, Smith similarly agrees that *ka-ko* can represent either raw copper or bronze in the Jn allotment tablets, and that the distinction between the two can be determined through the total amount being distributed to each group of smiths (1993, 175). Based on the archaeological evidence which suggests an average weight of 26 kg for copper oxhide ingots, and the evidence of distribution of ingot fragments, Smith proposes that the tablets which hold totaling lines of M 26 or more are recording allotments to raw smiths in the form of raw copper ingot fragments (1993, 185). Totaling lines of less than M 26, as well as certain instances without totaling lines, are proposed to be bronze allotments, either in the form of scrap bronze or fragments of a bronze ingot. While the sum of the allotments might be more than or equal to M 26, without an explicit totaling line, the allotted material is interpreted as bronze (Smith 1993, 194). Smith draws attention to the separate allotments to the smiths at *a-ke-re-wa* on Jn tablets 310, 693, and 725 as an example of how the distinctions in metal are made in the texts (1993, 196). On Jn 725, the explicit totaling line allots M 12, which is interpreted to be scrap or bronze ingot. The M 12 allotment on Jn 310 is in series with tablets which hold totaling lines equal to or greater than M 26, leading to the interpretation that these allotments are of raw copper ingot fragments (Smith 1993, 185). In regard to a lack of any textual evidence for tin to be distributed along with the raw copper under this model, Michailidou posits that when raw copper was distributed, it was for products to be made solely of pure copper, rather than a finished product of bronze: “This means that there was no need for tin to be sent from the palace to the smiths of the periphery, since either copper or bronze would on occasion be sufficient, therefore this may be the reason why tin is not recorded in the tablets of the Jn series” (2008, 529). A M 1 N 2 allotment of pure copper could produce a single copper vessel, while a similar allotment of bronze could produce five daggers like that found in Akrotiri, while it is proposed that the palace would still closely monitor the tin content of the allotted bronze depending on the object’s ultimate use (Michailidou 2008, 528-529). The opposing proposals mentioned above

both agree on the idea that the palace would have sought exacting control over the tin ratio in the products, whether collected as tax or as processed *ta-ra-si-ja* material (Michailidou 2008, 528-529; Gillis 1997, 508). While Gillis' proposal provides an answer to the missing descriptions for any expected finished products, the competing proposal does not. Neither proposal discusses whether the finished product, such as the smith's specialty product as posited by Gillis, might change when the original allotment weight changes, like the change seen in the lowering of each allotment for the smiths from Jn 658 to Jn 725 (Smith 1993, 204).

It is at this point that Blackwell's (2018) work on the Mycenaean metal hoards may fill in some of the gaps left in these models. A compelling proposal posits that in the hoards containing complete toolsets along with other broken bronze tools and scraps, the intact tools "represented models for what authorities expected smiths to manufacture as *ta-ra-si-ja* work" from the included scrap bronze (Blackwell 2018, 528). This would provide an answer to the lack of any product specifications in the allotment texts, as the product assignment would be defined by the physical model offered and returned along with the finished copy. The hoards also provide evidence of how the whole (yet unusable) tools like the double axe-heads were broken up into smaller fragments for distribution (Blackwell 2018, 531). The allotments in the Jn series do not hold product descriptors, because the *ka-ko* provided for processing would be accompanied by a model of the product expected in return. With weights of these smaller tools ranging from less than N 1 for a knife found in Akrotiri, to almost exactly N 1 for a large chisel from the same location, to approximately M 1 N 1 for the double axe from the Andrionianoi hoard in Euboea, great flexibility is afforded in what kind of tools may have been assigned for production based on the final allotment a smith was assigned, perhaps with the broken axe heads being recycled into different, lighter tool forms. Such material could be recycled into vessel pieces such as handles and legs, pieces which may have also been included as models in some hoards (Blackwell 2018, 532).

However, such fragments may have also been turned into new forms such as weaponry, leading to the final element of the tablets' context which has not been directly approached in this discussion: Pylos in crisis. A longstanding thread in the study of the Jn series has been based on a number of related questions: is the collection of "temple bronze" in Jn 829 for weapons production a normal occurrence? Is the "scanty amount" of metal allotted to the smiths, a third of whom are without an allotment, a similar sign of crisis? Were these allotments specifically for the production of weaponry as well? (Blackwell 2018, 516; Smith 1993, 206; Palaima 1995, 625). Convincing is the argument of a gradual decline involving perhaps diminished, but still-routine, activities rather than a sudden emergency (Shelmerdine 1987, 568; Palaima 1995, 632). This would still allow for the controlled production of the types of tools enumerated above, rather than a sudden mobilization for the production of military equipment. Yet, this decline does fit well with the evidence of metal shortage proposed in the Jn texts as well as from the archaeological data, including a "paucity of Cypriot oxhide ingots" on the Mainland in the 13th century B.C.E. (Blackwell 2018, 514; Shelmerdine 1987, 567).

