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Constructing Trust among Large-Scale Organizations: An Archaeological Case of Collective Action from Tlaxcallan, Mexico

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Constructing Trust among Large-Scale Organizations: An Archaeological Case of Collective Action from Tlaxcallan, Mexico

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by

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ABSTRACT

Within nation-states, agencies, cooperatives, and other groups seeking to coordinate in the management of resources, conflicting interests can hinder cooperation and preclude joint action. Increasing transparency in resource management policies and facilitating communication among groups can reduce cooperative dilemmas by building trust. Developments in collective action research have demonstrated that increased communication and transparency among participants can build trust because future outcomes and behaviors can be predicted based on observations of past actions. Archaeology provides case studies to explore some of the earliest attempts by nation-states to reduce tensions caused by competing factions. This dissertation explores one such case study from Late Postclassic (1250 AD to 1530 AD) Tlaxcallan, Mexico.

Ethnohistoric accounts suggest that the multiethnic Tlaxcallan confederacy was comprised of multiple social, ethnic, and political groups with competing interests. Despite their differences, cooperation was achieved through two strategies 1) establishment of a council-based government, and 2) building a cohesive identity through resistance against foreign economic and territorial conquest. Symbols of cooperative institutions at Tlaxcallan are revealed by "egalitarian" iconography visible on public buildings. Similar iconography painted on Codex-Style polychrome pottery is examined to determine if participants in different households, neighborhoods, and districts engaged in this collective ideology. Codex-Style polychromes painted with statements of self-aggrandizement, instead of inclusionary themes, reveal if households deviated from ideology painted on public architecture.

Public plazas were one location where Codex-Style pottery would have been used in public performance alongside public architecture. The variation in methods used to construct public plazas and residential terraces is compared at three levels of political organization (state,

district, and neighborhood) to identify where their construction was coordinated. Identifying where the authority behind the construction of these spaces was situated, which was necessary for producing and reproducing a state identity, can reveal where collective institutions were organized.

The hoarding of goods promoting statements of prestige and power, such as polychrome pottery, projectile points, and foreign obsidians reveals whether household members practiced the message of symbolic egalitarianism proclaimed on public architecture. Neutron Activation Analysis of polychrome pottery is used to identify if any bottlenecks formed around the exchange of these items. Portable X-ray fluorescence is used to identify if Tlaxcaltecan producers and consumers favored an obsidian source open to all members of the community, or if foreign sources available to comparatively smaller groups were used. A technological analysis of obsidian blades, projectile points, and other tools is used to understand if any exclusionary economic controls existed around the production and exchange of these goods.

I argue that the creation of a shared identity through the use of more inclusive iconography, equitably distributed public space, and open exchange networks of obsidian and ceramic items allowed residents located in different districts and neighborhoods to build trust across large distances, ethnicities, and socio-economic factors. While not all households participated, efforts to build trust and reduce competitive tensions among a multiethnic population are indicated. This dissertation contributes to the limited body of research on how trust is created among large-scale organizations such as nation-states.

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Chapter 1 Introduction

The alliance of cities that comprised the Pre-Hispanic Tlaxcallan state can be described as one of the most consequential in history, as they delivered substantial aid to Cortez during the conquest of Mexico by providing soldiers and resources that were invaluable to the Spanish campaign. After the initial defeat of Cortez at Tenochtitlan by the Aztec Empire, what the Spanish called the "Night of Sorrows", Tlaxcallan sheltered the refugee Spanish conquistadors and eventually contributed to the counterattacks that led to the defeat of the Aztec Triple Alliance. These actions directly allowed European imperial expansion into the Americas and indirectly facilitated other important events in Europe, such as the rise of mercantilism and colonialism, and the decline of feudalism in Western Europe (Crosby 1972).

Tlaxcallan, a small confederation of cities surrounded by the larger Aztec Empire, was an unlikely candidate to make such a large contribution to world history, given its placement on the periphery of world events. The nine cities that would eventually comprise the Tlaxcallan polity were in near-constant conflict with the more powerful states of Mesoamerica throughout the entirety of the Mesoamerican cultural sequence (Figure 1). Alliance building among the Tlaxcallan cities to fend off their powerful and aggressive neighbors, such as the Teotihuacan state during the Early and Middle Classic periods, the Toltec state during the Late Classic period, the Cholula state during the Early Postclassic period, and the Aztec Triple Alliance during the Late Postclassic period, forced a series of shifting alliances among cities located in the region that would become the Tlaxcallan state, with a seat of power located in the capital city of the same name. These long-term alliances eventually coalesced during the Late Postclassic period and facilitated a more cooperative government based on the shared goals of defense and economic stability among its multi-ethnic population. Defense against a common enemy drew

differently interested groups together into a more cooperative polity. As ethnohistoric accounts indicate, Tlaxcallan was a nation perpetually at war with its neighbors.

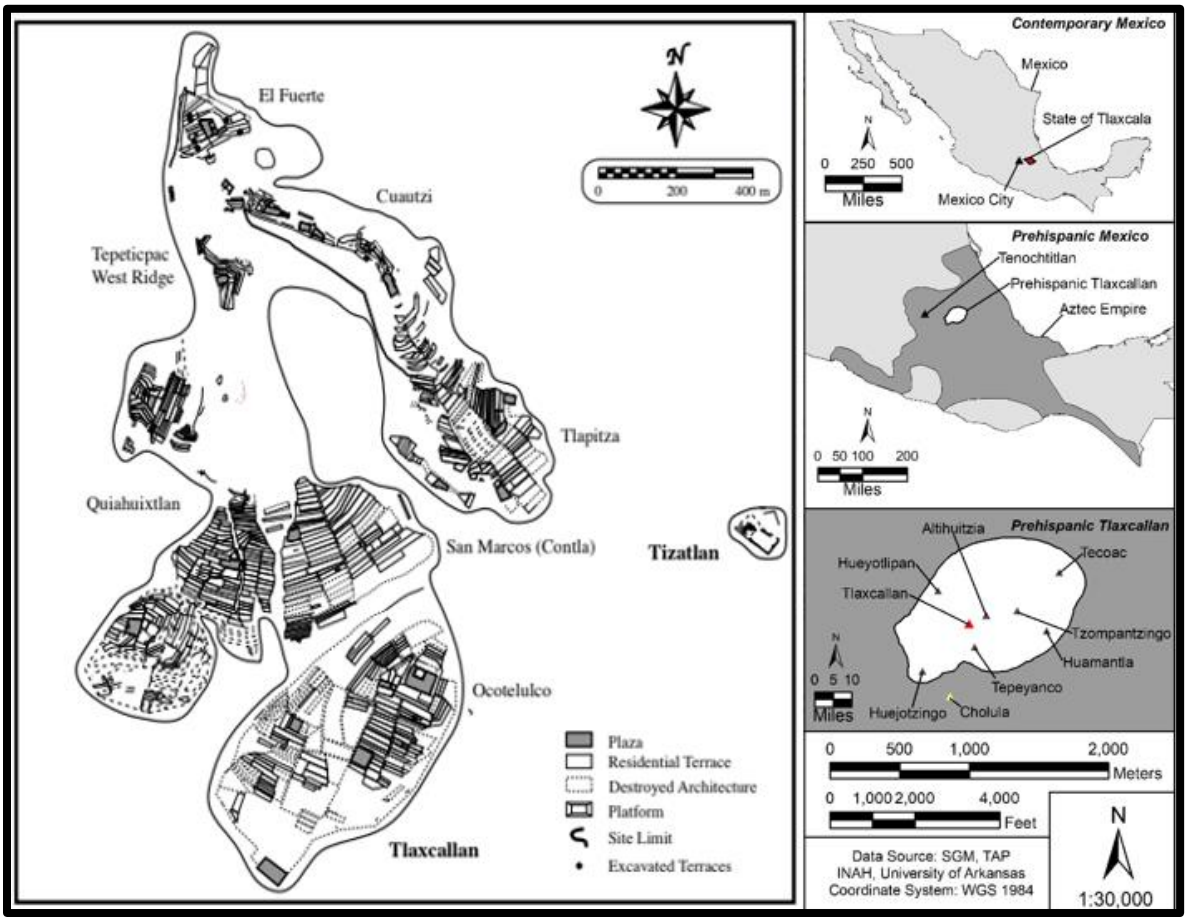

Figure 1. Alliance of cities which comprised the Late Postclassic Tlaxcallan state.

The result of the economic and military collaboration among Tlaxcallan cities, many of which had populations of different majority ethnicity, was a governmental system where competitive political and economic tensions among different ethnicities, and among different social groups may have been comparatively reduced. Reductions in economic and military tensions have been suggested to have facilitated a republic-like political apparatus, as was observed by Cortez himself (Cortez 1986 [1525]). Yet questions remain. *How were the social*

and economic systems at Late Postclassic Tlaxcallan organized? How did those systems reflect, or not, polity governance strategies? How were competitive tensions reduced, or not, among the multi-ethnic population?

To answer these questions, seven households of varying status were excavated during the Tlaxcallan Archeological Project (2015-2019), and the information gathered was examined alongside data collected during archaeological survey by the Tlaxcala Mapping Project (2010-2013). To test how these households interacted within the social and political systems at Late Postclassic Tlaxcallan, four alternative models are evaluated based on a multivariate analysis. The variables that inform model evaluation include household participation in, or rejection of, the inclusive iconography found on public architecture. Specifically, household participation in inclusive iconography can be evaluated based on the symbols visible on Codex-Style pottery recovered within households, which was painted with a similar iconography as that painted on public temples and altars throughout Tlaxcallan. Comparatively large proportions of self-aggrandizing iconography on pottery consumed would indicate rejection of inclusive themes among households. To test whether households actually practiced the inclusive themes supported by the state, economic cooperation can be evaluated by the use of equitable distributions of wealth or prestige items, like green obsidian, projectile points, and polychrome pottery. Economic competition would be evaluated by the hoarding of these wealth or prestige items. These alternative models are also developed to evaluate how households cooperated or competed with one another to obtain resources, and to obtain individualized power and prestige in relation to their neighbors. Based on the participation in, or defection from inclusive political ideologies, and the participation in equitable or exclusionary economic strategies, the degree of household engagement with Tlaxcallan's collective social and economic systems can be identified.

I argue that to decrease the competitive tensions that likely existed among the diverse social groups that comprised Late Postclassic Tlaxcallan, political architects sought to foster a sense of trust and symbolic egalitarianism among groups through the use of inclusive iconography visible on public architecture (Pohl 1998). Household participation in that message was also visible on the symbols painted on Codex-Style serving wares used in public and semi-public rituals. If households utilized high proportions of inclusive symbology, and economic cooperation is evidenced in the relatively equitable production and exchange of goods typically used to indicate power and prestige, then trust among households and neighborhoods can be inferred. If households utilized a lower proportion of inclusive symbology, and economic competition is observed instead, then distrust can be inferred.

Importance

Prevailing theory on the organization of states over the past 30 years has privileged top-down interpretations, with disproportionate attention placed on the autocratic power of the nobility (Baines and Yoffee 1998; Childe 1950; Earle 1993; Fried 1967; Sahlins 1963; Sanders and Price 1968; Service 1971; Trigger 2003; Wolf 1999). Despite a growing interest in alternative pathways to power and collective governance, a large body of research still overemphasizes top-down, elite-centered models, including those relating to political economy (DeMaraise and Earle 2017; Earle and Spriggs 2015; Kirch 2010).

Case studies like Tlaxcallan present us with alternatives to the dominant narratives that pervade the discipline by broadening and diversifying our models into a series of testable hypotheses (Fargher et al. 2010, 2011a; López et al. 2019; López et al. 2021). With the continued use of collective action theory in archaeology (Blanton and Fargher 2008; Carballo et al. 2016;

Feinman and Carballo 2018), the characterization of political systems on a continuum of cooperative to more autocratic has provided ample room for identifying behaviors that facilitate cooperation, rather than placing societies into collective 'types' (Fargher et al. 2020; Marino et al. 2020; Stoner et al. 2021).

Archaeological Correlates of Governance Types

Archaeological theory has provided ample means to detect commoner participation in political systems using portable goods recovered within households; including the examination of iconography on ceramics (Forde 2016; Hernández 2010; Levine et al. 2015), access to obsidian exchange networks (Braswell 2003; Brumfiel 1991; López et al. 2020; Gentil et al. 2021); variation in the scale and centrality of architecture utilized by different socio-economic statuses (Chase and Chase 1992; Kohler and Smith 2018; Hirth 1992; Fargher et al. 2011; 2021; Froese et al. 2014, 2018), and differential access to various wealth items (Charlton 1994; Charlton and Nichols 1992; Demarest et al. 2014; Kovacevich 2007).

Different strategies of governance are indicated through economic and social processes that can be detected with archaeological data. More autocratic systems of governance are indicated by bottlenecks in ideological or economic resources and evidence for centralization of authority with a ruling lineage or ruler (Blanton 1996; D'Altroy and Earle 1985; Earle and Spriggs 2015; Fox et al. 1996; Hayden 1998; C. Smith 1976). Collective governance is indicated by more equitably distributed public goods, common-pool resources, and more localized management of said resources (Carballo et al. 2016; Fargher and Blanton 2007; Fargher et al. 2021; Feinman and Carballo 2018; Marino et al. 2020).

In terms of public goods, observing such patterns archaeologically translates to public space, in this case, public plazas and terraces, being equitably distributed among neighborhoods and districts. I investigate whether public plazas or the areas where state themes and goals are translated to the lower levels of political organization, like districts and neighborhoods, were equitably distributed across Tlaxcallan. If intermediate-level elites who oversaw districts within Tlaxcallan were influencing where plazas were placed, then plaza placement should differ among Tlaxcallan's districts according to the needs of the district.

Several methods are used to identify patterns of portable resource distribution in the archaeological record, to reveal characteristics of differing types of governance. I use neutron activation analysis (NAA) of ceramics to tease apart patterns of ceramic consumption and exchange among contexts at Late Postclassic Tlaxcallan. Chemical analysis of ceramics in household contexts can reveal the production source necessary to identify patterns of household consumption, long-distance exchange, prestige economies, and ritual use of pottery (Blomster et al. 2005; Minc et al. 2016; Neff et al. 2000; Nichols et al. 2002; Stoner 2013; Stoner and Nichols 2019). If any source is concentrated among a particular household or district, then a bottleneck on that resource would be indicated using NAA on the ceramics recovered from archaeological survey and excavation.

Iconographic analysis of ceramics can also be examined to identify what political themes were promoted among different households and statuses, Codex-Style ceramics have frequently been examined in this fashion across Late Postclassic Mesoamerica (Fargher et al. 2010; Forde 2014; Levine et al. 2015; Hernández 2004, 2010; López 2019). Ample research has identified that these ceramics were consumed in all households in Tlaxcallan, but with possibly differing iconographic themes (Fargher et al. 2010, 2011a,b, 2020). These ceramics represent a 'narrative

style' pottery where proclamations of political affiliation and identity were made through certain iconographic motifs (Fargher et al. 2010; Ford 2016; Hernández 2010; Levine et al. 2015; Lind 1994; López et al. 2019; Pohl 2008). In some areas of Mesoamerica, egalitarian ideology is reported on Codex-Style pottery, while in others, pottery reflective of autocratic rule and festivals promoting elite ideologies are present. I seek to determine which style is used most frequently among the Tlaxcallan households of different status.

Technological analysis of lithic tools is frequently used to answer questions of political economy (Aoyama 1999; Hruby et al. 2011; Sheets 1975), including identifying preferences in the consumption of wealth and prestige items among elites or commoners (Andrieu 2013; Carballo 2007; Charlton and Pastrana 2017; Hirth 2010; Weigand et al. 1977). I examine the distribution of lithic materials among seven households of varying status to examine differences in raw material procurement and tool production that may pertain to variation in social and political affiliations.

In the case of prismatic blade production, the obsidian source of the materials produced can be a strong indicator of political affiliation, or whether a household was controlling the exchange of that particular item (Millhauser et al. 2015, 2018; López et al. 2020). Portable X-ray fluorescence can identify whether a particular material source was preferred among elites or commoners, like what has been suggested for green obsidian in Aztec Postclassic Mexico (Cobean 2002; Glascock et al. 1998; Millhauser et al. 2015; Pastrana and Carballo 2017; Smith 1990). Portable X-ray fluorescence is used to identify the obsidian sources among five households to identify preferences in lithic tool consumption and exchange, as discussed in Chapter 6.

Projectile point production and consumption are examined also, as projectile points were considered symbols of power and authority during the Late Postclassic period (Marino et al. 2016; 2020; López et al. 2020). I also examine the distribution of prismatic blade production among seven households located in Tlaxcallan, as control of such items can be an indicator of wealth and prestige, or potentially reveal bottlenecks in the distribution networks that can be controlled by well-situated individuals or groups (Aoyama 1999; Spence 1996; Maholy-Nagy et al. 1984).

Researching Cooperation

Collective action theory is applied as a framework in this dissertation because it is frequently used to tease apart the conflicting motivations of elites, commoners, religious specialists, merchants, and other agents that cooperate during state formation and maintenance. Several researchers have identified that trust is an important component of cooperation, and building trust among different groups with competing interests is an important step in overcoming conflicting self-interests among elites, corporate groups, political architects, traders, and military or paramilitary organizations (see Chapter 2) (De Cremer and Dewitte 2002; Liu et al. 2014; Ostrom 1999). I explore whether ideology and economic and public resources were organized and shared in a fashion that built trust in Late Postclassic Tlaxcallan, by examining the use of iconography, prestige goods, economic networks, and public goods by the residents of the seven households of varying status.

With growing recognition of the variable ways in which different segments of the community participate, or not, in political systems and resource management, archaeologists and social theorists have directed more attention to understanding how participation is first achieved

and sustained among intermediate socio-spatial units of social organization, such as districts or neighborhoods, that are organizationally more complicated than family or household units, but less complicated than the city or polity (Chase 2021; Froese et al. 2014; 2018; Manzanilla et al. 2015; Pool 2008; Slough et al. 2021). Throughout this dissertation, I use large-scale to refer to nation-states. Intermediate-scale organizations are defined here to be districts or large neighborhood organizations. Small-scale refers to smaller neighborhood units, households, or smaller parties like relatively local familial units.

Based on similar studies from the large urban center of Teotihuacan, Mexico, new research has suggested that large state-sponsored rituals were used to engage the participation of household and neighborhood residents within that of larger-scale policies, by providing ceremonial events at public venues like large plazas outside of the central pyramids, or more club-goods (plazas within temple complexes) where residents and citizens could also demonstrate social solidarity in the broader political system (Froese et al 2018). These events fostered a sense of broader community collaboration that reset any rising collective action problems that threatened to split the city into competing factions, such as tensions relating to differential wealth and status among different social segments. Yet, the importance of the specific behaviors in trust building has not been fully explored in archaeology (but see Golden and Scherer 2013; A. Chase and D. Chase 2004; Lucero 2003).

I argue one attribute fostered at large state-sponsored events is the creation of trust among diverse groups using symbols and iconography. An increasing number of studies demonstrate that social capital, of which trust is a major component, is important in fostering group collaboration. Because trust is rooted in reputation garnered from past interactions, in cases where participants have no prior experience working together, uncertainty is formed regarding

the likelihood that unknown members will participate equally. In these cases, steps to reduce this uncertainty, such as the use of flags, emblems, or displaying symbols communicating symbolic egalitarianism, can prevent 'free-riding' and defecting from group goals (see Chapter 2). Free-riding in this case is defined as an individual or group that may obtain the benefits of a good without contributing to the cost (Pasour 1981:453).

By increasing the visibility of participant use of inclusive iconography across districts, as well as increasing observations on the consumption of items that promoted local Tlaxcaltecan economic growth, trust among participating individuals would have been fostered. Identification of such behaviors at Late Postclassic Tlaxcallan would lend support to patterns observed in modern studies, where visibility of participant choices and decision making across groups within large organizations, can reassure group members that free-riding and defection are unlikely outcomes in other groups, thus strengthening trust overall, and facilitating cooperation (Holm and Nystedt 2010; Kahan 2003; Ronnerstrand and Sundell 2015; Sønderskov 2009). Examples of trust-building are the sharing of knowledge across groups, creating shared common goals, and promoting interactions that are likely to be repeated (Chen et al. 2014). At Tlaxcallan (and other locations throughout the world), participation in public events that promoted state ideology, the utilization of imagery or symbology that promoted a political ideology or identity, or using pottery that reproduced a state narrative could have served this purpose (Golden and Scherer 2013; Lucero 2003; Pohl 2008).

Expected Models

Briefly, the possible outcomes for these interactions could be expressed primarily through four models (discussed in greater detail in Chapter 2 and Table 1.1-1.4). The *Collective Model*

presents a scenario where the promotion of symbolically egalitarian ideology, painted on polychrome pottery recovered in households, matched similar iconography painted on public architecture. Trust that most individuals would not free-ride or defect from the collective endeavor that promoted a relatively equitable government, and a reduced focus on personal power strategies and economic domination, would have resulted in reduced levels of intergroup rivalries and economic competition. The reduced use of aggrandizing iconography would occur alongside the reduced use of wealth and prestige items, and personal exchange networks. Public plazas and terraces would have also been equitably distributed among districts. This focus on egalitarianism and reduced social and economic rivalries is the currently promoted model for Tlaxcallan (see Fargher et al. 2010, 2011, 2020, 2022).

The Defection Model (Table 1.2) would again indicate the use of egalitarian iconography painted on polychromes among households that again matched the symbolically egalitarian ideology painted on public architecture. However, while households would utilize these symbols and claim to participate in this state-sponsored ideology, the display of symbols of power, the use of personal exchange networks to access exotic goods, and the competitive display of wealth items among groups would be evidence of false participation. Additionally, repeated competitive interactions would further reduce trust because individuals would have built a reputation based on self-interest, reducing cooperation, and further fostering tensions (Liu et al. 2014).

The Collective with Defection Model (Table 1.3) would indicate that some households were using more egalitarian iconography on pottery, while others utilized iconography that was more personalized and contained expressions of power and wealth. Households would have also been mostly using lower levels of economic competition, with some households pursuing self-interested behaviors. This scenario would indicate that some households were not fully ascribing

to the state ideology visible on public architecture, and may have been intentionally rejecting it, thereby defecting from the collective good others were pursuing.

The Non-Collective Model (Table 1.4) would indicate comparatively lower use of iconography promoting messages of power and prestige, in conjunction with the concentration of items within households that promoted a message of power and prestige. This scenario would indicate self-interested interactions were frequently occurring. The use of personalized exchange networks, which would benefit a specific lineage or group while excluding benefits to others, would also indicate that economic competition among groups was pervasive. This scenario would point to low trust among groups. This occurrence would indicate a scenario of factionalism, competition, and non-participation was occurring, like exclusionary political systems found in other parts of Mesoamerica, most notably the Maya area.

The Organization of the Dissertation:

Chapter 2 details the history and use of collective action theory in archaeology. Why collective action fits best in detailing the political organization of the Tlaxcallan state, as well as ethnohistoric accounts relating to its use in Tlaxcallan. Chapter 2 introduces how the social and spatial organization of the city facilitated the creation of trust among the city of Tlaxcallan's households, neighborhoods, and districts. Different governing strategies in Mexico and Mesoamerica, such as more kingly or authoritarian strategies, are also examined. This chapter will also outline the key tenets of political economy, as previously used in archaeology to identify different political economic strategies and types of political organization.

Chapter 3 details the background to the cultural evolution of Tlaxcala, and the unique culture history of the region leading to the formation of the Late Postclassic state. The

importance of Codex-Style iconography and the "International Style" of symbols and paintings found on Tlaxcallan temples, pottery, and other portable materials will also be discussed. The Mesoamerican World System of the Postclassic period will be discussed during this chapter, which will partially explain the economic and ritual interconnectedness of Central Mexico during this period. Lastly, the political units that surrounded Tlaxcallan and facilitated cooperation in defense will also be identified. Material correlates for the expected models discussed above are also examined in greater detail. Expectations for the patterning of portable goods and iconography at different scales of analysis are laid out in reference to how these goods might reflect more inclusive or exclusive behaviors. Ethnohistoric records show that there was an official responsible for the administration of each of the three scales that focus this dissertation, and their job was to interface with the constituents under their authority.

Chapter 4 will examine the GIS data regarding the locations of public goods infrastructure throughout the city, specifically plazas and terraces. The accessibility of households to plazas within each of the different districts will be examined and discussed. The coefficient of variation (CV) is calculated for the plaza and terrace length, width, area, elevation, and orientation to assess standardization (Marino et al. in review). Plaza and terrace organization, more specifically, if the construction of these public goods was organized at the state, district, or neighborhood level, is examined.

Chapter 5 will pick up the theoretical discussion revolving around visibility and trust in collective action theory (see Holm and Nystedt 2010; Kahan 2003; Ronnerstrand and Sundell 2015; Sonderskov 2007), and the use of ritual to promote and maintain the state (see Froese et al. 2014; 2018; Golden and Scherer 2013; Lucero 2003). Late Postclassic Codex-Style polychrome pottery exchange – including iconographic meaning and distribution, will be the focus of this

chapter. Iconography focusing on agricultural fertility and the state religion, and iconography focusing on royalty and individualized prestige, are compared among households and districts.

Chemical analysis methods used in the dissertation will also be discussed. A background to NAA will be given, including sample preparation methods, and statistical analysis allowing for sample classification. Consumption of Codex-Style pottery, including source location, is discussed to determine if any household or district was consuming this pottery in statistically higher amounts, which may indicate production or a bottleneck on consumption in that district.

Chapter 6 will discuss the obsidian exchange networks utilized in Late Postclassic Tlaxcallan, and how building and participating in local exchange networks produced a system of trust among social groups. I argue that local merchants and consumers could utilize economic networks that promoted local economic growth, or foreign networks which promoted non-local economic growth and personal wealth finance, resulting in the formation of bottlenecks around trade goods. Given the longstanding war between Tlaxcallan and the Aztec Empire, the use of non-local networks would have also served as a statement of affiliation with the Aztec state, or it would have served as a marker of the use of a personal exchange network to build wealth.

Chapter 6 will also examine the distribution of projectile points and evidence for obsidian blade production recovered throughout the seven households excavated and will compare their exchange with that of similar tools from other locations in Mesoamerica. Patterns of exchange are discussed in this chapter that will help our understanding of portable goods consumption throughout Tlaxcallan.

Chapters 7 and 8 summarize the findings of the dissertation. The four models proposed are revisited, and what they identify about Tlaxcallan society is discussed. How the four models relate to the research questions regarding wealth, competition, and collective governance are

identified. Lastly, the broader impacts of this research on what strategies large organizations can utilize to build trust among disparate groups separated by distance, ethnicity, religion, and status, are presented.

Chapter 2 The Theory of Collective Action

This dissertation will primarily use collective action theory to understand how ideology and economic resources were used to build trust in Late Postclassic Tlaxcallan. Collective action theory has roots in political economy and political science and has been useful in understanding trust building among different social segments within nation-states (Ostrom 1990; 1999; 2000; Margaret Levi 1988; Olson 1965; Lichbach 1996). The general tenets of collective action will first be discussed, followed by a discussion of how building trust among diverse ethnic populations and socio-economic backgrounds can facilitate cooperation.

General Tenets of Collective Action

Collective action theory generally focuses on how differently motivated social groups -- whether based on class, ethnicity, occupation, religion, rank, or other -- are able to work together toward a common goal. It also focuses on the problems that arise that can prevent or deter successful cooperation. Collective action studies typically focus on what strategies facilitate cooperation, or the types of behaviors that prevent breakdowns in cooperation when a common goal is sought. These conflicts of self-interest are also known as 'collective action problems' or 'dilemmas' (Hardin 1971).

The theory of collective action can be further broken down into two broad types of inquiry, one which focuses on resource management strategies to solve collective action dilemmas (Hardin 1971; Ostrom 1990; Lichback 1996), and the other which focuses more specifically on revenue allocation by rulers and the funding of nation-states (Lindvisk 1994; Levi 1984; 1988). Hardin and Ostrom discuss resource management, specifically that of 'public

goods' and 'common pool resources.' Public goods are available for repeated use to everyone, they are non-excludable and are not diminished with each use (they are non-subtractable or non-rivalrous) (Samuelson 1954). Examples include public parks, public roads, public water control infrastructure (dams, levees, embankments), and public town squares where people meet to hold markets, post information, and communicate. Collective action problems can arise when public goods are over-utilized (e.g., too many people use a highway causing gridlocks), under-utilized (e.g., no one uses a park), or degraded through poor management strategies (e.g., roads or bridges left in disrepair). Such problems would be noted by the common public and would harm the reputation of the collective entity, and decrease public trust that funds provided to pay for these resources were being effectively managed.

Common-pool resources are goods that are diminished with each use. The 'taking' of resources by one group can detract from the ability of other groups to obtain what they need, potentially leading to rivalries or competition for use (Olson 1965). Examples include finite resources subject to over-exploitation, such as fisheries, forests, mineral resources, and other natural resources that are not privately owned or operated. Because access to common-pool resources is shared, over-extraction based on self-interest becomes a common problem, known as the 'tragedy of the commons' (Olson 1965; see also Lichbach 1996; Lindvisk 1984; Ostrom 1990). Over-extraction differs from over-utilization in that a good or item can be over-utilized but remain intact (e.g., a crowded road), while over-extraction depletes the resource or good until nothing is remaining (e.g., a fishery that is depleted with each use until no fish are left).

Participation in collective arrangements to build, maintain, and share common-pool resources depends greatly on each individual's or group's level of trust that others will reciprocate equitably. Ostrom (1990; 1999; 2000) demonstrated that when participants engage in

repeated face-to-face interactions, participant trust remains relatively high, and resources tend to be effectively managed. This occurs because participants will seek to fulfill their social contract and uphold their reputation. Collective action problems such as the tragedy of the commons can be avoided in this fashion. Cooperation can be encouraged through rewards for participation. Rewards can include a positive payout to participants, access to the common good, or by the avoidance of a negative outcome. Punishments for not reciprocating are another effective measure to facilitate cooperation (Acheson 2011; see also Carballo and Feinman 2014).

Previous collective action studies identify several mechanisms of how individuals of various backgrounds, political affiliations, identity, status, or ethnicity interact in the achievement of common goals (Blanton and Fargher 2008; 2010; Olsen 1965; Ostrom 2000). Research in this area has demonstrated that a main constraint to cooperation among disparate groups is the 'free-rider problem,' which describes individuals who shirk their responsibilities but still benefit from access to a common good. This problem can be averted through "the Four R's": reciprocity, reputation, retribution, and rewards (Carballo et al. 2014; Carballo et al. 2016; Olson 1965; Ostrom 2000). Reciprocity is behavior based on the expectation that a participant will provide help or inclusion in mutual endeavors,. Reputation is the recognition of prior good or bad behavior, and the associated prestige gained or lost from prior interactions. Reputation is linked to reciprocity, as good or bad behavior is partially defined on whether participants reciprocate. Retribution is also known as punishment for bad behavior. Retribution can be a key factor in preventing participants from free-riding in future endeavors. Lastly, reward is the gaining of a positive benefit due to self-interested, altruistic, and other motivations, as all are incentives for fostering cooperative behaviors. These four "R's" are all credited as effectively reducing the free rider problem.

Collective action theory has also been used to address more specific questions of political economy, such as the interplay between commoner 'voice,' and how elites, religious specialists, and political administrators may allocate revenues back to commoners or other agents and groups (Levi 1984). The 'Predatory Rule Theory' notes that those in authority will always seek to extract the best possible outcome for themselves (Levi 1981). Yet, if elites, governments, or other ruling 'agents' rely on payments from the general populace through such revenues as taxes or corvee labor, there will be more constraints on how those resources can be spent because the populace has the option to withhold payments (Levi 1988). If rulers selfishly allocate resources (e.g., they expend resources collected from the populace on exclusive self-aggrandizing projects or exclusive feasts) the lack of reciprocation observed by the populace will erode public trust. Such an outcome can potentially lead to the public defecting from future cooperation (e.g., they refuse tax payments or labor contributions). Examples include the American and French Revolutions, where the mismanagement of tax resources was a significant cause of unrest. In contrast, if elites use their own personal wealth to fund state functions, then significantly fewer restraints will be placed on how the resources are expended. Funds obtained from the general population are termed 'internal revenues,' while elite personal funds or elite landholdings are termed 'external revenues' (Levi 1988).

The implications of current collective action research in political economy and political science are clear, while some self-interested actors choose to 'free-ride,' as proposed in Olson's (1965) work *The Logic of Collective Action,* recent research demonstrates that perceptions and moral obligations, such as generalized trust and reciprocity, play a large role in shaping the actions of agents, and can reduce defection and free-riding among participants (Ostrom and Walker 2003; Kahan 2003; Sonderskov 2009; Ronnerstrand and Sundell 2015). Conversely, in

scenarios of general negative perceptions of a shared endeavor, actors who would normally contribute out of a sense of moral obligation are more likely to choose defection instead (Kahan 2003; Sonderskov 2009).

The Importance of Trust in Facilitating Collective Action

Trust affects whether an individual will cooperate with others, which in turn is greatly influenced by the other's reputation for reciprocation in the past. Trust is defined as the expectation of one person about the action's of others during a collective endeavor, before the actions of others are known (Ostrom 1998:12). The probability of whether cooperation will be reciprocated is based on prior experiences (Ostrom 1998:12). It is important to note here that levels of trust can be formulated about individual people, as in face-to-face interactions, as well as in institutions, such as committees, councils, or state governments.

Because trust is heavily reliant on the ability to directly observe the participation and reciprocation of other groups in a cooperative arrangement, the visibility of the actions of different agents in the collective greatly influences one's willingness to cooperate. Visibility is defined as seeing and perceiving how the choices of participants affect a collective action dilemma (Fennell 2021:2-3). A high degree of visibility enhances trust among individuals and groups, because reciprocity of actions can be observed, and an assessment of the reputation of participants can be formulated, which will influence future interactions.

Research involving small-scale groups like hunter-gatherers, small corporations, or agencies shows that maintaining relationships around trust and reciprocity reduces competitive tensions among groups with different interests. This is because the effects of reputation, punishment, and reciprocity among participants are readily visible in small-scale settings (Holm

and Nystedt 2010; Kahan 2003; Ronnerstrand and Sundell 2015; Sonderskov 2007). However, in large-scale organizations, corporations, or nation-states, uncertainty about how much or whether all participants will contribute is greater because their actions may not be readily visible. A lack of knowledge about unfamiliar participants and suspicion about their potential hidden motives can reduce the likelihood of obtaining a mutually beneficial outcome (Holm and Nystedt 2010).

Thus, fostering trust among participants is an important strategy for large organizations seeking to reduce collective action dilemmas and boost cooperation; and such efforts are broadly necessary to put into place across organizations, agencies, and states. The question of how trust is achieved among nation-states, large organizations that crosscut national boundaries, and large competing corporations, is still a relatively developing field (Wierzbinski and Potocki 2013). Large-scale organizations will often provide incentives for cooperation, such as highly visible public goods created through collective labor projects (Blanton and Fargher 2008:276; Blanton and Fargher 2011:506). This is partly because the public can directly observe, and benefit from, the results of their contributions.

The development of public goods does not always yield high levels of trust. If the public goods deployed are not wanted by the general public, then potential participants could perceive the project in a negative light. For example, if a government increases the police presence in a neighborhood instead of providing basic necessities like clean water, their constituents might begin to doubt how their tax contributions are being spent. In this fashion, the deployment of certain public goods can decrease trust and cooperation.

Among individuals who retain economic or familial ties to an external competitive group, these forces are increasingly felt. For example, in Tlaxcallan there almost certainly were families of Otomí heritage that crosscut the northern boundary of Tlaxcallan and the Triple Alliance

(López et al. 2021; Gentil et al. 2021). There was also probably lineage groups on the southern boundary that had familial ties that crosscut the Tlaxcallan-Cholula border. Within such families, conflicted loyalties probably led to tensions among family members. In these lineage systems with familial ties that crosscut political, economic, religious, or national boundaries, the deployment of public goods that benefited rival groups could have been isolating. Critically, while trust may be 'advertised' at the corporate, supra-household, or state scale on public goods, and while the deployment of large amounts of public goods may be interpreted by archaeologists as evidence for high levels of cooperation, and thereby trust among disparate groups, this may not have been the case.

Identifying Collective Behaviors in Archaeology

Collective action studies in the fields of political science and political economy overlap in several ways with archaeological studies that seek to explain how states formed and how groups managed resources. In archaeology, collective action has frequently focused on state formation and maintenance (e.g. Blanton and Fargher 2008; 2010; Fargher et al. 2016; Feinman and Carballo 2018; see DeMarris and Earle 2017). Later, the focus of collective action studies in archaeology shifted to include how humans cooperate more generally, with specific attention paid to behaviors that facilitate cooperation (Blanton and Fargher 2016; Carballo et al. 2014; 2016; Richerson and Boyd 1999). Very few studies in archaeology have focused on the role that trust plays in facilitating cooperation.

Collective and non-collective arrangements occur along a spectrum in all societies, and archaeological data can be used to identify more inclusive efforts of reducing collective action dilemmas, building trust, increasing reciprocity, and improving communication among disparate

groups (Carballo et al. 2014; Carballo and Feinman 2016). To explore the degree of collectivity in Postclassic Tlaxcallan, I analyze evidence for collective policies visible in the distribution of public spaces, iconography on public architecture, iconography on ceramics recovered from within households, and the production and consumption of portable goods that were often used to communicate a message of power and prestige, like projectile points, green obsidian, and Codex-Style ceramics. I elaborate on these points in the paragraphs below because they are the primary means to identify collective behaviors in this study.

Evidence for collective policies should be visible in public spaces, most frequently in equitable access to public architecture and infrastructure, like equal access to roads, plazas, and markets that bring benefits to all citizens (Blanton and Fargher 2008; 2010). Policies enacted that encourage group participation are evidenced by shared resources or shared public goods. Examples include defensive walls, hunting corrals, road systems, drainage systems, market plazas, storage facilities, public temples, and public altars (Eerkins 2013; Roscoe 2016). Broadly, the organization of intensified agriculture, large public plazas, defensive walls, or other large-scale extra-household construction projects has been stated to be evidence for collective social organization if little evidence for significant top-down coercion exists (Blanton and Fargher 2009; Carballo et al. 2014; Stoner et al. 2021). The organization of labor needed for large-scale construction is one example of a 'restriction point' used by elites to acquire power and prestige, although these constructions can also be accomplished by cooperating kin groups (Earle and Spriggs 2015; Thompson et al. 2018). Where evidence of commoner and elite cooperation exists, like in Classic period El Palmillo, Oaxaca (Carballo and Feinman 2016) and in large regions of the Gulf Lowlands (Stoner et al. 2021), researchers have suggested community organization as playing a key role in social development.

Public spaces are key arenas where identities are negotiated and reified (Inomata 2006). They are the forums in which a collective identity can be promoted, but they also can be the context of dissent, protest, and promotion of intergroup differences. The iconographic message of more inclusive state policies should reflect a shared identity and promote the voice of all members of the collective in decision-making. If a government promoted inclusive iconography, then it might downplay the role of individual groups, such as a noble lineage or a particular ethnicity, and instead focus on inclusive ideas based on themes of shared interest. Themes of common interest across a diverse set of groups might be religious practices, agricultural production, or security and defense. More exclusionary practices might also be featured in public spaces, where emblems, statues, inscriptions, and other symbols of authority might privilege one individual or group over others.

State policies may affect household consumerism and may therefore be revealed by studying the distributions of material goods and portable items across households. Household residents engaged in ritual practices at different scales (state, neighborhood, household). Within these contexts, participants would proclaim aspects of their identities using portable items like decorated serving wares, jewelry and lapidaries, clothing and uniforms, flags and emblems, and symbolic weaponry or medals. These items are frequently found in the material records of households.

More mundane portable goods are also affected by macroeconomic policy, so general patterns of collective economic policies should be reflected in household inventories identified archaeologically. Collective policies that provide equitable access to resources should result in open exchanges and trade networks that provide access to foreign and local goods to all households regardless of class. Conversely, exclusive policies might restrict certain goods from

broader consumption. In the case of this dissertation, foreign and local polychrome pottery and obsidian are examined because they are common items in Mesoamerica that may be restricted from households if more exclusionary policies were utilized.

Archaeologists have examined how groups fostered social solidarity through inclusive ideologies that present a common identity cross-cutting groups of different interests (based on ethnicity, class, occupation, neighborhood, lineage, etc). Competitive tensions among groups can fester and erode trust if not alleviated through a common identity that unifies groups (Blanton et al. 1996; Carballo et al. 2014; Chase and Chase 2009; Chase et al. 2011; Fargher et al. 2010, 2022; Feinman and Carballo 2018). For example, a hierarchy of nested public rituals might have served the purpose of promoting social solidarity at Classic period Teotihuacan (see Froese et al. 2016; Manzanilla et al. 2015).

The identification of multiple palaces and large-scale architectural complexes among the different barrios at Teotihuacan suggest that multiple elite lineage groups were present during the Classic Period. Yet, evidence for state-sponsored efforts to foster trust and social solidarity among the different districts at Teotihuacan is evidenced by impersonal (or "faceless") art, martial imagery, and emphasis on abstract principals of common interest, such as agricultural cycles depicted in murals on buildings and temples. Based on iconography and paraphernalia used in state-sponsored rituals near the large pyramids in the downtown epicenter, researchers have suggested that a single inclusive identity was fostered to crosscut the different and competing lineages residing within the city (Feinman and Carballo 2108; Manzanilla et al. 2014; 2017). Despite the lack of identified noble or kingly lineages within the city, economic competition to procure exotic goods and materials among the city's intermediate elites suggest tensions still existed (Feinman and Carballo 2108; Manzanilla et al. 2017).

Archaeological examples of exclusionary policies are prevalent and include the restriction of certain individuals from participating in various activities, such as political office, religious rites, or the use of certain goods, items, or foods. This behavior can be identified within societies located in the Maya area during the Classic period, where conspicuous consumption, personalized economic networks, and hieroglyphic texts point towards a society where resources were controlled by those of royal, divine, or noble lineages. Similarly, in Late Postclassic Central Mexico, Aztec and Mixtec nobles were depicted in the codices as possessing sumptuary items restricted from the commoner classes, like cotton clothing, precious metals, and turquoise items (Anawalt 1980:37; Olko 2014).

Communication and Trust at Intermediate Socio-Spatial Units

Large-state sponsored rituals were frequently used to engage the participation of household and neighborhood residents in ancient states. State-sponsored ceremonial events at public venues provided a forum where different groups could demonstrate solidarity with each other and with the state through the symbols they wore (clothes, designs on pottery, etc.) and through their actions (participation in collective ritual) (Froese et al. 2014, 2018; Slough et al. 2021). This in turn fueled cooperation and may have helped to reduce collective action problems by building a broader sense of community.

The perceived 'beliefs' of one's peers, or those they trust, can greatly affect how an individual perceives a shared objective. For example, research has demonstrated that if an individual was exposed to positive beliefs about a shared goal by their immediate peers, they were more inclined to feel and act positively about that shared objective, thus increasing participation and reducing defection. Conversely, those with close ties to individuals who felt

negatively about a shared goal were inclined to feel and act negatively about the shared endeavor, resulting in higher rates of failed cooperation (Holm and Nystedt 2010; Ronnerstrand and Sundell 2015; Sonderskov 2007; Kahan 2003).