Although the evidence of an increase in the trade and use of scrap bronze is evident in non-palatial contexts like the Cape Gelidonya wreck, it is argued that the kind of evidence of bronze recycling found in the palatial hoards is not evidence alone to indicate an increased dependency on this material (Blackwell 2018, 512). However, even in hoards which do contain raw copper ingots or ingot fragments, such as the Tsountas Hoard, these are outnumbered, if not outweighed, by the bronze objects. Further, none of the Mainland hoards contain any raw tin. With this in mind, I believe it unlikely that under the model proposed by Michailidou that so much of the *ka-ko* distributed to the smiths was for the production of raw copper products, when bronze was still needed for tools and weaponry. This leaves two options for Smith's Group A allotments: that the material distributed was to be returned as bronze, or that the allotted material was bronze from the beginning. Yet, the former option returns to the question of how tin was provided for bronze

production. For this answer I point to Michailidou's earlier proposal that "craftsmen might be able to procure the necessary tin by blending in recycled bronze" (2001, 96). Others have placed an emphasis on the necessity for careful bronze ratio control by the palace, as well as pointed to the ratios at Nichoria as evidence for a better control of such ratios by the smiths (Michailidou 2008, 528-529; Gillis 1997, 508); Shelmerdine 1981, 323). Yet, this ignores the fact that 57.89% of the LHIII bronze at Nichoria still fell below the ideal window of 10-12% tin, as well as the explicit variability in tin ratios found in the kind of tools which are proposed to be assigned for production under *ta-ra-si-ja* (Shelmerdine 1981, 323; Michailidou 2001, 96). I believe this evidence, with a predisposition for bronze recycling, the notable dearth of tin, and the combined evidence for a broader metals shortage all point to the recycling of these copper allotments into bronze products, such as tools. Tin is not recorded in the Jn series because it was not distributed, and the raw copper allotments were turned into tin bronze either through the recycling of amounts of tin bronze into the raw copper, or the addition of the raw copper into recycled bronze, with either process leading to a potentially less (or more) than ideal ratio of tin to copper in the alloy.

New archaeological evidence and analyses of old evidence still confirm the commonly understood model for the bronze *ta-ra-si-ja* production system at Pylos reconstructed on the basis of textual interpretation, while also providing new insight into some of the particularities in how it operated and providing answers to some of the larger questions which arose from the textual analysis. As more archaeological evidence comes to light, the interpretation may change, but for the time being the present evidence has allowed for a more complete picture of more longstanding models of the system.

Conclusion

To conclude, this dissertation first considered the context of the Jn series tablets for information which would then be helpful in comparing the textual evidence of the palatial *ta-ra-si-*

ja system as it pertained to the textile and bronze industries. Differences between the palatial administration of these two systems turned the focus on the actual smiths and how their standing in social and economic spheres impacted, or was impacted by, their metalwork for the palace. Though obligated to the palace through *ta-ra-si-ja*, prosopography revealed a certain amount of autonomy for the smiths, which was corroborated by the evidence for bronze circulation independent of palatial control. Further consideration of the archaeological evidence combined with prior textual interpretation has helped build out a more complete picture of the bronze industry and *ta-ra-si-ja*. The Jn series illustrates the careful control of the copper and bronze distributed to the smiths as it concerned the palace, with the detailed recording of these individual responsibilities extending to other texts concerning the smiths. The largest questions confronted in this dissertation were seemingly complete omission of details like the composition of the metal provided and the product expected in return. Some of this may be due to linguistic ambiguity, but the archaeological evidence also reveals that certain omissions may have been more deliberate, with the palace administering the *ta-ra-si-ja* system for bronze production through methods outside of the Jn records. While this model cannot be accepted with complete certainty, a more compelling picture is beginning to emerge of the smiths at Pylos as research continues.

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Appendix

Table 1: Tablets by Hand 2 and Hand 21 at Pylos	
Hand 2	Hand 21
Jn 310	Jn 658
Jn 320	Jn 706
Jn 389	Aq, Ab, Cc, and Cn series
Jn 413	
Jn 415	
Jn 431	
Jn 478	
Jn 601	
Jn 605	
Jn 692	
Jn 693	
Jn 725	
Jn 750	
Jn 829*	
Jn 832	
Jn 845	
Jn 881*	
Jn 937	
Ma, Mn, Ta, Fr, and Wr series	
*- “Collection tablets”	

Table 2: Tablets Containing Totaling Lines	
Jn 320	Jn 389
Jn 413	Jn 415
Jn 431+433	Jn 478
Jn 601	Jn 658
Jn 706	Jn 825
Jn 845	

Table 3: Tablets with Secondary Entries	
po-ti-ni-ja-we-jo entries	
Jn 310	Jn 431+433
do-e-ro entries	
Jn 310	Jn 413
Jn 431+433	Jn 605
Jn 706	Jn 750