Accordingly, public forums could serve as a venue to communicate support for political ideologies, but they could also serve as the locations of debate and dissent (Inomata 2006). Participation in public events that promoted or dissented from state ideology, the utilization of imagery or symbology that promoted or dissented from a political ideology or identity, and using pottery that reproduced or broke from a state narrative, were several ways that individuals communicated their intentions regarding shared objectives and goals (Golden and Scherer 2013; Lucero 2003; Pauketat and Emerson 1991; Pohl 2003). Before the modern age of global internet, wide-spread literacy, and hyperconnectivity, it is important to remember how icons and symbols found on architecture and portable media such as pottery and clothes shaped and reinforced socio-religious ideologies. In Mesoamerica, several examples of state symbols and ideology were found on public architecture, and these state symbols and iconographic themes were also reproduced on the highly decorated Codex-Style ceramics found throughout Central Mexico. These ceramics were used in semi-public rituals within households and neighborhoods, and frequently used to proclaim political affiliations, promote noble ideologies, or promote kingly lineages (Levine et al 2015).

Researchers have begun to examine how different groups within a polity might vary in how they cooperate or diverge from collective policies (Manzanilla et al. 2015; Pool 2008; Chase 2021). Among intermediate-level units, like neighborhoods, interest has grown in seeking to understand how large-scale collective policies intersect with smaller-scale cooperative behaviors. At the intermediate scale of organization cooperative strategies promoted at the large-scale are

translated down to actionable behaviors utilized among smaller-scale organizations or neighborhoods (Froese et al. 2014; 2018; Slough et al. 2021). Froese and colleagues (2018) have suggested that large-scale rituals at Teotihuacan provided a venue in which citizens could demonstrate social solidarity with the broader political system, thereby facilitating cooperation in a self-organized governmental apparatus.

I argue that interactions that occurred within the plazas and temples of Tlaxcallan's neighborhoods and districts created trust among different social groups who likely did not interact on a daily basis, and allowed them to visually demonstrate their participation in, and support of, the broader political system. Increasingly, studies demonstrate that the building of social capital norms through behaviors of reciprocity, reputation, retribution, and rewards among differently motivated social groups builds trust in the broader collective. The building of trust among groups seeking to cooperate is important to prevent defection in collective action dilemmas (see Golden and Scherer 2013; A. Chase and D. Chase 2004; Lucero 2003). These studies indicate that the visibility of participant choices and decision making within large organizations can reassure group members that free-riding and defection are unlikely outcomes in other groups, thus strengthening trust in the overall system and facilitating cooperation (Holm and Nystedt 2010; Kahan 2003; Ronnerstrand and Sundell 2015; Sonderskov 2007).

Communication at the intermediate-socio spatial scale allows individuals in different groups to demonstrate intentions more easily to other non-group members. Ceremonies that occur at intermediate-socio spatial units, like neighborhood plazas, draw members together from different groups that might not interact frequently. This allows members of different groups to get a more intimate look at what policies and projects each other support, thereby decreasing anonymity, increasing accountability, increasing visibility among heterogenous populations, decreasing

uncertainty, and increasing emotional attachment. All of these factors have been shown to increase trust and facilitate cooperation in previous studies (see Jagers et al. 2019).

To model these interactions at Late Postclassic Tlaxcallan, seven households of varying status were excavated during the Tlaxcallan Archeological Project (2015-2019) and the artifacts recovered produced a comparative dataset. Ceramic artifacts collected from site-wide archaeological survey during the Tlaxcala Mapping Project (2013-2015), and geospatial data encompassing site-wide public and private architecture are also examined. These datasets allowed for the comparative analysis of obsidian and ceramic artifacts using chemical data, revealed by NAA and pXRF.

I outline in the alternative models below ways in which households may have participated in political themes regarding inclusive governance, or whether households deviated from the message visible on public architecture. Based on the participation or defection in inclusive political ideologies, and the participation in equitable or exclusionary economic strategies, the social and economic systems of the Late Postclassic Tlaxcallan state can be identified, and where power was situated, either among neighborhoods, districts, or at the overarching state level can be discussed. If organized among districts or neighborhoods, it is likely that studies focusing on state-level collective policies may have missed any variation present in political organization throughout the nation-state.

Alternative Models

To model these interactions at Late Postclassic Tlaxcallan, seven households of varying status were excavated during the Tlaxcallan Archeological Project (2015-2019) and the artifacts recovered helped to construct a comparative dataset. To test how these households interacted

with the social and political systems in play in the multi-ethnic state, four models were examined and tested using the material goods recovered. These models are designed to identify the degree to which households participated in state-sponsored political themes regarding inclusive governance, or whether households deviated from that message. They also set up alternatives to evaluate to what degree households cooperated or competed to obtain individualized power, wealth, and prestige, as reflected in the exchange and consumption of prestige goods and the social networks in which they were exchanged. These axes of variation, based on the participation or defection in inclusive political ideologies and the participation in equitable or exclusionary economic strategies, will help identify how social and economic systems were organized.

One possible outcome from these interactions is expressed in *the Collective Model* (Table 1.1). This model presents a scenario involving a high rate of participation in semi-public ritual performances among households, which promoted a 'narrative' theme of egalitarian ideology on pottery that matched inclusive iconography on public architecture. A reduced focus on personal power strategies and economic domination, observed from equitable distributions of obsidian and ceramic goods among households (green obsidian, projectile points, blade production, finished tools, polychrome pottery), would suggest low levels of economic competition among disparate groups and an equitable and open system of exchange. Public goods (public plazas, terraces) would be equitably constructed throughout the pre-Hispanic city of Tlaxcallan. According to Fargher and colleagues (et al. 2010, 2011, 2020, 2022), this focus on egalitarianism and reduced social and economic rivalries is the currently suggested scenario for Tlaxcallan (see Fargher et al. 2010, 2011, 2020, 2022).

The Defection Model (Table 1.2) would indicate pervasive participation in highly visible ritual performances promoting egalitarian ideology, visible in the iconography recovered on polychrome pottery within households. The message of egalitarianism would be largely ignored in practice, and a high level of competition would be evidenced by the display of items that signal rivalries, such as symbols of aggrandizement, the use of personal exchange networks, and wealth items among groups (concentrations of green obsidian, projectile points, polychrome pottery, and obsidian tools). High degrees of competition would indicate comparatively lower trust among groups because increased competition leads to greater perceptions of self-interested decision making within groups, and when repeated, a reputation based on self-interest would be built (Liu et al. 2014:4).

Table 1. Four Models Proposed

	Participation in Inclusive Iconography	Participation in Competitive Iconography
Cooperative Economic Interactions	1.1 *Collective Model* Use of inclusive iconography Cooperative economic strategies of resource pooling and promoting a group identity	1.3 *Collective with Defection Model* Use of competitive iconography Cooperative economic strategies of resource pooling and promoting a group identity
Competitive Economic Interactions	1.2 *Defection Model* Use of inclusive iconography Competitive economic strategies of accumulation and individualized prestige	1.4 *Non-Collective Model* Use of competitive iconography Competitive economic strategies of accumulation and individualized prestige

The Collective with Defection Model (Table 1.3) illustrates low levels of participation in semi-public ritual performance promoting egalitarian ideology, but low levels of economic competition among groups of differing ethnic or socio-economic status. This would be evidenced by egalitarian iconography on Codex-Style polychromes being utilized in some districts only, while others used more aggrandizing themes. Kingly or aggrandizing iconography would demonstrate that some households were not ascribing to the egalitarian ideal promoted by the state. Items of aggrandizement and power (projectile points, green obsidian, polychrome pottery) would be found in relatively equal frequencies among some households, and other public goods (plazas, markets, exchange networks, terraces) would be relatively equitably accessible. This scenario would indicate that some households are not fully ascribing to state ideology and may be defecting.

The Non-Collective Model (Table 1.4) would indicate low levels of household participation in reproducing the state's egalitarian ideology. High levels of economic competition among households would indicate that trust among households was low, as defection and free riding would have been occurring. This would be evidenced archaeologically by dissimilar frequencies of Codex-Style iconography among households, meaning that themes of personal power like wealth and nobility, kingly rulership, and Aztec ideologies would be promoted on Codex-Style polychrome pottery. Variation among household assemblages involving prestige indicators (green obsidian, projectile points, polychrome pottery) would be relatively high. Or their would be comparatively more use of items which pointed towards defection from more localized networks and merchants. Additionally, other public goods, like plazas, markets, and terraces would not be equitably accessed by individuals of differing ethnic or socio-economic status across the site. Exchange networks would be oriented towards the benefit of a few groups,

instead of all. This would suggest a scenario representative of factionalism and competition in Tlaxcallan, as indicated by Pohl (1998).

Material correlates for each of the three models will be discussed in Chapter 3. Chapter 3 will also discuss the culture history of Tlaxcallan, including some reasoning as to why collective action and cooperation in the polity may have evolved, as opposed to other areas in Central Mexico. Chapter 3 will discuss the specific behaviors and material correlates of trust building regarding the formation of open or restricted exchange networks that benefit commoners or elites. Lastly, the exchange of obsidian goods in Mesoamerica, and the geopolitics of obsidian exchange during the Late Postclassic period, will help define why economic competition among districts, neighborhoods, or households may have occurred in the use of local or foreign merchants and exchange networks.

Chapter 3 Approaching Collective Action in Late Postclassic Tlaxcallan

The Pre-Hispanic Tlaxcallan culture area formed in what is referred to as the 'Tlaxcala Block' located in the center of the modern-day State of Tlaxcala, Mexico. This region lies in the basin between the Itzacíhuatl, Popocatepetl, and Malinche Volcanos, an area that may have once been a lacustrine wetland environment (Effra et al. 1971). Today it sits on a plateau that served as a known corridor with trade routes leading through and around the mountain passes of Central Mexico to points further south in Puebla, Oaxaca, the Gulf Coast, and the Maya region (Carballo et al. 2013; 2007; Charlton et al. 1978; see Boone and Smith 2003). These geographical features, known as the 'Tlaxcala Corridor,' directly affected the rise and fall of some of Mesoamerica's most important cities: specifically, Teotihuacan, Cholula, and Tenochtitlan (Carballo et al. 2013; Garcia Cook 1981). The movement of groups through this corridor, both to facilitate trade, to settle in the fertile Puebla-Tlaxcala Valley, and to escape the various conflicts that occurred as a result of the expansionist states that surrounded the valley, fostered the founding of the multi-ethnic settlements within the area that would later become Tlaxcallan. Migrations through the Tlaxcala corridor began in the Middle Formative Period. Further migrations occurred throughout the Classic period into the Postclassic period (Carballo et al. 2007; Garcia Cook 1981; Lesure et al. 2006; Plunket and Uruñuela 2012; Fargher et al. 2010; 2011).

The multi-ethnic polity which composed Late Postclassic Tlaxcallan formed in relation to the migrations and interregional interactions extending back to the Middle Formative period (Figure 2) (Abascal 1975a; Garcia Cook 1981; Lesure et al. 2006; Plunket and Uruñuela 2012). The Tlaxcallan State incorporated Nahua, Otomí, and Huastec language groups, and incorporated other Chichimec peoples who resided near Cholula and Huejotzingo in an alliance based on defense against common enemies (Castillo Tejero 1996). The longstanding alliances among

these ethnic groups facilitated their ability to resist Aztec dominance in the Late Postclassic period.

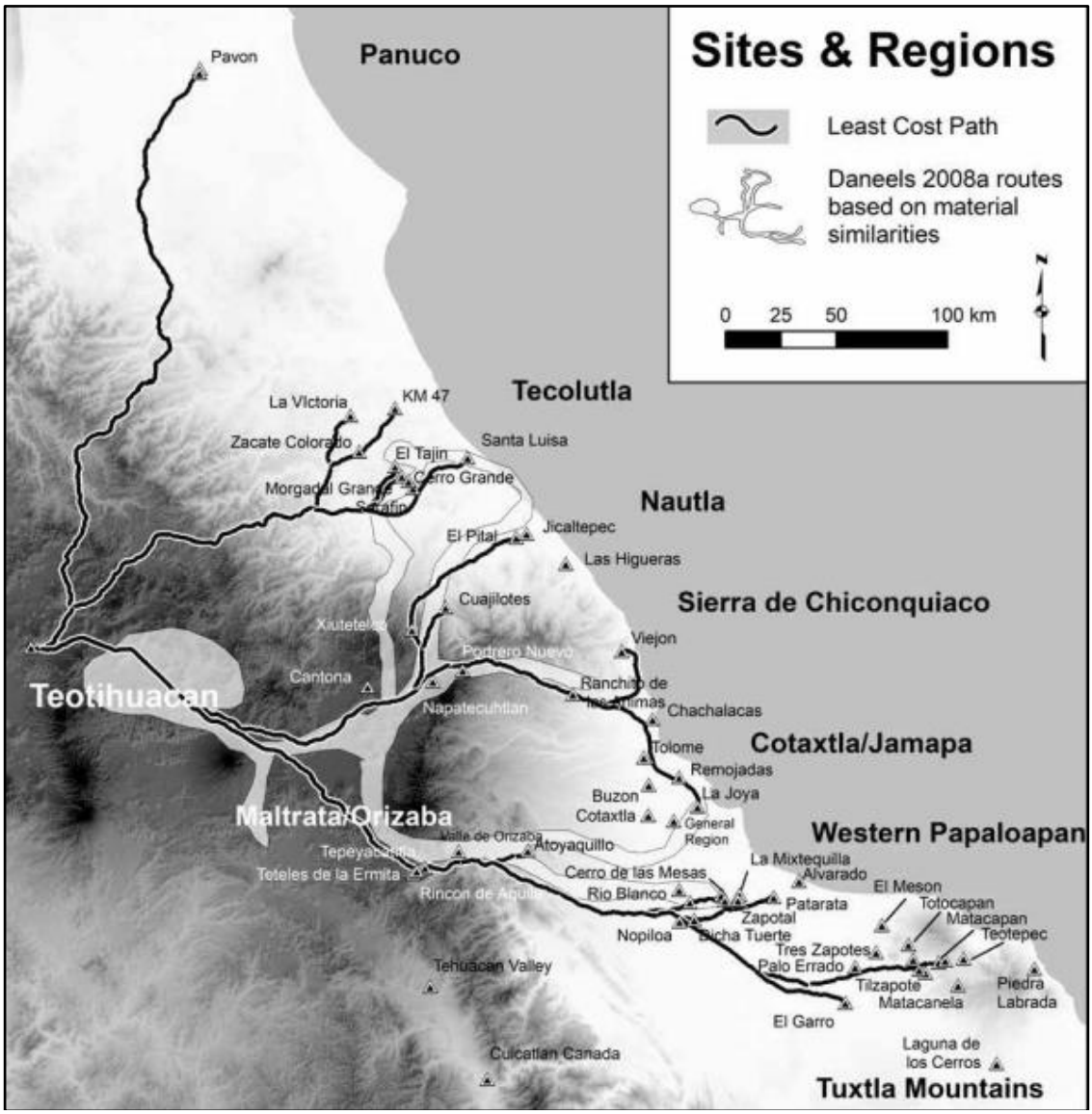

Figure 2. Placement of Tlaxcallan cultural area (roughly corresponds to grey circle) within the Classic Period corridors that linked States and Empires in Mesoamerican chronology (black lines). From Stoner and Marino 2020, Figure 10.1.

History of the Late Postclassic (AD 1250-1520) Occupation in Tlaxcala Region

The political organization of Tlaxcallan was complex with multiple cultural groups having settled in the region before the Postclassic Period. The pre-Hispanic city of Tlaxcallan was a 400+ hectare city located in the State of Tlaxcala, Mexico (Fargher et al. 2007; López et al. 2015; Millhauser et al. 2015). The city had been described as comprising 4 separate "kingdoms," allied together to form a loose confederation known as an altepetl (Lockhart 1992; c.f. Gibson 1952). Each of the four kingdoms that comprised the city (Tizatlan, Quiahuixtlan, Ocotelulco, and Tepeticpac) were first postulated to be ruled by a lineage-based kingship system in which rulers were invested with personal power through decent (Lockhart 1992; Gibson 1952). Tepeticpac was traditionally believed to have been settled first. The site is located at the summit of a low-lying mountain that overlooks the Puebla-Tlaxcala Valley. Either the descendants of the Tepeticpac lineage, or other families, were originally believed to have subsequently founded Tizatlan, Ocotelulco, and Quiahuixtlan, in that order (Lockhart 1992; Muñoz-Camarga 1984 [1584]).

Ethnohistoric sources give a description of the founding of the Tlaxcallan city, although this description differs slightly from information obtained from archaeological investigations (see below). According to Motolinía (1954:316-318) the first district of the city to be founded was the Tepeticpac district, the name of which means "on top of the Sierra." Muñoz-Camarga places the founding date of the city in the year Five Flints, which corresponds to AD 1380 (Camarga 1984:82). Motolinía made sure to state that the modern City of Tlaxcala is located "one league" below the pre-Hispanic location noted as an unoccupied Sierra. He described the modern city as being located where the modern river course flows (Motolinía 1954:317).

Motolinía noted that Tepeticpac was founded at a high altitude because of the many wars fought between Tlaxcallan and its enemies. At the time of conquest, Xicotencatl the Elder was stated to be the lord (district head) of Tepeticpac, and his son was the premier general of the land (Camarga 1984:84; Cortes 1986:204).

The Spanish chronicler Muñoz-Camarga (1984:72) noted that the ashes of the deity Camaxtli were protected by the district head of Tepeticpac. The founding ruler of Tepeticpac gave a portion of those ashes to the founding ruler of Huejotzingo (the brother of the district head of Tepeticpac), before the other districts of Tlaxcallan were founded. Because of this statement, it is likely that the Tepeticpac district utilized the funerary bundle of Camaxtli to incorporate participation in the Tlaxcallan alliance, and as a legitimization strategy. The ashes of Camaxtli were noted to be kept in both the main temple at Tepeticpac, and the main temple at Huejotzingo (Camarga 1984:72; see also Pohl 1998:185). Both Camarga (1984:5,72) and Motolinía (1954:132-133) make clear that Camaxtli was the state deity of Tlaxcallan and Huejotzingo. In contrast, Quetzalcoatl was stated to be the principal god of Cholula (Motolinía 1954:132-133).

The next district founded was that of Ocotelulco, due to population pressures according to the chronicler Camarga (1984:71) and was built on a hillside located closer to the river which flows through the modern town. It was stated to be south of Tepeticpac and ruled by Maxicatzin at the time of the conquest (Camarga 1984:80; Cortes 1986:207). Ocotelulco was noted to be the seat of the largest market, ruled by the most powerful ruler (Maxicatzin) (Motolinía 1954:317). Hernando Cortez and Muñoz-Camarga attest to Maxicatzin as being the most wealthy and the most powerful ruler of Tlaxcallan, and the "Lord of the Market" (Camarga 1984:80; Cortez 1986:207). Pohl (1998:185) explicitly states based on ethnohistoric accounts and iconography on

altars and in temples, that Tepeticpac and Ocotelulco likely utilized different power legitimization strategies, and also experienced significant tensions involving factionalization between the two districts and rulers.

Tizatlan was founded next and to the east of Tepeticpac and Ocotelulco, and said to be ruled by Xicotencatl the Elder according to Motolinía (1954:317). However, rulership of this district differs among chroniclers, and because this area is largely considered to have been a political and religious center, it was probably not a residential complex at all, but an administrative complex where the Tlaxcallan council met (Fargher et al. 2011; Pohl 1998:185). Archaeological survey has identified that this location was devoid of any residential occupations, and only a large temple complex was constructed there (Fargher et al. 2010; 2011; 2020).

Lastly, the district of Quiahuixtlan is listed as being the fourth and final area settled (Motolinía 1954:316) and was ruled by Tequanitzin (Camarga 1984:68). Quiahuixtlan was described as the westernmost district of the capital and contained a large area. This area was a large supplier of soldiers for the incessant wars which were fought between Tlaxcallan and its neighbors.

Based on this description, it is likely that Xicotencatl the Elder was actually the council head at the time of conquest (Pohl 1998:185). Motolinía probably confused him for the district head of Tizatlan because the council met at Tizatlan, despite it being a non-residential area. Other individuals like Maxicatzin, Xicotencatl the Younger, and Tequantzin were examples of other district-level elites and council members at the time of conquest. Motolinía also stated that while the four districts were governed by four principal lords, many lesser lords were organized under them (1954:318). These lesser nobles were probably neighborhood heads.

Motolinía (1954:318) stated in his account that Nahua was the most spoken language in the capital, and that Otomí was more commonly spoken in the hinterlands. This lends evidence to the argument that Tlaxcallan was a multi-ethnic polity, and that regional differences in lineage systems based on ethnicity were present in the polity. It is likely that familial ties and lineage systems also crosscut the borders between Tlaxcallan and the Aztec Empire. Otomí was described by Motolinía as the second most spoken language, and Pinomes was the third most spoken language (1954:318).

Ethnohistoric accounts point towards significant tensions between at least two elites in Tlaxcallan at the time of conquest. Camarga (1984:85) goes to great lengths to mention the rivalry that existed between Xicotencatl the Elder (the ruler of Tepeticpac) and Maxicatzin (the ruler of Ocotelulco). This rivalry culminated in the death of Xicotencatl the Elder's son (Xicotencatl the Younger), a political move ordered by the Tlaxcallan council and publicly supported by Maxicatzin (Camarga 1984:86). These two elites also utilized two different strategies of legitimization. At Tepeticpac, a strategy focused on socio-religious legitimization was used. At Ocotelulco, control of the largest market provided wealth and prestige through economic influence (see Pohl 1998:185). Based on Motolinía's description of Quiahuixtlan, that district may have provided quality training of soldiers, or other martial characteristics, as a legitimization strategy, but this needs further study.

Other evidence for factionalization within the Tlaxcallan polity is noted by the chroniclers. At Ocotelulco, shortly after the founding of the district, a district head was murdered by his brother who then acceded to rulership (Camarga 1984:79). Other accounts of factionalism and civil wars are frequently discussed in ethnohistoric accounts (Camarga 1984:55-57; see also Pohl 1998).

The chroniclers also mention that significant geopolitical interactions had been affecting Tlaxcallan at the time of conquest. Hernando Cortes (1986:199) mentioned that Tlaxcallan was incessantly fighting with the Aztec Triple Alliance located to the west and north of Tlaxcallan, and their allies in Veracruz located to the east. Other chroniclers note that the Tlaxcallan state was locked in a perpetual war with Cholula to the south (Camarga 1984:62-64; Cortes 1986:215). This 'envelopment' of Tlaxcallan by its enemies allowed for the Triple Alliance to carry out an economic embargo on the state, according to Hernando Cortes (1986:208), which may have resulted in the diminishment of obsidian and other resources (Millhauser et al. 2015).

More recent analyses of both ethnohistoric accounts and archaeological data call into question the division of the city into four distinct kingdoms and instead argue for a unified city organized into different districts. Gibson (1952) specifically cast doubt on the four-kingdom organization and asserted that no evidence for this organization existed before the Colonial period, when this organization was first proposed. No Spanish chronicler, including Cortez, noted this political organization in their description of the city at the time of the conquest (Cortez 1986 [1525]; see also Motolinía 1950 [1568]; Diaz 1986 [1581]; Muñoz-Camarga 1984 [1584]). Instead, all ethnohistoric documents mention rule by a council, principally consisting of between 30-500 members (Fargher et al. 2010; 2011). All Spanish accounts do mention at least two individuals (*Maxixcatzin* and *Xicontencatl*) whom they note as being 'nobles' or 'lords', but these two are not called kings, nor are any kings mentioned by Cortez in his description of Tlaxcallan. By contrast, Cortez does call a Maya 'lord' of Cozumel a 'king,' and he makes it clear that Moctezuma of the Aztecs was 'king' who ruled many 'lords' (Cortez 1986 [1525]).

The status of Tizatlan itself as a 'kingdom,' or even a city, has been called into question, as an archaeological survey of the area identified no residential buildings or artifacts, simply a

large temple in the center of a plaza (Fargher et al. 2016). Additionally, the concept of the 'altepetl' as a lineage-based system of rulership as described by Lockhart (1992) has been debated. Some describe it as a kinship system based more on property and land affiliation, and not lineage affiliation (Chance 2000).

With these discrepancies in mind, a recent archaeological survey (2007) and excavations occurring within the area that used to be the pre-Hispanic city of Tlaxcallan (2015-2019), has identified instead a political apparatus where three districts (Tepeticpac, Ocotelulco, and Quiahuixtlan) formed the core city of Tlaxcallan (Figure 3) (Fargher et al. 2007; 2010; 2011a; 2011b; Millhauser et al. 2015; 2017). The pre-Hispanic city was founded at the end of the Early Postclassic period, and grew rapidly, likely due to its safe position on an easily defensible mountaintop (Fargher et al. 2010:317; López et al. 2021:5). The Colonial period city, and thus the modern City of Tlaxcala, is located in the valley below the pre-Hispanic capital. The movement of the city was likely an early version of the *reduciones* system widely used by the Spanish during the Colonial period, to relocate indigenous settlements to areas where they could be more easily controlled.

Ethnohistoric accounts coupled with recent archaeological research indicate that the Tlaxcallan state encompassed about 2500 square kilometers and included at least 8 regional centers that housed between 250,000 and 300,000 people in total. Evidence suggests that the site was a complex alliance of cities (including Tlaxcallan's intermittent ally Huejotzingo) (Fargher et al. 2010; 2016), that spanned the entirety of the large geographical area previously mentioned as the Tlaxcala Block. Evidence for this is found in ethnohistoric accounts, and Cortez (1986 [1525]) mentioned several battles that occurred within the borders of the Tlaxcallan state, but several days march away from the capital city of Tlaxcallan. During these battles, different city-

state members attacked the Spanish army as they marched towards the Aztec capital in Central Mexico from the Gulf Coast. When first asked why they chose to resist the Spanish, the Tlaxcaltecans blamed a faction of their confederation partners, for starting the war, and these same members of the confederation were mentioned as both generals and council members on Tlaxcallan's ruling council (Cortez 1986 [1525]; see also Motolinía 1950 [1568]; Diaz 1986 [1581]; Muñoz-Camarga 1984 [1584]; Zorita 1963 [1585]).

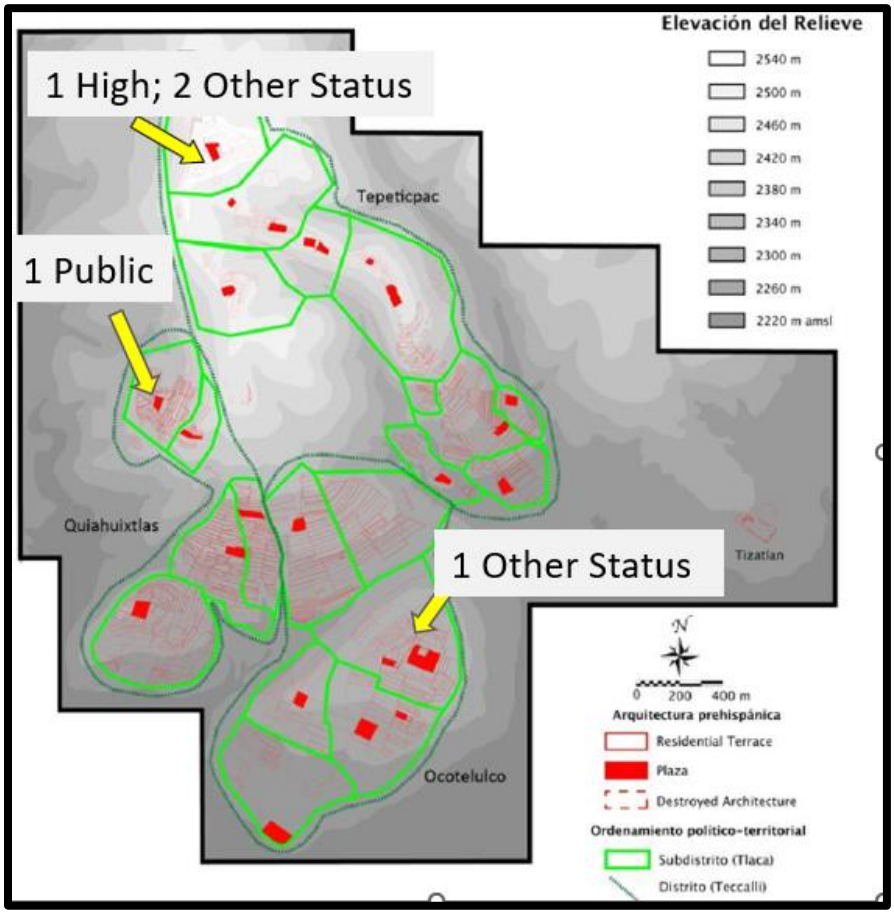

Figure 3. Location of plazas, terraces, and excavated structures in LPC Tlaxcallan.

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The eponymous city of Tlaxcallan was the largest settlement within the multi-ethnic state and housed on the order of 40,000 individuals and included the seat of power which was likely located at the temple complex at Tizatlan. Ethnohistoric accounts point to the city of Tlaxcallan being the economic, political, and religious epicenter of the broader Tlaxcallan state, for this reason we refer to it as the capital of that state. Each district within the city, called *teccaltin* in ethnohistoric accounts (Chance 2000), was subdivided into neighborhoods (*tlaca*) centered around public plazas. Each district (singular *tecalli*) was administered by a ruler (*teuctli*), and the ruling heads (*tetecuictin)* of each district were important members of Tlaxcallan's ruling council. Tlaxcallan's ruling council consisted of an estimated 50 to 250 members, with the outlying cities in the Tlaxcallan polity also contributing council members.

The ruling council enacted large-scale policies at Late Postclassic Tlaxcallan. The most frequently discussed role of the council by ethnohistoric accounts was state defense, leading public rituals, and maintaining diplomatic relations. Ethnohistoric accounts also described the ruling council as tasked with internal affairs like electing officials and ensuring compliance with laws and policies. External affairs consisted of maintaining geopolitical relations (i.e., meeting with diplomats), and organizing state defense (i.e., leading military institutions and troops).

Intermediate-scale governance was likely accomplished at both the district and neighborhood levels. For example, each district had a ruler who administered matters important to their constituents. Ethnohistoric accounts and archaeological evidence point to these tasks as revolving around tax and tribute collection, coordinating military and other corvée labor obligations, policing, and maintaining market institutions. The district administrators likely acceded to their position based on merit, as identified in ethnohistoric accounts. Ethnohistoric documents also mention that lines of heredity (i.e., the statesman Xicotencatl the Elder and his son Xicotencatl the Younger) also played a large role in an individual's political success. However, any authority figure in Tlaxcallan, regardless of their social rank, could lose their position or title, or be executed at the discretion of the state. An example of this is illustrated by the execution of Xicotencatl the Younger after council vote; he was a popular noble, a successful general, and the son of a premier statesmen. The fact that council members could be sentenced to death by council vote (Motolinía 1950 [1568]; Cortez 1986 [1525]; see also Fargher et al. 2010), demonstrates that nobility did not exempt one from following the rules of the state. Due to these factors, some have identified the Tlaxcallan political structure as a New World republic (see Fargher et al. 2010; 2011a, b; 2021; 2022). Cortez (1986 [1525]) likened the political organization of Tlaxcallan to the European Republics of the time, and he directly named Genoa,

Piza, and Venice as being similar in political organization to Tlaxcallan. Regardless, the current evidence points to a nation-state experiencing significant geopolitical stress caused by the encroaching Aztec Empire during the Late Postclassic period (Figure 4). It was crucial for Tlaxcallan to effectively incorporate its disparate parts into a coherent alliance, including the mitigation of any internal competitive tensions in order to resist Aztec conquest.

In terms of neighborhood organization, neighborhood headman, priests, or more localized lineage heads probably served as figures of authority in Tlaxcallan, based on several lines of evidence. First, neighborhood heads are frequently identified in cross-cultural discussions of neighborhood-level organizations, including Mesoamerica and locations further abroad. For example, In Late Postclassic period Mesoamerica, throughout the political units that comprised the Yucatan Peninsula, rulers termed *botabob* oversaw neighborhood units called *cah* (Chase 1985:223-225; Marino et al. 2020:786; Oland 2016:109). In the books of *Chilam Balam,* Landa (Thompson 1970:169) identifies priests or specialized craftsman, termed *ahmen,* as figures of authority within neighborhoods in the Yucatan. In the Puebla-Tlaxcala valley during the Late Postclassic and Early Colonial periods in Central Mexico, López and Hirth (2012) discuss a lower-level "elite" or headman that oversaw landholdings within small geographic proximities. These relatively smaller units, centered around a noble estate or possibly a lineage group occupying a valley space or area within a town (i.e. neighborhood), served to link households (small-scale) to larger political organizations such as neighborhoods (small-scale to intermediate-scale), districts (intermediate-scale), and then the state (large-scale). Outside Mesoamerica, a *bao* is identified as a probable organizational unit that was under the authority of a neighborhood headman, and these organizations were an important political unit in Chang, China (Smith 2010:8). A similar structure of tribute producing landholders organized around a neighborhood

head are known as Calpolli in contemporary and Colonial Mexico, but Hicks (1982:240) also notes that when referring to pre-Hispanic Central Mexico, Calpolli could also be referring to barrio-level organizations. However, this discussion illustrates that neighborhood political units in pre-History, similar to today, were probably a key arena of smaller scale decision-making.

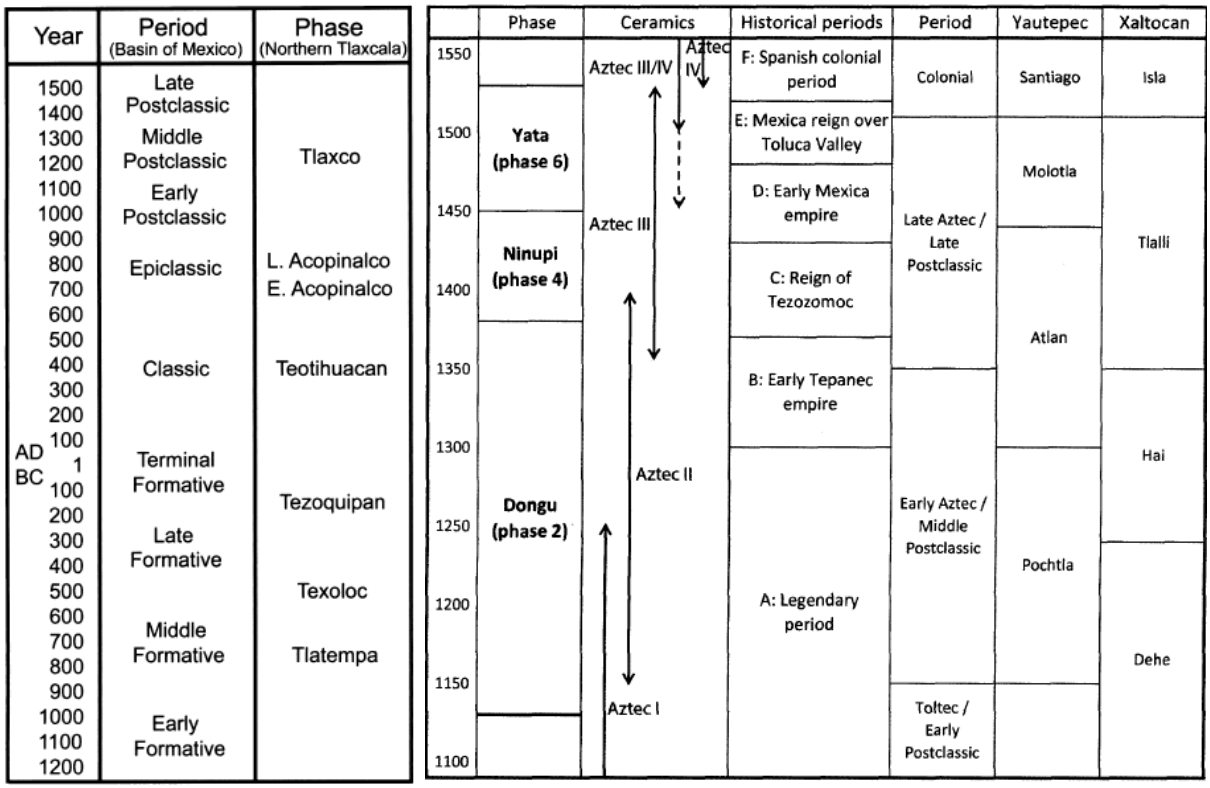


Figure 3. Basin of Mexico and Northern Tlaxcala chronology (Left), alongside updated Aztec chronology (Right) for Central Mexico (see Carballo 2007, Figure 1; Huster and Smith 2017, Figure 8).

Competition in Late Postclassic Tlaxcallan

Because Tlaxcallan was a large state in Central Mexico that encompassed several cities of different ethnicities, religious beliefs, and political-economic motivations, the creation of a policy to reduce competition and increase trust among its constituents would have been of

paramount importance. Because these individual cities interacted with one another through a council system, building such a system across diverse groups would have required a high level of trust to function. Examples of conflicts are inherent between the positions of authority and the nobility that existed in Tlaxcallan, where service to the state was a significant means to attain status during the Late Postclassic period.

In ethnohistoric accounts several terms are used to describe an individual's rise or fall in status, and these changes in political status often result from internal power struggles. For example, *pipiltin* means noble, *macehualli* means commoner, and *yaotequihua* is a commoner being promoted to noble (Fargher et al. 2010, 2011; Motolinía 1954 [1568]; Zorita 1963 [1585]). The fluidity of status in Tlaxcallan is also believed to have occurred among political office holders (see Motolinía 1954 [1568]), as even high-ranking members of Tlaxcallan's ruling council were able to be tried by law, demoted, or executed (Cortez 1986 [1525]). Several chroniclers point to factionalism among members of the ruling council, including the authority of some members to disobey council directives and make unilateral military decisions (Pohl 1998; Cortez 1986 [1525]).

Thus, some form of self-interest and likely competition among political architects existed. Economic tensions also probably existed among commoners, merchants, and elites, an occurrence found within every society. To reduce these tensions, it has been suggested that an "egalitarian" ideology was promoted through conspicuously placed iconography on temples and altars throughout the city (Fargher et al. 2010, 2020). Rituals performed in public spaces, which referenced the deities and themes observed on this iconography, were performed to produce a sense of "Tlaxcallan exceptionalism" (Fargher et al. 2010; 2011; 2020). A similar scenario has also been observed in other parts of Mesoamerica, where "symbolic egalitarianism" may have

been fostered using ritual performances, in order to promote cooperation among diverse populations (see Chase and Chase 2004).

Organization of Tlaxcallan Neighborhoods

The Postclassic city of Tlaxcallan, located in Central Mexico, where this research occurred, was a large capital city of more than 40,000 individuals residing in three districts. The Tlaxcala Mapping Project located and mapped 815 residential terraces, 21 neighborhoods, and 36 public plazas throughout the three districts of the pre-Hispanic capital city. In this urban environment, neighborhoods can be identified based on the proximity of plazas to residential terraces, and the spatial layout of residential terraces. Plazas were the center of public life in Mesoamerica. Not only were they critical spaces for public ceremonies, but they served economic, political, and social functions for the surrounding households as well. The plaza is where members of neighborhood households would interact on a frequent basis. I compare neighborhood plazas and terraces using indices of area, length, width, perimeter edge length, orientation angle, and elevation to identify any patterns in plaza and terrace placement that may reflect how space was organized among the 21 neighborhoods.

The archaeological study of neighborhoods is broadly important because they are a universal feature of urban development worldwide (Smith 2009, 2010, 2020; Pacifico and Truex 2019). Archaeologists and historians often provide case studies that contemporary urban planners can use to understand the organization of space in dense populations, the social mixing of individuals of various wealth and status, the organization of resources, and the creation and maintenance of social hierarchies and political power (Blanton and Fargher 2011; Froese et al. 2014; Hutson and Welch 2019; Pugh et al. 2020; Smith 2004, 2011; M. Stark et al. 2015;

Thompson et al. 2018). Archaeologists typically see neighborhoods as an intermediary between households and larger administrative units in urban settings, and also where the domestic and political economies intersect. I argue that by modeling how public goods were deployed among the neighborhoods placed within districts, I can compare how those neighborhoods were integrated into the larger political system.

The identification of neighborhoods can occur in several ways, but they are chiefly defined as areas where individuals experience daily 'face-to-face' interactions and have distinct social and physical characteristics; they are usually identified by close proximity of households to features that facilitate daily social interactions, such as the aforementioned plazas (Hutson and Welch 2019; Smith 2010; Thompson et al. 2018b, 2022). For example, the spatial clustering of households has been used to infer the presence of neighborhoods (Price et al. 2022; Thompson et al. 2018, 2022; York et al. 2011). The clustering of households adjacent to public architecture is another indicator of neighborhood organization (Fargher et al. 2010; Stark et al. 2015). This is because residents likely interacted daily regarding local political decision-making, and during domestic activities (Thompson et al. 2018b; Walden et al. 2019). The clustering of the "Three-Temple Complexes" at Teotihuacan may be a more densely urbanized version of spatial organization surrounding public architecture (Headrick 2007).

Walled pathways have also been interpreted to represent neighborhood boundaries because they enhance connectivity among residents within the walls but increase the difficulty of interacting with those outside (Hutson and Welch 2019; Jennings and Earle 2016:478). This is not to say that residents could not interact with those outside of the neighborhood, only that city planners designed the urban landscape to facilitate easy interaction *within* neighborhood units (Jennings and Earle 2016:478). Gridded roads and walled pathways are another form of

boundary used to construct ward-like neighborhood settings by urban planners, as identified in 18th-century Istanbul and several Pre-Classic and Classic Mesoamerican centers (Blanton and Fargher 2011; Pugh 2020).

This study examines the physical characteristics and locations of public plazas and residential terraces to ascertain the principles of their construction. Both of these architectural categories have been studied in Tlaxcala for over a decade, and as such are well understood in terms of construction practices, location, and function (Fargher et al. 2010, 2011, 2019, 2020). Prior research identified neighborhoods based on the clustering of residential terraces in conjunction with the placement of public architecture (Fargher et al. 2010; 2019). As neighborhoods serve as an intersecting node of the domestic and political realms, top-down influences can be modeled because public spaces served multiple economic, religious, and political functions, and state ideology and public policy were promoted at these locations. They also served as the location of smaller-scale public rituals and economic transactions, and a gathering place for residents and intermediate elites. Thus, public plazas represented the location where top-down policies met lower-level participation or rejection (Fargher et al. 2019; see also Golden and Scherer 2013; Walden et al. 2019).

The archaeological study of neighborhoods can yield important information on how residents interacted at intermediate socio-spatial units (i.e., communities participating in daily face-to-face interactions). The comparison of neighborhoods within larger organizational units (i.e. administered barrios or districts) can illuminate how broader policies were enacted at different scales, including how they were operationalized among households. The location of public goods (public plazas) within the neighborhoods of Late Postclassic Tlaxcallan is examined to illuminate how they were organized among districts (Figure 5). For example, were

plazas constructed in a similar fashion and similar location in each of the three districts of Late Postclassic Tlaxcallan, or did their construction in some districts differ by size, elevation, and proximity to other plazas? Were plazas smaller or fewer in number in some districts, and how do these differences (if any existed) compare to iconography visible on public architecture and Codex-Style ceramics?