Table 4: Smiths Present on Cn and Jn Tablets (After Nakassis 2013, 88)				
Name	Cn text(s)	Jn text(s)	Prosopographical Identification	*ta-ra-si-ja* status
a-ka-ma-wo	131, 719	431, 706	Probable	*a-ta-ra-si-jo*(Jn 431)/ a-ta-ra-si-jo(Jn 706)
a-ko-to-wo	45, 254	431	Certain	*ta-ra-si-ja*
a-ta-tu-ro	436	431	Certain	*a-ta-ra-si-jo*
a-we-ke-se-u	131, 285, 592	605	Certain	*a-ta-ra-si-jo*
*a-*64-jo*	1287	832	Possible	*ta-ra-si-ja* (*a-ke-te-re*)
Da-u-ta-ro/ da-u-da-ro	1287	431	Probable	*ta-ra-si-ja*
de-ko-to	600	410	Certain	*a-ta-ra-si-jo*
do-ro-jo	45	320	Probable	*a-ta-ra-si-jo*
e-do-mo-ne-u	925	389, 605	Probable	*ta-ra-si-ja*(Jn 389)/ *ta-ra-si-ja*(Jn 605)
e-te-re-ro/ [·]-te-re-ro	600	415	Probable	*a-ta-ra-si-jo*
e-wi-te-u	40, 437	832	Certain	*ta-ra-si-ja (a-ke-te-re)*
i-ma-di-jo	436	310	Probable	*ta-ra-si-ja*
ka-ra-u-ko	285	706, 832	Certain	*ta-ra-si-ja*[?](Jn 706)/*a-ta-ra-si-jo*(Jn 832)
ka-ta-wa	40	605	Certain	*ta-ra-si-ja*
ke-we-no	600	431	Certain	*a-ta-ra-si-jo*
ko-ma-we	925	750	Probable	*ta-ra-si-ja*
ko-tu-ro2	436	431	Certain	*ta-ra-si-ja*
ku-pi-ri-jo	131, 719	320	Probable	*ta-ra-si-ja*
ku-ri-sa-to	4	706	Possible	*ta-ra-si-ja*[?]

ma-u-ti-jo	40	389	Probable	*ta-ra-si-ja*
mi-ka-ri-jo	600	605	Certain	*ta-ra-si-ja*
o-wa-ko	131	725	Certain	*ta-ra-si-ja*
pe-qe-u	45	693	Probable	*a-ta-ra-si-jo*
po-ro-u-te-u	131	310	Certain	*ta-ra-si-ja*
po-ru-qo-ta	40, 437	845	Certain	*ta-ra-si-ja*
qe-ta-ko	45, 570, 600, 1287	431	Certain	*ta-ra-si-ja*
ra-ma-jo	285	692, 725	Probable	*a-ta-ra-si-jo*(Jn 692)/ *ta-ra-si-ja*(Jn 725)
to-ro-wi	131	601	Certain	*ta-ra-si-ja*
**wi-ja-te-u/ wi-ja-te-wo*	45, 600	431	Possible	*a-ta-ra-si-jo*
**82-de*	600	431	Certain	*a-ta-ra-si-jo*

Table 5: Smiths Present on E-series and Jn Tablets (After Nakassis 2013, 102)

Name	E- text(s)	Jn text(s)	Prosopographical Identification	*ta-ra-si-ja* status
a-da-ma-o	Eb747.A=Ep301.4,Eo351.1,.2=En659.8,.9	832	Certain	*a-ta-ra-si-jo*
a-tu-ko	En609.5=Eo211.2,Ep 301.5	658, 725, 927	Certain	*a-ta-ra-si-jo*(Jn 927)
e-do-mo-ne-u	En609.13=Eo 224.3	389, 605	Probable	*ta-ra-si-ja*
e-ri-ko-wo	Ep212.2	845, 927	Possible	*qa-si-re-u*(Jn 845)/ *a-ta-ra-si-jo*(Jn 927)
e-u-me-ne	Ea757, Ea822	725	Probable	*ta-ra-si-ja*
e-u-ru-wo-ta	Eb156.1=Ep613.9	310	Possible	*ta-ra-si-ja*
i-ma-di-jo	Ea29	310	Possible	*ta-ra-si-ja*
*ka-ra-pa-so/ ka-ra-*56-so*	Eo269=En659.19	389	Possible	*ta-ra-si-ja*
ko-tu-ro2	Eb839.A=Ep613.13, Eb499.A=Ep301.13, Eb1347.1	431	Possible	*ta-ra-si-ja*
ne-qe-u	Eb495.1=Ep613.1	725	Possible	*ta-ra-si-ja*
pe-re-qo-no	Ea270	605, 725	Probable	*ta-ra-si-ja*
sa-ke-re-u	Ea56,Ea304,Ea756, Ea776	431	Probable	*ta-ra-si-ja*

te-te-re-u	Eb1176.A=Ep539.8	389	Possible	*a-ta-ra-si-jo*
ti-qa-jo	Eo278=En467.1	310	Possible	*ta-ra-si-ja*
wa-na-ta-jo	Eb369.A=Ep301.3, En609.15=Eo224.5, En 609.3–8=Eo211	832	Certain	*a-ta-ra-si-jo*
wi-dwo-i-jo	Eb1186.A=Ep539.12	415	Possible	*ta-ra-si-ja*