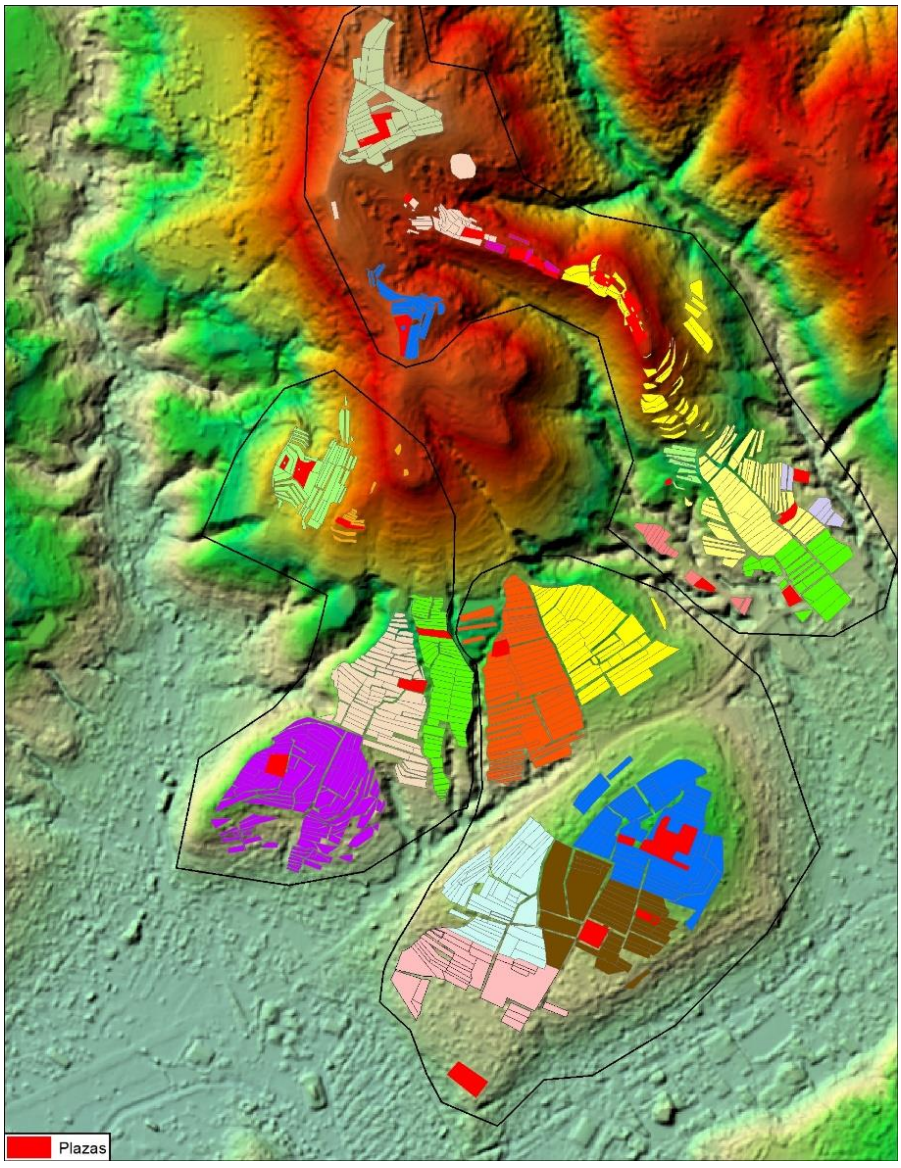


Figure 4. Organization of districts (black line), neighborhoods (different colored polygons), and plazas (red rectangles) at Tlaxcallan. Plazas also occur at higher elevations (green-yellow-red base map) and terraces occur at lower elevations (blue-grey-white base map).

Current collective action research in archaeology asserts that public goods are often deployed by elites in direct exchange for internal revenues (Blanton and Fargher 2008, 2010; Blanton and Fargher 2016), which are those resources drawn from the broader population. In the case of public plazas, for example, in pre-modern states taxes generated from the markets held there often accounted for substantial revenues to the state. Public goods such as plaza architectural complexes, market judges, roads to and from marketplaces, and market security, are examples of public goods provided to city residents. Thus, cities that invested in a large number of public goods are postulated to reflect a more collective strategy of governance and resource management (Blanton and Fargher 2008, 2016; Fargher et al. 2019). In contrast, organizations that develop fewer public goods are interpreted to employ a less collective style of governance, where fewer constraints are placed on elites regarding how state revenues are spent. Because there are few constraints placed on how resources are spent, elites are more likely to spend revenues on personal projects promoting their own wealth and power rather than on public goods.

Research on social and ethnic clustering, especially like that observed in Mesoamerica at Teotihuacan, suggests households that comprise a neighborhood are more likely to share commonalities than households located in other districts. A confounding factor is the diverse motivations and goals of different neighborhood residents within large polities or organizations. Residents living within neighborhoods will likely have similar social, economic, and political affiliations based on their close social and spatial proximity. However, residents in different neighborhoods separated by larger social and physical distances, especially in multiethnic cities, are likely to have different social, economic, and political affiliations, oftentimes with competing interests (York et al. 2011). The neighborhood plaza would have been the location where

individuals regardless of social background would meet face-to-face for rituals, festivals, markets, and other political communications. These distinct units of the socio-spatial landscape, where the household, neighborhood, and polity meet, offer an opportunity to examine how policies enacted at the upper levels of the socioeconomic and political hierarchy are operationalized and received at the lower levels.

It is hypothesized that if neighborhood plaza and terrace construction was organized by the state, then the placement, shape, and area of plazas and terraces would remain relatively standardized *across* the three districts. If the construction of these neighborhood features were organized at the district level, then differences (variation) in placement, shape, and area would be identifiable *across* the three districts, but not *within* each district. Instead, if district-level organization was indicated these factors would be relatively standardized within districts. If plaza and terrace construction was organized at the neighborhood level, then plazas and terraces should differ *across* the three districts, but features would be relatively similar *within* each neighborhood.

Because public plazas were frequently the seat of social, political, and economic performance among pre-modern states, identifying which level of administration coordinated their construction can point to the different power strategies utilized by elites at Late Postclassic Tlaxcallan. For example, in the Ocotelulco district, it has been suggested that a primary power strategy was control of the market there. Thus, it would be expected that plazas would be fewer, larger, and placed more centrally within the Ocotelulco district, to facilitate the monitoring of economic transactions. The Tepeticpac district, in contrast, was the religious seat of Tlaxcallan. It is hypothesized that plazas would be dispersed, smaller, and occur in higher numbers within

each neighborhood to reach as many people living within each neighborhood in order to facilitate the accessibility of messages carrying political ideologies.

Iconography on Tlaxcallan Public Architecture and Codex-Style Ceramics

Recent research in Tlaxcallan has identified that the largest architecture within the city was the highly decorated temple located at Tizatlan, where altars and walls were covered in painted symbols and iconography (Fargher et al. 2011). A similar temple has been identified within the Ocotelulco district, and similar temples are believed to have existed in the other districts (Caso 1927; Fargher et al. 2011). Iconography at these locations does not exhibit personal accounts of elite victories, lineages, or portrayals of extreme wealth and nobility, and their patterning of 'faceless' and impersonal themes has been compared to what has been observed at Classic Period Teotihuacan (Fargher et al. 2011a, b; 2010). This iconographic style (also called the International Style or Codex-Style) is found throughout Mesoamerica (Caso 1927; Noguiera 1954). But unlike the International Style iconography found at other powerful and frequently researched states and empires, like Cholula, Tenochtitlan, and in the Mixteca-Alta region, Codex-Style iconography in Tlaxcallan was possibly focused on impersonal scenes of fertility and religious ideology (Figure 6). In contrast, similar iconography found in Aztec Central Mexico, Cholula, and the Mixteca Alta of Oaxaca contained examples of royal lineages and elite centric themes of wealth and prestige (Ford 2016; Hernández 2010; Levine et al. 2015; Olko 2014; Pohl 2003; Umberger 1996).

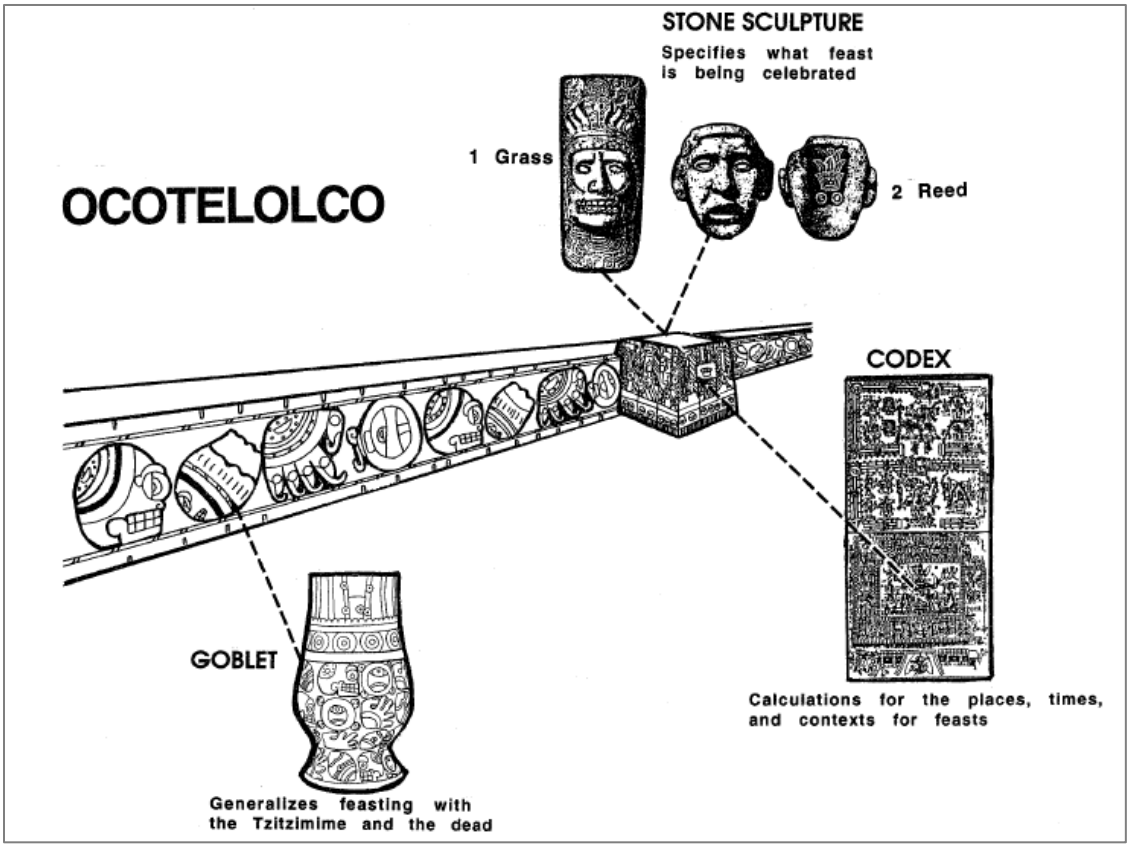


Figure 5. Codex-Style symbols on public architecture (Altar B) in the main temple at Ocotelulco Tlaxcala, on Codex-Style ceramics, and in the Codex Borgia, believed to have been written in Tlaxcallan. From Pohl 1998, Figure 4.

The symbolism found on public architecture throughout Tlaxcallan has been suggested to be similar to the iconography found within households containing Late Postclassic Codex-Style pottery, although the iconographic message of that pottery has not been fully explored (but see Fargher et al. 2010; Hernández 2010; López et al. 2019). Prior to this research, it was not known whether Codex-Style pottery was produced or exchanged freely within Tlaxcallan (see Chapter 6). Icons present on Codex-Style polychrome pottery, intended for ritual use, were highly visible to members of the household and others who had occasion to interact with them. Its purpose was to promote a message or narrative promoting the identity of either self-interested aggrandizement

or inclusionary messages focused on impersonal themes (see codice in Figure 5) (Ford 2016; Hernández 2010; Levine et al 2015; Pohl 2003).

It is argued here that the presentation of these highly visible goods utilized during semi-public and public rituals, like agricultural festivals, religious events, weddings, celebrations of birth, and funerary events, was undertaken to communicate either support for, or defection from, state ideologies among family members and friends, as has been argued in other areas of Central Mexico and Mesoamerica generally (Ford 2016; Hernández 2010; Levine et al. 2015; Pohl 2003). Some friends and family that congregated during these events were likely residents of other neighborhoods and districts within the Tlaxcallan State. The use of these goods was not only visible to large crowds during public events occurring in large plazas but was also visible to individuals that congregated during smaller semi-public events occurring within households. Individuals attending both these public and semi-public events probably included those who resided in locations outside the local socio-spatial unit, such as friends, relatives, and likely friends of relatives who lived throughout the polity. Whether intentional or subconscious, communication among diverse groups would have occurred and was one way for members of the polity to observe and interact with the views of other individuals who lived in different districts and neighborhoods.

Ethnohistoric accounts make clear that factionalism and competition may have occurred among Tlaxcallan's districts, as identified epigraphically based on different themes in the symbolism found on temples and altars throughout the polity (Pohl 2003). There is no reason to assume that households would not be able to choose which Codex-Style iconographic theme they identified with most, and the fact that multiple themes were available on Codex-Style pottery supports the idea that the election of ideologies in households may not have been controlled by

the state, a topic explored in Chapter 5. Household support for the ideologies proclaimed by the Tlaxcaltecan state can therefore be ascertained by identifying which symbols were depicted on Codex-Style ceramics and most frequently consumed among Tlaxcaltecan households. This is also an interpretation adopted from similar ritual practices, using Codex-Style pottery, from the Mixteca Alta Region of Oaxaca (Figure 7) (Levine et al. 2015; Ford 2016).

If the iconography and symbolism found on public architecture are also observed on the Codex-Style pottery found within households, then it can be inferred that those households were showing support for state ideologies and themes, and showing solidarity with their neighbors, probably to build trust across the polity by communicating commonly held beliefs with those participating in the same rituals. Because the iconography found painted on public temples and altars is clearly related to state ideology, the same themes found within households provide a proxy to observe either acceptance or rejection of that ideology. These interactions would seem to closely resemble a similar scenario identified at Teotihuacan, where participants engaged in 'faceless' rituals as part of recurring events to show support for the collective good, or what Froese and colleagues call a 'reset' event (Froese et al. 2018). If such an occurrence is not identified, then perhaps the scenario of factionalism and competition, as previously identified by Pohl (2003) is more likely.

At Late Postclassic Tlaxcallan, the purpose of using the egalitarian iconography observed on public architecture, and suggested to have been included on Codex-Style polychrome pottery recovered within households, may have been to promote more inclusive political strategies among the diverse social groups which comprised the city, including elites and commoners. Tlaxcallan was surrounded by aggressive neighbors, including the Aztec Empire and the Cholula state to the south. To model how symbols of egalitarian ideology, state ritual, or noble and

kingly lineages may have been utilized by different households, I seek to pattern the consumption of these symbols throughout Tlaxcallan's households. I specifically ask, is Codex-Style pottery limited to certain households, how was it exchanged among households, and was a certain iconographic theme preferred in each?

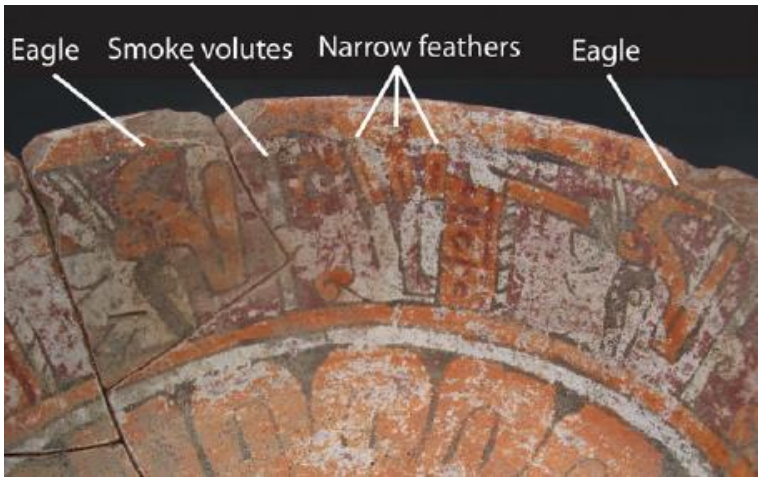
Figure 6. Codex-Style pottery depicting Lord Five Deer (left) and Lord Eight Deer (right). On Codex Style vase recovered from the Mixteca Alta, Oaxaca. From Pohl 2003.

The consumption of highly visible goods that were utilized during public and semi-public rituals like weddings, agricultural festivals, and religious events, was probably undertaken to communicate participation in a shared ideology in Postclassic Mesoamerica (Ford 2016;

Hernández 2010; Levine et al. 2015; Pohl 2003). Iconography in Aztec Central Mexico, Cholula, and the Mixteca Alta of Oaxaca primarily contain examples of royalty, noble lineages, and elite ideologies (Figure 8) (Ford 2016; Hernández 2010; Levine et al. 2015; Olko 2014; Pohl 2003; Umberger 1996). Some friends and family who congregated during these events were likely neighbors of those hosting the event, other participants were likely close friends or relatives that lived in different locations. Evidence for the public display of these ceramics is found in the recovery of Codex-Style sherds from public plazas during site-wide survey (the survey dataset examined here), and the recovery of Codex-Style sherds from the public structure located in the Quiahuixtlan district, excavated during the Tlaxcala Archaeology Project. The display of Codex-Style pottery during these events was thus visible to invited friends, relatives, and likely friends of relatives that lived throughout the polity.

Royalty was depicted differently at Tlaxcallan compared to other polities in Central Mexico. Among the Aztec, nobles were painted in codices as wearing fine cotton cloth, as well as golden diadems, with gold and turquoise earrings (Olko 2014). Anawalt (1980:37) describes the wearing of these items as restricted from the commoner classes in Aztec Central Mexico, and violations of these sumptuary laws were punishable by death. These vestures were meant to convey a relation to the civilized Nahua life previously discussed, often personified in the deity of Quetzalcoatl. Iconography found on the Templo Mayor in Tenochtítlan focused on the feathered serpent, the wind god Ehecatl, and the rain god Tlaloc to personify this royal descent from Quetzalcoatl and a civilized life and royal ancestry (Olko 2014). In Cholula and the Mixteca Alta of Oaxaca, iconographic examples of royal lineages and elite ideologies include eagle heads, feathers, clouds, stellar eyes, and flowers. These motifs are associated with royal

ancestors, wealth, deities, and nobility (Forde 2016; Hernández 2010; Levine et al. 2015; Olko 2014; Pohl 2003; Umberger 1996).

A). 

B). 

Figure 7. Codex-Style ceramics from Tutupec, Oaxaca, with iconography reflective of wealth, prestige, and royal ancestry. From A). Forde 2016, Figure 9; and B). Levine et al. 2015, Figure 5.

In the case of Tlaxcallan, several different ethnic groups cooperated to resist Aztec encroachment, both economically and in warfare. To engage the cooperation of this multiethnic group, strategies were likely enacted to facilitate participation in ideas and activities that cross-cut group membership. A unique and inclusive Tlaxcallan identity was likely fostered in iconography and on public architecture to enmesh the various culture groups that had settled in the region. A sense of 'symbolic egalitarianism' was likely promoted to encourage resistance to foreign enemies (see Chase and Chase 2004 for examples from the Maya region).

Iconography on public architecture in Tlaxcallan differed from that of the Aztecs, in that it primarily depicted Tezcatlipoca, Camaxtli, and other deities associated with a 260-day ritual calendar, used to organize public celebrations, events, and festivals within plazas (Figure 9).

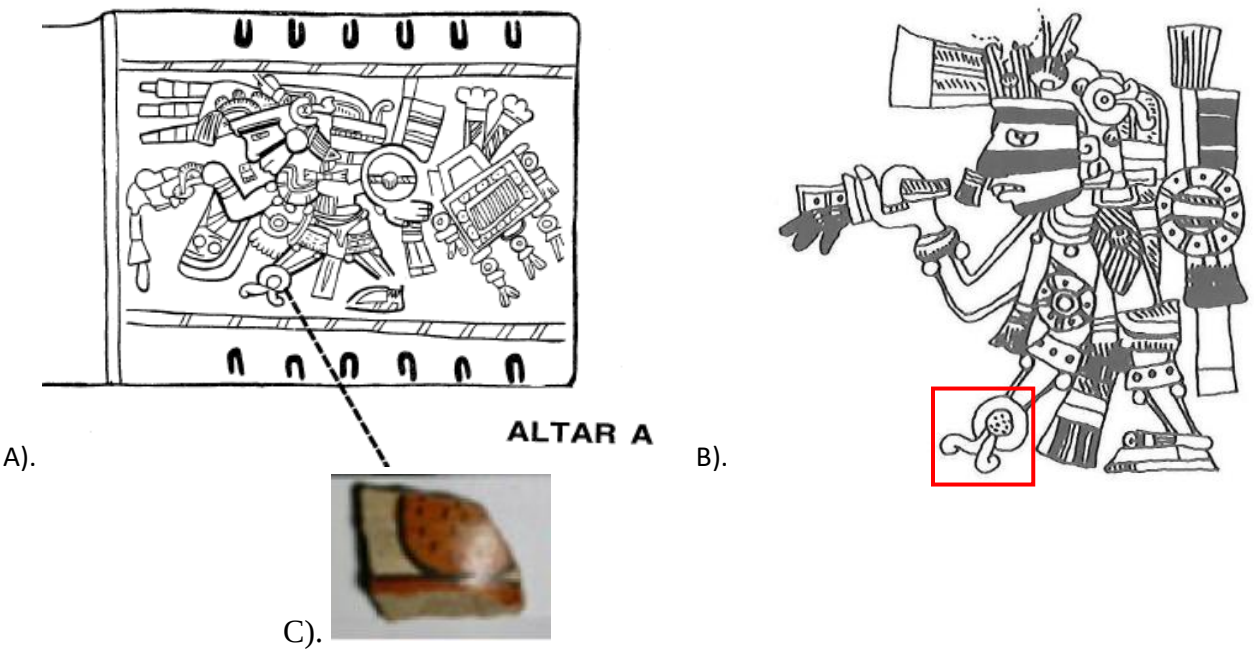
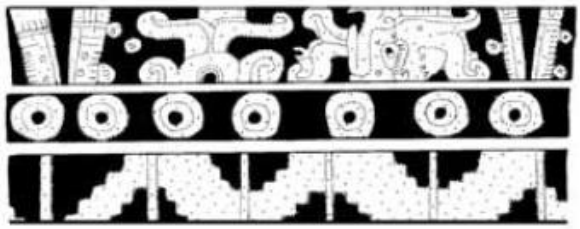


Figure 8. A). Painting of Camaxtli on Altar A of the Tizatlan Temple, Tlaxcala. From Pohl 1998:192. B). Camaxtli painted in the Codex Borgia with obsidian mirror for a foot. From Hernández 2004:20. C) Depiction of obsidian mirror on Codex-Style polychrome sherd recovered from excavations at Tlaxcala.

These deities were associated with hunting, warfare, justice, and divination, and were the primary gods of Chichimec peoples (Caso 1927; Contreras 1994; Noguero 1929; Pohl 1998; Fargher et al. 2010). Ethnohistoric accounts also note that Camaxtli (Tezcatlipoca) was the most powerful deity of Tlaxcallan (Motolinía 1950:78-83 [1568]). Murals painted in the Ocotelulco and Tizatlan temples in Tlaxcallan, largely conform to the style found in the Codex Borgia, which was probably painted in Tlaxcallan. The style painted in the Codex Borgia, called Codex-Style or alternately "International Style" of art and iconography has been found throughout Postclassic Mesoamerica but included different themes (Boone 1982; Boone and Smith 2003; McCafferty 2001; Smith and Heath-Smith 1980; Taube 1992, 2004).

Because iconographic analysis of pottery has been discussed as a good indicator for inferring past social group formations generally (see Carballo et al. 2014:124; Pauketat and Emerson 1991), it is used in this dissertation as iconographic themes of political organization are found on pottery recovered from each excavated household in Tlaxcallan. I follow iconographic procedures outlined in previous studies focusing on codex-style polychromes (Fargher et al. 2010; Hernández 2005, 2010; Levine et al. 2015; Lind 1994; Pohl 1998; Taube 2004). Utilizing these classification systems, iconographic themes associated with the Cult of Tezcatlipoca, Camaxtli, death, war, cosmology, and fertility are interpreted to represent 'faceless' or more impersonal strategies oriented towards reaffirming a collective identity (Figure 10). Iconographic themes have also been used to identify more 'faceless' types of government at other locations, but most important to this research at Teotihuacan (Carballo and Feinman 2016:292, Table 1).

Focus on these themes would have created a message of inclusion and emphasis on ideals beneficial to all Tlaxcallan culture groups: such as skill in warfare and agricultural and economic production. It also represented a break from the use of the religious pantheon supported by the Aztecs to the west and the Puebloans of Cholula to the south. This break would have contributed to the sense of Tlaxcallan 'exceptionalism' mentioned previously, as it differed from Aztec beliefs of nobility, royalty, and other more exclusive themes (Fargher et al. 2010, 2011a, 2011b).

A)  B). 

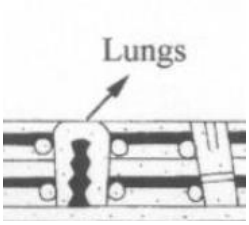
C).  D). 

Figure 9. A). Celestial eye from Complex of Smoke and Darkness recovered on Codex-Style sherd from Tlaxcala. B). Complex to Smoke and Darkness from Hernández 2010. C). Lung motif and maguey thorn motif from Complex of Death and Tezcatlipoca on Codex Style sherd recovered in Tlaxcala. D). Lung motif from Hernández 2004.

It is likely that beliefs of Tlaxcallan exceptionalism and symbolic egalitarianism would have bled over into the economic sphere of influence in Postclassic Mesoamerica as well. The use of such an identity would probably have been reflected in other portable goods, such as obsidian goods which may have been controlled by the Aztec Triple Alliance, or goods considered to be representative of power and prestige. A sense of exceptionalism would have probably precluded the use of Aztec obsidians, if households participated in such an identity. The use of items that represented personalized messages of aggrandizement would have probably been reduced if a sense of symbolic egalitarianism had been fostered. These interactions should be visible in the geopolitical exchange of obsidian artifacts.

Obsidian Exchange and Geopolitics at Tlaxcallan

The Aztec Triple Alliance was known to facilitate the exchange of obsidian resources throughout Late Postclassic Central Mexico, with the Pachuca and Otumba sources exchanged through the state-sponsored merchant class known as the *pochteca*. Despite the presence of multiple volcanic sources in Central Mexico during the Late Postclassic Period (Figure 11), Pachuca and Otumba materials occur in high amounts in Aztec-governed cities, on the order of 90% or higher (Olson 2001; Smith 1990:157; Smith et al. 2007). In more distant and peripheral provinces, such as the Eastern Aztec frontier, Aztec obsidians also increased during the Late Postclassic period, likely from Aztec imperial strategies. For example, at Late Postclassic Totogal in the Tuxtla Mountains region of Veracruz, the consumption of green obsidian saw a four-fold increase from 12% of the total obsidian assemblage to 47% (Venter 2012:245). Similarly, in the Mixtequilla Region of Veracruz, Aztec obsidians doubled from 23% to 43% (Stark 1990:269).

On the southwestern frontier of the Aztec Empire in the Mixteca Alta region, a decrease in the amounts of green obsidian consumed is observed, but an increase in the amount of Pico de Orizaba obsidian also occurred (Levine et al. 2011). The Cholula state was the possible distribution point for Pico de Orizaba obsidians during the Late Postclassic period (Braswell 2003:146; Daneels 1997:245; Levine et al. 2011:128). The facilitated trade of green obsidian in Aztec-governed cities during the Late Postclassic period, and artificially increased demand for this good, may have created supply-shortages outside of these areas. To compensate for these supply issues, the merchants in the Cholula area may have collaborated with the *pochteca* to increase imports to other areas. They may have also been forced by the Aztecs to increase

exports to other areas along the southwestern frontier, or they may have simply taken advantage of a beneficial economic situation (see Levine et al. 2011). However, nearly every author researching obsidian exchange during this period attributes the shifting exchange of obsidian resources to geopolitical interactions in some way (see Cobean 2002; Levine 2011; Levine et al. 2011:128; Millhauser et al. 2015).

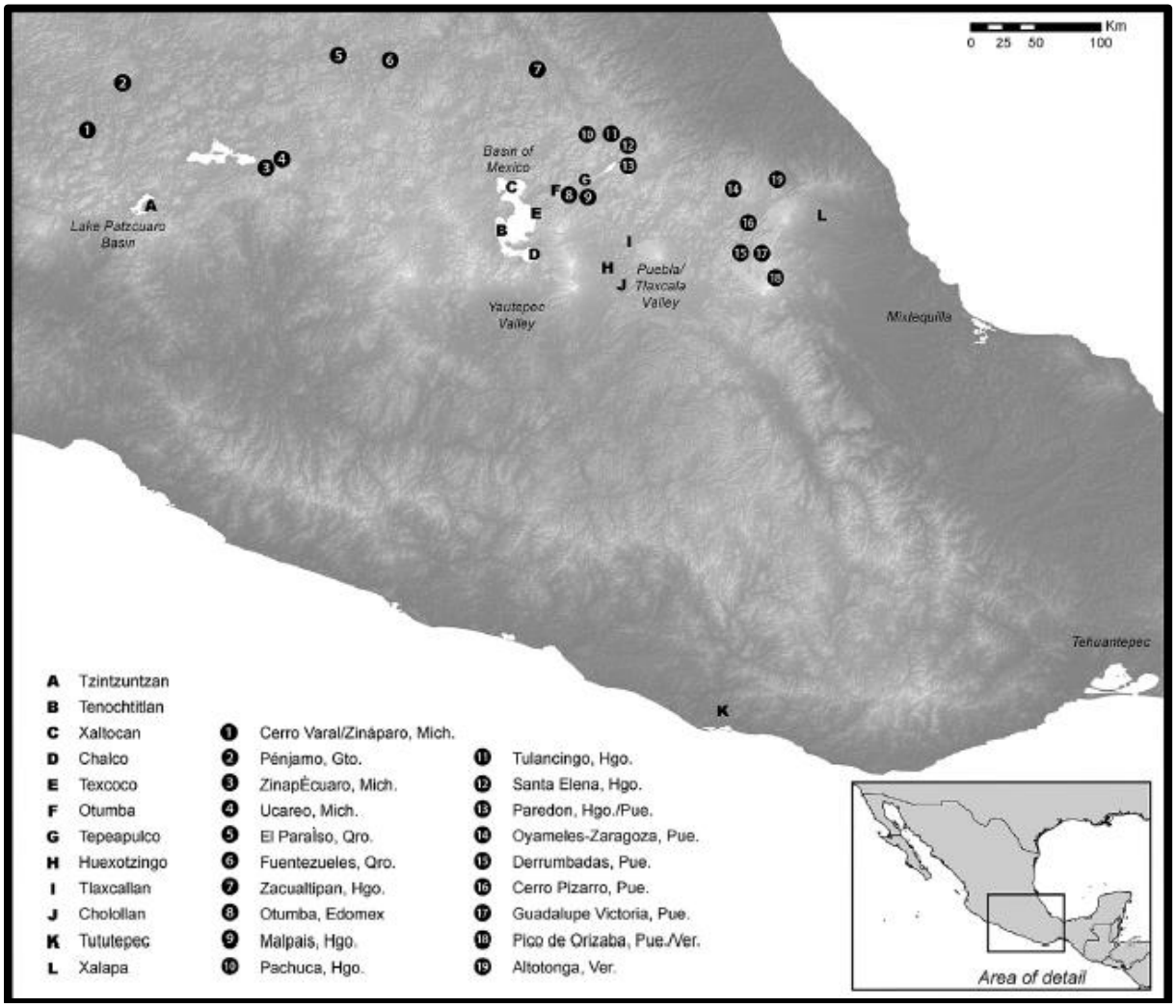


Figure 10. Mesoamerican obsidian sources and major centers during the Late Postclassic Period. From Millhauser et al. 2015.

In the case of the Tlaxcallan state, given that Cholula was an ally of the Aztec Triple Alliance during the Late Postclassic period, and also locked in a war with Tlaxcallan, it is probable that the low supply of Pico de Orizaba obsidians observed in all obsidian samples in the region are also a result of geopolitical interactions. This good could have been avoided by Tlaxcaltecan consumers, as an item produced by a foreign nation-state that the Tlaxcaltecans were at war with. Or an embargo could have been placed on its exchange, similar to what has been suggested for Aztec green obsidian.

On the western Aztec frontier, in the Tarascan Empire, green obsidians are observed in exceptionally small frequencies. Walton (et al. 2017) report proportions of 5% or less in Tarascan datasets (see also Pollard 2003). This too was likely a result of an ongoing war and goods blockade between the Aztec and Tarascan Empires during the Late Postclassic Period (see Pollard 2008; Walton et al. 2017).

Facilitated trade of this nature over broad geographic areas fit a model of restricted exchange, where the influence of elites or policy regarding trade of items is unaffected by supply and demand, and is instead affected by manipulation of supply, access, technology, or information. This type of regulated exchange can lead to the formation of 'bottlenecks' or restricted markets if left unchecked. Such manipulation is known to have occurred in Aztec Central Mexico and further abroad, most famously by the para-governmental *pochteca* merchant class previously discussed (Berdan 1975; Smith 2003). In Tlaxcallan, an embargo on goods excluding the polity from Aztec economic networks has been mentioned ethnohistorically, representing one example of how higher-level policy may have affected trade (López et al. 2021; Millhauser et al. 2015).

Another possibility is that no embargo was placed on Tlaxcallan, allowing Aztec merchants to manipulate the obsidian trade as they had at other cities in Late Postclassic Mesoamerica, by achieving 'economies of scale.' This possibility would have required a response from Tlaxcaltecans, as restricting the supply of such an important resource would have crippled the Tlaxcallan supply of weapons. The restriction of supplies needed for defense would have benefitted the Aztec Triple Alliance economically and simultaneously hindered Tlaxcaltecan merchants. Such a geopolitical interaction has also been suggested based on the amount of non-Aztec obsidians consumed in the capital city of Tlaxcallan, and at two hinterland centers of Metepec and Calcahuas (Millhauser et al. 2015; López et al. 2021; Fichman 2014). The reliance on non-Aztec obsidians, specifically that from the El Paredón volcano situated roughly 70 kilometers north of Tlaxcallan, represents a scenario where Tlaxcallan merchants may have acted in response to Aztec economic pressures. The use of El Paredón obsidians in high proportions among Tlaxcallan households during the Late Postclassic period would represent a substantial finding and clear break in the obsidian consumption patterns observed in other parts of Mesoamerica. Significantly, *no other known polity* during the Late Postclassic period was consuming El Parédon obsidian in amounts higher than 10 percent (Brasswell 2003, Figure 20.3). If households in Tlaxcallan are consuming large amounts of this material, which is high quality obsidian, then a unique obsidian consumption sphere supplying one of the largest markets and Late Postclassic states can be identified.

To test if any geopolitical actions affected the supply of obsidian to Tlaxcallan consumers, I use Portable X-ray fluorescence (pXRF) analysis of obsidian blades. Obsidian blades (n = 1350) from 5 households located in the Tlaxcallan capital city are examined to test if the Aztec Triple Alliance placed an embargo on the Tlaxcallan state, and if this affected obsidian

exchange (Gentil et al. 2022; Millhauser et al. 2015; López Corral et. al. 2021). Portable x-ray fluorescence has become probably the most widely used method in archaeology to trace the movement of goods and ideas across space (Frahm 2017; Hiezer et al. 1965; Marino et al. 2022; Millhauser 2005; Weaver and Stross 1965). I test whether patterns observed in obsidian exchange indicate a focused economic policy by a political institution, or if cooperation among producers, consumers, and political architects to keep markets open is indicated instead. While the obsidian sources occur at varying distances from Tlaxcallan, it must be stated that all obsidian found within the city was imported.

Evidence supporting an Aztec placed embargo would be observed if Aztec sources are recovered in extremely low proportions. The supply of these materials would be restricted from Tlaxcallan producers and consumers, and thus would result in quantities similar to what is observed in other restricted settings, like that of the Tarascan Empire, where Aztec obsidians occur in proportions of 5% or less (Pollard 2008). If the trade of Pachuca obsidians were prohibited by the Aztec state, obsidians from other sources would be present in higher amounts, with one or more sources comprising a majority, but no sources being present in amounts of 90% or more. This is because obsidian source proportions compromising 90% or more of an assemblage are a strong indicator of elite or state sponsoring of that particular source, and not a foreign embargo.

Instead of an Aztec embargo, Tlaxcallan elites may have also promoted the use of El Paredón obsidian among Tlaxcaltecan citizens to subvert Aztec economic manipulation or to serve as a legitimization strategy (Millhauser et al. 2015). Consumption of very high amounts of El Paredón obsidian would indicate elite promotion of this good, similar to the amounts of green obsidian recovered in Aztec governed cities. El Paredón obsidians would have to be recovered in

proportions of 90% or higher in Tlaxcallan, similar to green obsidians in Aztec Mexico (Olson 2001; Smith 1990; Smith et al. 2007). Attached production, storage facilities, or consumption of this resource in settings promoting the aggrandizement of the state or individuals would also be expected.

Obsidian exchange and consumption within Tlaxcallan may not have been directly promoted by any state, either the Tlaxcaltecan or Aztec, because it was one of several low-value quotidian items. Obsidian blades, while perhaps a 'bulk luxury item' (Blanton et al. 2005), were still relatively low-value goods during the Late Postclassic period, reducing incentives to cross contested borders to sell them. With roughly a year's supply of five blades (Clark 1986) being worth a single undecorated ceramic vessel during the Late Postclassic period (Huster 2016:277), the trade of these quotidian items with multiple source substitutes in Tlaxcallan could have been too costly a risk to import if an embargo was in place.

However, Tlaxcaltecan political architects, merchants, producers, and consumers likely supported local merchants, and the consumption of local goods for a broad number of reasons. First, Tlaxcaltecan political architects would not tie the supply of a necessary household item, and an item crucial for defense, to a supplier controlled by their enemy during an active war. Second, local Tlaxcaltecan merchants importing Paredón obsidian would have wanted to exclude competition to their market share from non-local groups to protect their livelihood. Third, as the Aztec State was the sworn enemy of Tlaxcallan, the promotion of Aztec merchants and the consumption of items associated with them, such as green obsidian, was a visible indicator of support of foreign enemies, thus a detractor to the collective good of public defense.

A reduction in Aztec obsidian at Tlaxcallan may reflect low consumer demand for Aztec goods generally, and not pressures from top-down policies. At the local scale, this may have

been caused by the promotion of local economic growth and the reproduction of local social ties. As obsidian was a visible indicator of social and economic networks, it can be used to model the emphasis that households placed on local versus foreign economic interactions. Given that geopolitical pressures precluded the use of the two closest resources, which were the Malpaís and Otumba volcanos, the consumption of lower proportions of Aztec obsidians, and the consumption of higher proportions of obsidians coming from the El Paredón volcano, was likely an expression of social solidarity.

A scenario of social solidarity in obsidian consumption should be supported by low proportions of green obsidian, or other obsidian sources associated with polities that were allied with the Aztec Triple Alliance (i.e. Otumba). Higher amounts of sources local to Tlaxcallan would be widely traded and consumed in all contexts (i.e. El Paredón or possibly Zaragoza-Oyameles). Either of these sources would be higher in proportion, but not on the order of 90% for a given resource, as this would represent state-sponsored consumption. Other, less-utilized sources (Pico de Orizaba, Malpaís, Pachuca, and Zaragoza-Oyameles) should also be present, reflecting that households utilized secondary and tertiary sources, and thus consumer choice was the primary mechanism of consumption. Again, given that Malpaís and Otumba were closer, the use of El Paredón obsidian would indicate that the closest resources were not utilized.

Late Postclassic (1250-1520 AD) Tlaxcallan, Mexico, offers a unique case study to test how conflicted interests were mitigated, as significant forces were in place that influenced the rational motivations of merchants, producers, consumers, citizens, and political architects alike. Obsidian, one of the most frequently consumed natural resources in Mesoamerica, would have entered Tlaxcallan in one of several ways, either through exchange networks created by familial ties and lineage systems linking Tlaxcallan with families residing near obsidian geological

resources, or through market systems and exchange networks (possibly open or restricted) linking Tlaxcallan to the broader Mesoamerican World System (Gentil et al 2021; López et al. 2020; Marino et al. 2020; Millhauser et al. 2015; 2017).

Geopolitical pressures exerted by the Aztec Empire have been suggested for limiting the supply of green Pachuca, Otumba, and Pico de Orizaba obsidians entering Tlaxcallan markets through an embargo on those items. Familial ties with individuals residing to the northwest in Aztec territories, however, may have provided an opportunity to use personal networks to procure green and other Aztec-controlled obsidians. This would have allowed the exchange of these goods into Tlaxcallan at significant financial gain to those merchants.

On the other hand, the procurement of obsidian from the El Paredón volcano may also have been facilitated by embedded networks of Otomí-Tlaxcaltecan lineages crosscutting the Tlaxcallan border and extending north into the Paredón source area (see Millhauser et al. 2015; 2017; López et al. 2015; 2021; Gentil et al. 2022). The utilization of embedded networks moving obsidian from the Paredón source would likely not have resulted in any bottlenecks, because it was widely accessible to all through familial ties.

The implications for each of these scenarios regarding Aztec obsidian is important, because green obsidian was a powerful symbol of the Aztec State. The use and ownership of green obsidian would have been visible to observers, especially its use in higher frequencies than other local goods. Because Tlaxcallan and the Aztec State were locked in a deadly and costly war, the consumption of goods conspicuously linked to Aztec economic imperialism would have been noticed, and likely discouraged as the consumption of conspicuous goods representing a foreign enemy typically are during wartime economies.

A collective action problem would have thus ensued for Tlaxcaltecan merchants. Tlaxcaltecan merchants would either a) pursue their rational monetary interest and do business with Aztec merchants, or b) cooperate in response to attempts of Aztec imperial strategies for physical and economic domination. The first outcome would lead to an increase in the financial gain for individuals utilizing the Aztec economic system, which was supplying obsidian to the greater Mesoamerican World. However, this would result in a financial loss to those outside this network, meaning a loss for those supporting the local Tlaxcaltecan economy. Engaging with the Aztec imperial economy would be a more exclusive and competitive economic strategy. The outcome for economic cooperation and supporting the local economy (i.e., rejecting Aztec goods) would result in economic independence from the Aztec in obsidian exchange generally, as well as an economic gain for all merchants, not just a few.

The use of a personal network would be an example of a more exclusionary and subtractable system. An open exchange network, or open market system in Tlaxcallan's case, would be more akin to a public-good, accessible to all and not subtractable. A restricted exchange system, or a restricted market system, however, would also represent an exclusionary club or toll good (see Ostrom 1994; Carballo et al. 2014).

I test if cooperation of this nature was achieved in Tlaxcallan by comparing the obsidian sources utilized in five households of varying status through pXRF analysis. Exchange networks and market systems are reliant on supporting agents and personnel like merchants, shopkeepers, producers, consumers, market judges, security forces, and tax collectors, all with competing economic and political self-interests (Blanton [with Fargher] 2016; Golitko and Feinman 2015; Hirth 1998; Hutson 2000; Kurtz 1984; Nichols et al. 2002; Ossa 2013). Such competing interests could provide restricted markets ample room to form because of possible 'bottlenecks' formed

around the trade of certain items (DeMairras and Earle 2018; Marino et al. 2020). Because the Triple Alliance maintained geographic and economic domination of the surrounding regions, such bottlenecks have already been suggested for Tlaxcallan involving the exchange of Aztec obsidians (López et al. 2021; Millhauser et al. 2015). Other forms of market manipulation, such as an Aztec embargo, have also been suggested (López et al. 2021; Millhauser et al. 2015; 2017).

Importantly, all of these categories are related to the Four R's of cooperation previously mentioned and include a form of self-interest. In the case of Tlaxcallan, self-interest likely drove many of the motivations I discussed. Reducing restricted exchange networks that financially benefited the enemies of a polity at war was likely a self-interested motivation for Tlaxcaltecans. This act of *retribution* would have reduced Aztec revenues in one of the largest markets in Mesoamerica. At the same time, keeping the exchange networks open would have financially benefitted local merchants, and also supported local political institutions through taxation. This behavior can be attributed to *rewards* in the form of economic growth and the creation of local networks, of use to individuals and institutions alike. *Reputation* would have been affected by the consumption of these highly visible goods, as many of the sources served as indicators of a social network linking individuals with a specific geopolitical entity. For example, green obsidian was associated with the Aztec State, and 'smokey grey' obsidian was probably associated with local Tlaxcallan merchants (see Millhouser et al. 2015). Clear grey obsidian was also probably associated with Aztec economic networks during the Late Postclassic Period because the source volcano for this material (Pico de Orizaba) fell within the region controlled by the Aztecs (Cobean 2002; see also Levine et al. 2011; Millhauser et al. 2015). Green, clear grey, and 'smokey grey' obsidian, to an extent, allowed for recognition of 'good' and 'bad' behavior, thus contributing to one's *reputation*. Lastly *reciprocity*, or willingly contributing to

the local market system by using locally procured goods, likely occurred. Reciprocity probably occurred among the general population to prevent local Tlaxcallan merchants from falling into destitution, to encourage local growth, and to promote economic independence from their longtime enemy, as is common in most war-time nations. This could have occurred in the form of a boycott of visibly foreign goods, like green obsidian. In short, keeping the markets open and free of cheating served many purposes, perhaps the *most* purposes, and demonstrates how marketplaces can be considered a public good, or a more exclusionary good if cooperation is not achieved.

Obsidian Blade and Projectile Point Production at Late Postclassic Tlaxcallan

Obsidian blades and associated debitage, and obsidian projectile points recovered from seven residential and public contexts throughout the pre-Hispanic city of Tlaxcallan, are also examined to test if any household or status group controlled the production or exchange of these items. Obsidian projectile points were seen as high-status items in some locations in Mesoamerica, such as at the Late Postclassic Maya Capitol of Chetumal (Chase and Chase 1988; Marino et al. 2016). They were likely associated with high-status locations there because they represented an elite's ability to bring in foreign and exotic resources, such as obsidian and other material goods.

Projectile points were not considered a high-status item at Late Postclassic Tlaxcallan, however, they were still considered to be items that conveyed a message of power and authority, as they were frequently depicted with the state deity Camaxtli, who was often shown with obsidian and arrows, including in the Codíce de Tepeticpac (Aguilar 1986; Duran [1579] 2006;

López et al. 2021; Marino et al. 2020). The bow and arrow were also linked to themes associated with the Chichemca hunter-warrior ideologies that were used to construct an identity of "Tlaxcallan exceptionalism" and contrasted against Aztec themes of royalty and nobility (Fargher et al. 2010; López et al. 2021).

Obsidian blade production is examined to understand if any house sought to control the production of obsidian goods and tools after they entered the city. A production chain analysis is used to identify if any household was controlling any step of the production process. By focusing on the behaviors of crafters, visible in their production outputs recovered as tools, fragments of tools, and production-related materials, the lineal decision-making process of production can be recognized (Schiffer 1972; 1976). When expressed in terms of chains of actions each step in the chain can be linked to decisions made by actors as part of an intentional and preplanned series of technological choices (Schiffer and Skibo 1997; Sillar and Tite 2000). Behavioral chains are focused on more than tool functions, but also on the diachronic changes in behavior needed to complete the different *segments* of the behavioral chain (Schiffer 1975). Identifying these behavioral chains within household contexts allows archaeologists to identify how production-related activities were organized (Sheets 1975). The tripartite paradigm known as production-system analysis, like the French *chain operatoire,* the American technological choice or production chain system (Bleed 2001), and the Japanese *Giho* (Lu 1998), are all different forms of production chain analysis.

The lineal series of behaviors observed in production chains are often referred to as the technological or reduction sequence. The technological sequence is additive in ceramics and reductive in lithics, but follows a clear path of segments, beginning with the collection of raw materials and includes the early stages of production. Next in the chain are the later stages of

production, followed by the use, discard, and any tool refurbishments that may occur. (Bleed 1986, Flenniken and Raymond 1986; Kay and Mainfort 2014; Vining 2005:26-39).

Production chain analysis in lithics has successfully been utilized to identify control of lithic production and procurement strategies by identifying the complete lithic sequence, or by only identifying segments of the sequence. Sheets (1972; 1975) identified prismatic blade production at Chalchuhuapa, El Salvador, after categorizing the production sequence of prismatic blades into stages focusing on raw material selection and core shaping, blade production and refurbishment, and lastly obsidian eccentric production and discard (see Sheets 1975). Following a similar model, Shafer and Hester (1979; 1980; 1981) utilized a production chain to identify chert biface production at Colha, Belize. Based on raw material selection and a complete reduction sequence, Shafer and Hester (1979; 1980; 1981) identified that Colha was a primary distribution center of tools during the pre-Classic and Classic Maya periods. A lack of any initial production debitage at other sites, and only the recovery of largely spent cores and refurbishment flakes at other areas in the Coastal Maya zone, was used as evidence to support the theory that sites outside of Colha were only consumers of Colha products (Dockal and Shafer 1993). Marino et al. (2016) used a production chain to demonstrate the productive power of Cholha had waned during the Postclassic period in the coastal Maya zone, with the advent of market economies affecting the shifting supply of lithic tools during this period.

Aoyama (1999; 2001; 2005) utilized a production chain analysis to identify a bottleneck around the production and exchange of obsidian blades at the Maya site of Copan. The presence of obsidian blades, cores, and other crafted items in central elite households at the Classic period site suggested production in elite contexts. After identifying production related debris in only elite houses, with little evidence of production debitage being recovered in lower-status

households, he suggested redistribution as the primary mechanism of exchange. A functional use-wear analysis also demonstrated differences in craft production activities between elite and non-elite households, leading Aoyama (1999; 2001; 2005) to conclude that Maya elites organized the procurement and production of blades at Copan.

The production chain analysis used here is divided into three stages (see Chapter 6 for methodology), initial procurement and shaping, early-stage production, and later-stage production/refurbishing. Final exchange and consumption among households are also discussed, but given that the overwhelming majority of lithic tools recovered from Tlaxcallan were obsidian blades, consumption and exchange are mostly discussed in the pXRF section of Chapter #6 in this dissertation. If any political-economic patterns in the organization of this industry can be identified, or if any stage of the production chain process was controlled, then a bottleneck on the production of that good and at that stage of production can be identified (see also Aldenderfer 1991; Andrieu 2013; Dockal and Shafer 1993; Kovacevich 2014; Whitaker et al. 2009).

Summary: Material Correlates of Collective/Non-Collective Arrangements Used in this Dissertation

Iconography Thesis and Material Correlates

In this case study from Tlaxcallan, pottery from five households are examined with iconographic analysis. The consumption of more egalitarian symbols on ritualistic pottery recovered from household settings, were compared to more exclusionary themes of nobility and wealth found within the same households. A greater prevalence of more egalitarian themes would signal the acceptance of the inclusive political strategies promoted by the state (see Chapter 5). In contrast, the consumption of more exclusionary themes that depict nobility and

elites as exceptional would point to household residents having identified more with competitive political strategies that affirmed a royal lineage, ideology, or political group, and that was focused more on exclusion.

Aside from iconography, the exchange and consumption of Codex-Style pottery can elucidate if any household, district, or status group sought to control the production or trade of these goods used to promote highly visible political ideologies. If any household or group controlled the trade of Codex-Style pottery, a more exclusive practice would be indicated that either affirmed an elite or household lineage, or would point towards a household or group utilizing a personalized exchange network or identity. Conversely, local production among many households, or the shared consumption of imported items among many households would indicate more inclusive strategies geared towards the creation of a shared identity.

Public Architecture Thesis and Material Correlates

Indices of area, length, width, perimeter edge length, orientation angle, and elevation are compared for both plazas and terraces among the 21 neighborhoods within the three districts that comprised the capital city of Tlaxcallan. Ethnohistoric accounts point to the importance of public plazas in affirming state political economic strategies. If plazas were constructed in a similar manner and in similar locations within neighborhoods across all three districts, then state-level organization of plaza construction could be inferred (see Chapter 4). If plaza construction differed in terms of area, shape, or frequency within districts, then the organizing power behind plaza construction is inferred to be situated within the purview of district-level (intermediate-level) elites.

Identifying plaza organization is important because some ethnohistoric accounts indicate that the capture of wealth through economic activity may have occurred within plazas and served as a source of power for some districts. If this was the case, then some plazas would likely differ in terms of size and construction according to a plaza hierarchy. If plazas did follow a hierarchical pattern, more important plazas would have been larger and located closer together to facilitate the monitoring of the economic transactions which occurred within these potentially controlled spaces (see examples of market hierarchies in Feinman and Garraty 2010:180; Garraty and Stark 2010; C. Smith 1976).

Other accounts indicate that plazas were a place where commoners and elites engaged in religious and political rituals through performance. The creation of a shared identity in these ritual performances possibly served as a source of power for elites at these locations. In this scenario, plazas would be more dispersed, which would have allowed for the sharing of ideology and the production of power among all neighborhoods. Therefore, if plazas were more dispersed, then a different function of plaza space can be inferred, one where economic control was not the focus.

The organization of plazas and terraces, which may have occurred at the higher levels of societal organization, can also be contrasted with the consumption practices of portable goods occurring at the lower levels of societal organization. Consumption of portable goods (Codex-Style polychromes, obsidian) within the households located in one district, can be compared to household consumption practices occurring in other districts. Comparing practices among households in this manner can point to differences or similarities in economic or political policy in different sectors of the Postclassic city. The consumption of portable goods across districts can be examined alongside other middle and upper-level political and economic policies, such as the

construction of public goods within districts. In this manner, trust building activities enacted by elites for the common good, such as access to public goods, can be examined alongside the behaviors of households to ascertain if trust building strategies were effective.

Obsidian Long Distance Exchange Thesis and Material Correlates

The recovery of obsidian blades consumed within households can point to political and economic networks preferred by households (see Chapter 6). The exchange of obsidian within Mesoamerica during the Late Postclassic Period was associated with geopolitical alliances. The merchants who traded these goods, and the goods themselves, originated from locations that were regulated by different states and empires. The Paredón obsidian source may have been exclusively utilized by local Tlaxcallan traders during the Late Postclassic period, while the Pachuca obsidian source was associated with the Aztec Empire. If households utilized an obsidian source associated with local merchants (Paredón), then a more inclusive economic strategy can be inferred. If instead the use of Pachuca obsidians is indicated, then a scenario can be inferred where benefit to foreign merchants, or those with familial or economic ties to foreign merchants, is indicated. The use of foreign obsidians would also have represented the use of a personalized exchange network and personal finance strategy, a more exclusive behavior if indicated.

Obsidian Blade Production and Projectile Point Thesis and Material Correlates

Examining the evidence for obsidian blade production recovered archaeologically can help identify if any bottlenecks existed around the production or exchange of these items.

Utilizing a production-step or *chaine operatoire* method can identify if any step of the production process for obsidian blades was controlled by any household. For example, while obsidian blades may not have been concentrated in any household context, if early-stage obsidian blade production debris was concentrated in certain households, then it can be inferred that procuring and early shaping of obsidian tools was an activity practiced by that household. If a particular source of early-stage goods was concentrated within that household, then it can be inferred that the household was seeking to profit from that source using a personalized exchange network which they could more easily access than other households.

Similar to obsidian blade exchange, projectile points found within households can indicate whether any sampled households sought to aggrandize their status (see Chapter 6). Because projectile points were symbols of power and authority during the Late Postclassic period, if any household is identified as having a much larger than average cache of these items, then that would indicate that the residents at that location were seeking to draw attention to themselves and affirm their personal status more than other households. In conjunction with the other behaviors examined above, this may indicate a personal power strategy based on exclusion.

Chapter 4 Organization of Public and Private Space in Tlaxcallan

The public plaza was a key component of the operation of Mesoamerican political, religious, and economic systems. It was at these locations that government officials administered policies and upheld laws. Merchants and other economic specialists, some operating as para-governmental groups, organized markets and marketplace transactions, as well as collected market taxes. Religious specialists organized and performed sacred and state holidays at these locations, oftentimes utilizing a religious calendar that was linked to agricultural cycles and feasts. Martial events, parades, ceremonies, and drills often took place in these highly visible spaces. The construction of these public spaces was important to multiple groups. Understanding whether their construction was administered through state-level political institutions or among lower-level political systems operating at the district or neighborhood level can point to how these public goods were organized for either inclusive or exclusive political and economic uses among Late Postclassic Tlaxcallan.

Neighborhoods, or the areas where daily face-to-face interactions among different household residents occur, serve as an intermediate unit of organization in large urban settings. Neighborhoods can also serve as the location where household residents, merchants, local elites, or district officials interact. Where public goods infrastructure exists to promote those interactions, and where social and physical characteristics make such zones archaeologically identifiable, some assumptions of collective action theory can be tested.

It is argued that if plazas are more centrally located and placed in fewer locations, then more control over the activities occurring in those locations was probably sought, and individuals and groups were probably encouraged to conduct activities at these locations because they were more easily controlled by district-level or state-level elites. Ethnohistoric sources are used to

interpret why these locations may have been more controlled. For example, sources state that district-level elites in the Ocotelulco district gained power and wealth through the control of the largest market located in that district.

In contrast, if plazas occupied more space, were more dispersed, and occurred at more locations, then the need to reach a greater number of individuals *within* neighborhoods was probably needed. Ethnohistoric sources state that in the Tepeticpac district, control over ideology and religion was a key power strategy of district-level elites. The construction of plazas in a more dispersed manner, where neighborhood residents could access those plazas more easily and participate in political and religious rituals, was likely an important strategy in the organization of the plazas at Tepeticpac.

If all districts exhibited a similar pattern of plaza 'standardization,' then state-level authority probably was used to organize their construction. The location and placement of residential terraces are also examined to understand if a central authority organized their construction. Five attributes are considered to assess if terraces have a similar shape, elevation, and orientation across the three districts, or if variation in size, shape, elevation, and orientation was similar at the state, district, or neighborhood level. Terrace length, width, orientation angle, perimeter length, and elevation are attributes considered to understand if variation in terrace construction existed within a neighborhood, district, or across districts (Figure 12). It is argued that if terraces demonstrate low degrees of variation across districts, then an overarching central authority oversaw their construction, possibly through established construction rules (state-level authority). If terraces present small degrees of variation *within* each district but vary to greater degrees between districts, then district-level organization is inferred. If terraces show little variation *within* neighborhoods but display great degrees of variation across districts, then

neighborhood organization is inferred. Contrasting where power was situated among Tlaxcallan's public and private spaces can point to how authority was used to enact policies, organize resources, and engage groups in either collective or less collective systems.

One form of dissimilarity in plaza size and shape that may have introduced variation to the dataset could have been a result of a plaza hierarchy having existed at Late Postclassic Tlaxcallan. Similar to how archaeological sites or market spaces that served more individuals or occupied a more centralized location differed in importance, and thus size (see discussions in Blanton 1976; Hirth 1998; C.Smith 1976; Garraty and Stark 2010), the plazas at Late Postclassic Tlaxcallan could have also varied due to different levels of importance and emphasis given to them. If plaza hierarchies were present, then they would be identified by the variables considered here, designed to calculate variation. If any emphasis in terms of construction was placed on a few plazas within specific districts, as would be evidenced by larger, more centralized plazas in those districts, then the differences can be discussed and analyzed alongside portable goods and iconography to ascertain why their construction differed. The presence of plaza hierarchies within a district would significantly indicate a more top-down emphasis on plaza construction within that district and neighborhood space.

A comparative sample of house lot footprints is used as a training dataset from the City of Boston, using the same variables as the dataset examined from Tlaxcala. Specifically, house lot length, width, orientation angle, perimeter length, and area are examined in the training dataset. This sample, which encompassed three neighborhoods from the East Boston district that were constructed with various levels of pre-planning, is used to examine the level of standardization in house lot footprints. The dataset from East Boston is then used as a proxy to compare the level of pre-planning in Tlaxcallan.

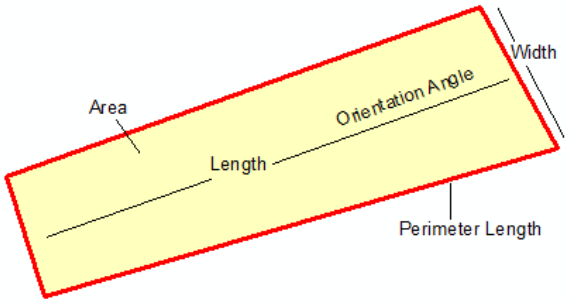


Figure 11. Attributes used to assess organization of terrace construction (WGS84).

GIS Materials and Methods

The data for this study was provided by the Tlaxcala Mapping Project, which located and mapped 815 residential terraces and 36 public plazas throughout the three districts of the pre-Hispanic capital city of Tlaxcallan. Satellite imagery was used to identify the potential location of pre-Hispanic terraces, those locations were marked on orthorectified photos, and then the terrace location was subsequently visited and systematically surveyed on the ground to confirm its pre-Hispanic origin (Fargher et al. 2010). Terrace boundaries were then traced in ArcGIS, using identified architectural features like stone wall boundaries, stone stairs, earthen ramps, adjacent terrace embankments, and road boundaries to obtain the terrace outline. Of the 952 architectural features identified by the Tlaxcala Mapping projects, 698 (73.3%) were surveyed in person. There were 101 roads, structural platforms, retaining walls, and small structures that were excluded from this dataset, producing the dataset consisting of 815 residential terraces and 36 public plazas, the focus of this research.

The data extracted from the Tlaxcallan Mapping Project was incorporated into ArcGIS, where spatial indices such as terrace area, terrace length, terrace width, terrace perimeter length, and the degree of terrace orientation angle were calculated. The latter was computed to assess whether specific terraces of the pre-Hispanic city were aligned in relation to each other. Subdivisions that follow the same alignments and orientations, as well as the construction of plazas within neighborhoods, may reflect the central planning of urban spaces. To test if the urban design was organized by neighborhood, district, or state-level planners, an open-source five-meter LiDAR based Digital Elevation Model (DEM), provided by the Instituto Nacional Estadística y Geografía (INEGI) and used in previous remote sensing studies (see Stoner 2017; Stoner et al. 2021) was coupled with satellite imagery to examine terrace and plaza form and area.

After plotting in ArcGIS, characteristics for plazas and terraces were examined. For the plazas, the primary characteristics considered were the number of plazas within each district, the percentage of land that each plaza occupied relative to residential terraces in the same neighborhood, and the elevation of plazas in relation to other features. Elevation also proved useful in this study, as it was noticed early on that plazas occupied the highest elevations when compared to where terraces were constructed.

Analysis of the terraces primarily utilized the calculate geometry tool and the calculate minimum bounding geometry tool in ArcGIS. These were useful to obtain raw data necessary for obtaining terrace area, width, length, perimeter, and orientation angle. These variables were chosen because they constitute the primary characteristics useful to identify terrace shape and are a universal set of characteristics that can be used to model terraces worldwide. Because terraces frequently did not represent a square or rectangle, the convex hulls option was used in ArcGIS,

which calculates the longest distance between polygon borders. This option was utilized because other methods produced forced square or rectangle geometry after calculation. These raw numbers were then exported to Excel, where statistics focusing on assessing variation were performed.

Because Tlaxcallan was a hilltop center, assessing factors like terrace area, width, length, perimeter, and orientation angle incorporates elements of analysis that are affected by the natural landscape. However, all areas mapped represent greatly modified urban spaces, including building up and leveling of terraces (elevation), grading of slopes, building of stone retaining walls, drainage systems, roads, paths, plazas, and the paving of most surfaces with a plaster and cement-like substance. Terraces were constructed for the purpose of building residential or public structures, and were not for agriculture, leaving surfaces nearly completely paved.

Accordingly, the length of terraces, the number of terraces constructed within districts, and the placement of terraces and plazas in relation to each other, were all factors affected by both the natural landscape and the urban design of architectural features. For example, in areas where the surrounding slopes were relatively steep, the urban design of terraces would have affected how long terraces were horizontally constructed, and the number of horizontal divisions among house lots. The division of property is known to be the primary focus of terrace construction because terraces are divided by stone and daub walls, cement or plaster covered walls, and raised earth and stone retaining walls constructed to modify the landscape in such a way as to make them suitable for habitation.

The factor affected most by landscape would likely have been terrace and plaza orientation angle. Although at Tlaxcallan, the construction of retaining walls for slopes would have led to straighter terrace orientations, and more seamless transitions between terraces

constructed side-by-side. Architectural investments in retaining walls would have led to *less* variation in orientation angles, if terraces were preplanned. As less variation is interpreted to mean more architectural investments in this analysis, these factors would again be more related to local or community property divisions of the urban space. Where the decision-making for those property divisions was organized is what I seek to identify. Below we explore these divisions and discuss the organization of domestic and public space.

One of the most useful methods for assessing variation in archaeological datasets is the calculation of the coefficient of variation (CV) (Eerkins and Bettinger 2001; Martindale-Johnson 2008:56; Roux 2003). This calculation is used to compare datasets by measuring the variation, or the spread of the distribution around the mean, by calculating sample standard deviation and dividing that by the sample mean. Multiplying this value by 100 produces a percentage, and if the resultant value is closer to zero, a dataset has been identified that is more standardized (see Costin 1991, 2001; Eerkins and Bettinger 2001; Costin and Hastrum 1995). If the resulting value is closer to 100, the sample being analyzed has a higher spread of variation, and thus represents a dataset with great dissimilarity in terms of architectural forms or plans. Dissimilarity in architectural form, plan, and space, has been frequently used to argue for less planning and less centralized involvement in the construction of urban landscapes (Carballo and Fortenberry 2015). Eerkins and Bettinger (2001) acknowledge that a dataset below a CV of 57.7% does not indicate a high degree of similarity, but also does not provide evidence for 'ad-hoc' or random production.

Calculations utilizing the CV have been performed in dozens of studies in archaeology to determine variation among countless artifact classes and types that primarily evaluate variation in the physical shape of objects (Eerkins and Bettinger 2001; Johnson 2014; Kvamme et al.

1996; Longacre et al. 1988; Meissner 2014; Roux 2003). Examples include the width, thickness, or height of ceramic vessels, apertures, handles, etc., (Eerkins and Bettinger 2001; Roux 2003). Lithic analysts also utilize this method to assess variability in tool form and shape by examining the width, length, edge thickness, basal shape, notching, etc., of lithic tools like blades, bifaces, scrapers, projectile points, etc., (Martindale-Johnson 2008; Johnson 2014; Messner 2014, 2017). While it has not yet been applied to architectural features, because the classes I examine (length, width, area) are identical to prior studies examining portable artifacts, I apply it here.

Following these prior studies, which identify a CV of 1.8% as the highest form of standardized production, and 57.7% as representing the cutoff between items produced by non-specialists in an ad-hoc manner, I utilize a scale of classification ranging between these two values. Importantly, the identification of pre-planning was taken into account for terrace production at Tlaxcallan. Because I only seek to determine if terrace construction was non-random, and therefore planned in some way, I am not seeking to identify evidence for number of specialists, the presence of attached production, higher skilled individuals, or the presence of producer guilds, as other authors do. I classify the higher CV values that fall within the range of 57.7% to 50% as weakly standardized. Values between 40% and 49% I classify as beingly moderately standardization. Values 39% and below I classify as highly standardized. Based on an experimental dataset taken from East Boston (see below), I primarily rely on values with a CV below 39% to identify standardized terrace production. CV values higher than 39%, such as those classified as weakly and moderately standardized, are discussed because they aid in visualizing the variation found in the sample of terraces.

Cities that were pre-planned established infrastructure like roads, plazas, platforms, or drainage systems in advance, and then houses, stores, and other private structures filled in that

pattern. Unplanned cities grew in a haphazard manner, and cities sometimes formed a wagon-wheel pattern (although not always). In Tlaxcallan, pre-planned spaces would be represented by terrace patterns that formed a grid-like pattern and were established in advance, and the terraces were then populated with multiple houses. Should terrace organization be more grid-like *within* a district, then planning would be inferred at the district-level of political organization (e.g., higher level elites). Should terraces be more grid-like *within* neighborhoods, than neighborhood level organization would be inferred (e.g., intermediate-level to lower-level elites).

GIS Results Boston Comparative Dataset

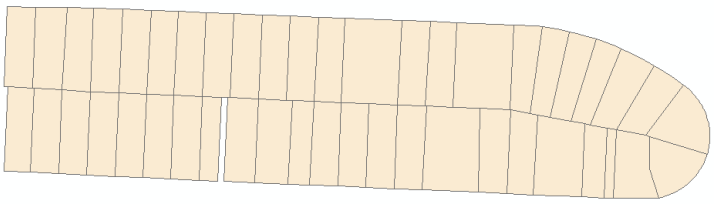
To confirm if the use of CV is a robust method, I examine a comparable dataset provided by the City of Boston. I compare parcel boundaries from the East Boston District, which was annexed by the City of Boston in 1837, and originally consisted of five islands in Boston Harbor. In the 1940's, the modern footprint was created when the five small islands in Boston Harbor were connected via landfilling and reclamation. I examine three small neighborhoods within this district, utilizing open-source parcel data provided by the City of Boston.

The parcels are located between Orient Avenue and Gladestone Street (n = 46 parcels), Falcon Street and Condor Street (n = 56 parcels), and Webster Street and Summer Street (n = 82 parcels) (Figure 13). The parcels located on Orient Avenue and Gladestone Street represent an example of what would appear to be a highly standardized configuration. Parcels are nearly exactly rectangular, oriented in a similar direction, and look visually similar in terms of area, length, and width.

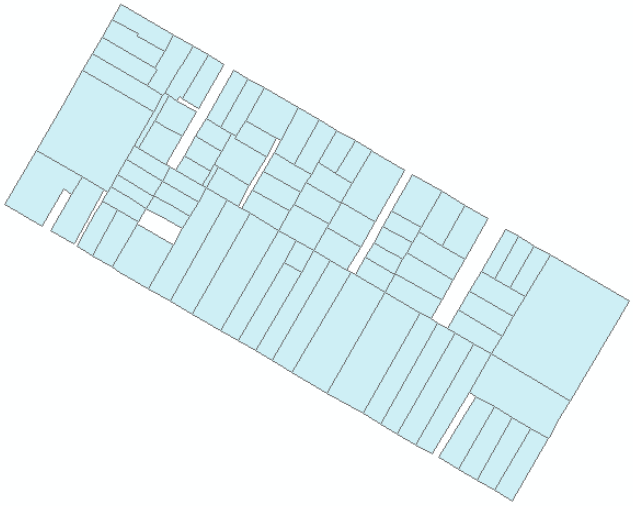
Parcels on Webster Street and Summer Street represent a non-standardized neighborhood. Parcels visually differ in terms of length, width, area, and orientation. There is also public architecture (parks and schools) that affects the size of these parcels. Geographically, the shape of East Boston Island likely affects some of the urban design of this area, as the Jeffries Point landform extends into Boston Harbor, and then tapers north to connect to the Boston-Logan International Airport.

These three neighborhoods provide comparable data to test our assumptions about how terraces at Tlaxcallan were organized. It is expected that if terraces were constructed with highly standardized centralized pre-planning, they would represent values comparable to those produced from the 46 parcels examined at Orient Avenue and Gladestone Street dataset. An intermediate amount of standardization at Late Postclassic Tlaxcallan would be represented by CV values similar to those calculated for the 56 parcels found at Falcon Street and Condor Street. CV values similar to the 82 parcels examined at Webster Street and Summer Street provide an example of terrace placement that would have been formed around haphazard neighborhood development.

Results from our comparative dataset produced expected patterns across the three neighborhoods examined (Table 2). The Orient Avenue and Gladestone Street CV values proved to be standardized for the area, width, length, terrace perimeter, and orientation angle of parcels. This is likely because this area was the first settled in East Boston, and the infrastructure here such as the main roads and thoroughfares have remained relatively unchanged. The Orient Heights neighborhood has had significant investment in terms of planning, has consistently remained unchanged in terms of house lot area, and this dataset visually represents an extremely similar urban landscape.



A).



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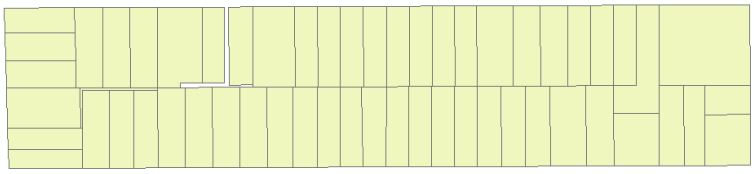


C).

Figure 12. Parcels associated with three different neighborhoods in East Boston: A). the Orient Gladestone neighborhood. Note little variation in parcel shape and area. B). the Webster Street and Summer Street Neighborhood. Note high variation in parcel area, orientation, length, and width. C). the intermediate Falcone Street and Condor Street Neighborhood. Note general alignment, variation present, but clear visual similarities are present.

Table 2. Coefficient of Variation values for three East Boston Neighborhoods. Values above 57% show no evidence for standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are strongly standardized.

Neighborhood	Area	Width	Length	Perimeter	Orientation
Falcon-Condor	40.56	34.59	10.57	12.35	48.14
Orient-Gladestone	29.48	32.87	7.43	9.18	38.00
Webster-Summer	96.75	51.10	43.56	40.79	76.55

Results obtained for Webster and Summer Street demonstrate no standardization for the area and orientation variables, the variable for width is weakly standardized, and parcel length and perimeter length are only moderately standardized. This result is expected as this neighborhood visually represents a poorly aligned area with great variation in parcel shape and area. As this area historically represents a wharf that was heavily modified after original construction, with several episodes of landfilling and modification to the main roads in this area, a greater degree of variation in parcels is expected.

The CV's calculated for the Falcon Street and the Condor Street neighborhood suggest an intermediate result. Variables for parcel width, length, and perimeter length all demonstrate a standardized dataset. Variables for area and orientation are moderately standardized. As this neighborhood has seen little modification in terms of house lot and street footprints, this result is again expected. A visual comparison of Tlaxcallan terraces most closely resemble those parcels located at Falcon Street and Condor Street.

The CV results calculated on the three experimental datasets from East Boston provide proxies of use for understanding terrace construction at Tlaxcallan. It is predicted that urban units with *three or more variables* that are standardized, similar to the Falcon Street and Condor

Street neighborhood, and the Orient Avenue and Gladestone Street neighborhood, represent areas of centralized pre-planning. We apply these results to our dataset of Late Postclassic Tlaxcallan terraces at the state level by calculating the CV of all terraces for the variables terrace area, width, length, perimeter length, and angle of orientation. At the district level, terraces were extracted into three datasets divided by district, and CV was calculated for all terraces within each of the three districts. Standardization at the neighborhood level was calculated by extracting excel values for terrace area, width, length, perimeter length, and angle of orientation for each of the 21 neighborhoods, and CV was calculated for each of these 21 neighborhoods.

GIS Results Analysis of Tlaxcallan Plazas

State and District Level Plaza Organization

The configuration of Late Postclassic Tlaxcallan plazas varies considerably among the three districts. Only the variables of perimeter length and plaza length show evidence for high levels of standardization. (Table 3). The CV values calculated for the area are high and indicate no standardization. CV values calculated for plaza width and orientation angle offer evidence for moderate levels of standardization, and weak standardization, respectively. Due to the high degree of variability observed in all examined attributes except for plaza length and perimeter length, an argument for plaza standardization at the state level is not supported based on this dataset.

Table 3. Coefficient of Variation values for plazas and terraces located at Tlaxcallan. Values above 57% show no evidence of standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are highly standardized.

Evidence for State Level Organization of Terraces and Plazas at Tlaxcallan

Architecture	CV Area	CV Length	CV Width	CV Orientation	CV Perimeter
Terraces	47.48	108.18	54	50.91	47.48
Plazas	79.29	36.39	43.8	53.54	37.88

At the district level, plazas show signs of pre-planning and standardization within districts for nearly every variable considered (plaza area, width, terrace length, perimeter length, orientation angle, and elevation) (Table 4). First, CV values for the plazas located within the three barrios demonstrate that plazas are standardized in Tepeticpac and Quiahuixtlan for plaza length, plaza width, perimeter length, and moderately standardized in area. Ocotelulco is standardized for plaza length, plaza orientation angle, and plaza perimeter length, while plaza width is moderately standardized. Only the variables for the area in Ocotelulco, and plaza orientation angle in Quiahuixtlan, demonstrate no evidence for standardization.

Table 4. Coefficient of Variation values for plazas among three districts at Tlaxcallan. Values above 57% show no evidence for standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are highly standardized.

Evidence for District Level Organization of Plazas

Plazas	CV Area	CV Length	CV Width	CV Orientation	CV Perimeter
Tepeticpac	44.23	28.8	29.29	55.59	31.69
Ocotelulco	65.5	39.04	40.25	38.43	39.63
Quiahuixtlan	44.6	29.8	34.83	67.36	21.56

Based on the LiDAR DEM, plazas were constructed at the highest points within each district, probably as a part of an intentional strategy to make these locations more visible (Figure 14). The El Fuerte neighborhood of the Tepeticpac district contains the only plaza that does not occupy an elevation greater than 1.5 standard deviations above the mean district elevation. This neighborhood is the highest point in Tlaxcallan, but it represents a relatively flat mountain summit resulting in the construction of surrounding terraces at a similar elevation as the plaza. The Tepeticpac district has the greatest number of neighborhoods (n=10), and the greatest number of plazas (n=19) (Table 5). Tepeticpac has the most plazas within each neighborhood, with six neighborhoods having more than one plaza. The average number of plazas per neighborhood at Tepeticpac is 1.9. Neighborhood plazas also, on average, account for the largest proportion of land in Tepeticpac. Plazas in Tepeticpac account for 10.65% of the area in the district, more than double the same figure for the other two districts. Terraces at Tepeticpac comprise 74.01 acres of land, while plazas make up 8.82 acres (Table 6).

Table 5. Summary statistics of plazas and terraces at Tlaxcallan

Organization of Plazas within Tlaxcallan

District	# of Plazas	Plaza Area	# of Terraces	Terrace Area	% # of Plazas	% Plaza Area
Tepeticpac	19	8.82	230	74.01	7.63	10.65
Ocotelulco	8	9.3	282	166.18	2.76	5.30
Quiahuixtlan	9	4.03	303	85.86	2.88	4.48

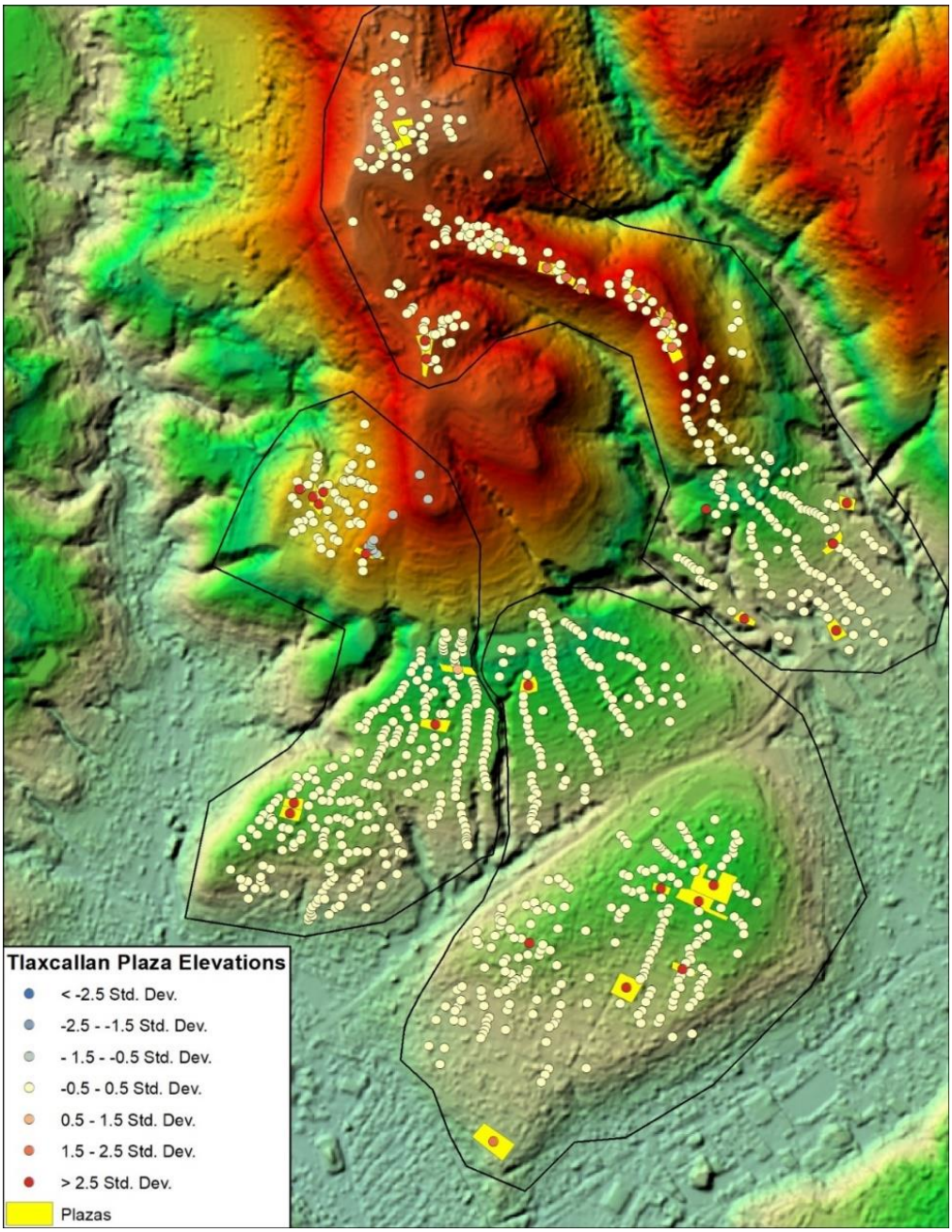


Figure 13. OLS regression calculation for plazas and terraces within each district and their elevation. Plazas are generally at higher elevations than terraces (points).

Table 6. Summary Statistics for Tepeticpac Neighborhoods

Neighborhood	Plazas	Plaza Area	Terraces	Terrace Area	%Plazas	%Plaza Area
T10	2	1	23	4.79	8.00	17.27
T9	1	0.49	6	2.44	14.29	16.72
T8	2	1.1	57	22.64	3.39	4.63
T7	1	0.62	24	12.14	4.00	4.86
T6	1	0.1	9	1.96	10.00	4.85
T5	1	0.41	13	3.11	7.14	11.65
T4	4	2.04	39	7.92	9.30	20.48
T3	3	1.07	3	0.87	50.00	55.15
T2	2	0.67	21	2.99	8.70	18.31
T1	2	1.32	35	15.15	5.41	8.01
Sum	19	8.82	230	74.01		10.65
Average	1.9	0.882	23	7.401	12.02	16.19

The Ocotelulco district contains six neighborhoods in total, with 8 plazas present (Table 7). The ratio of space allocated to plazas in Ocotelulco is significantly less than the space allocated to plazas in Tepeticpac, despite Ocotelulco being significantly larger. In fact, Ocotelulco is the only district that has a neighborhood with no identified plazas (but see below). Ocotelulco also contains the fewest number of plazas among all three districts. The average number of plazas per neighborhood in Ocotelulco is 1.33, again the lowest of the three districts. Terraces at Ocotelulco comprise 166.18 acres of land, while plazas comprise 9.3 acres of land. When all land is compared, Ocotelulco plazas occupy 5.3% of the district's space.

Quiahuixtlan contains a total of five neighborhoods, with nine plazas represented (Table 8). Quiahuixtlan also contains a plaza in every neighborhood; with a total of 4.48% of all land being composed of plaza space. Quiahuixtlan represents an intermediate case of public goods utilization in Tlaxcallan, with plazas representing 4.03 acres of land, compared to the 85.86 acres of land used for residential terraces. On average, Quiahuixtlan had 1.8 plazas per neighborhood.

Table 7. Summary Statistics for Ocotelulco Neighborhoods

Ocotelulco Neighborhoods						
Neighborhood	# of Plazas	Plaza Area	# of Terraces	Terrace Area	% # of Plazas	% Plaza Area
O6	0	0	41	25.31	0.00	0.00
O5	1	0.66	64	33.97	1.54	1.91
O4	3	4.26	60	50.39	4.76	7.80
O3	2	1.82	39	17.55	4.88	9.40
O2	1	0.65	49	20.94	2.00	3.01
O1	1	1.91	29	18.02	3.33	9.58
Sum	8	9.3	282	166.18		5.30
Average	1.33	1.55	47.00	27.70	2.75	5.28

Quiahuixtlan has a total of 303 residential terraces, nearly comparable to the 282 terraces found in Ocotelulco. However, the terraces at Ocotelulco cover nearly double the space than those at Quiahuixtlan. Also, while Quiahuixtlan and Tepeticpac were roughly equal in size in terms of area, Tepeticpac had 2.1 times more plaza space than Quiahuixtlan when expressed as a percentage of all land.

Table 8. Summary Statistics for Quiahuixtlan Neighborhoods.

Quiahuixtlan Neighborhoods						
Neighborhood	# of Plazas	Plaza Area	# of Terraces	Terrace Area	% # of Plazas	% Plaza Area
Q5	4	1.14	50	11.21	7.41	9.23
Q4	1	0.36	9	1.15	10.00	23.84
Q3	2	1.12	112	33.62	1.75	3.22
Q2	1	0.77	68	23.77	1.45	3.14
Q1	1	0.64	64	16.11	1.54	3.82
Sum	9	4.03	303	85.86		4.48
Average	1.8	0.806	60.6	17.172	4.43	8.65

GIS Results Analysis of Terraces

State and District Level Terrace Organization

At the state-level in Tlaxcallan, when all terraces are considered, there is again no evidence observed for standardization in their construction (see again Table 3). No variable demonstrates evidence for a strong degree of standardization, while only the attributes for area and total perimeter length have CV's low enough to allow classification as moderately standardized. CV values for terrace width and orientation angle have weak evidence for standardization. These results do not lend evidence for pre-planning or standardized construction at Tlaxcallan at the state-level.

Terrace organization within districts also fails to appear standardized (Table 9). All districts show moderate evidence for standardization of terrace length, terrace orientation angle, and terrace perimeter length. Terrace width had weak evidence for standardization in the Tepeticpac and Ocotelulco barrios, but strong evidence is observed in the Quiahuixtlan district. No evidence for standardization exists for terrace area. Because there is mostly weak to moderate evidence of standardization for most characteristics that were tested, central planning is not observed at the state or district level for terraces.

Neighborhood Level Terrace Organization

When neighborhoods are considered individually, there is strong evidence indicating that neighborhood planning was initiated at the lower levels of government. Each neighborhood shows some standardization of specific variables, but which variables appear standardized varies

across them. No pattern emerges to suggest that a central entity organized terrace construction above the neighborhood level.

Table 9. Coefficient of Variation values for terraces among three districts at Tlaxcallan. Values above 57% show no evidence for standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are strongly standardized.

Evidence for District Level Organization of Terrace Construction

Terraces	CV Area	CV Length	CV Width	CV Orientation	CV Perimeter
Tepeticpac	82.04	47.25	55.55	47.25	45.22
Ocotelulco	107.95	42.06	56.23	45.23	42.13
Quiahuixtlan	67.83	46.58	38.87	46.01	44.91

At Ocotelulco, for example, every neighborhood demonstrates a weak to strong level of standardization for terrace length, perimeter length, and orientation angle (Table 10). Terrace area generally returns a CV value that indicates no standardization or a weak level of standardization. Terrace width is moderately to strongly standardized in every neighborhood except Ocotelulco Neighborhood 1, where no evidence of standardization is observed. Orientation angle is the only variable in Ocotelulco that appears to be standardized, but this variable is heavily affected by topography in this location, given the steep valleys surrounding the city.

At Quiahuixtlan, terrace length, width, and perimeter length return CVs that demonstrate moderate-to-strong levels of standardization for each neighborhood (Table 11). Terrace orientation angle is another factor which shows a strong amount of standardization in three neighborhoods, but only a weak level in one neighborhood, and no standardization in another. The CV value for area provides no evidence for standardization, or relatively weak

standardization (Neighborhoods 1 and 2). Quiahuixtlan Neighborhoods 1 and 2 are the only neighborhoods that have CV values indicating a weak to strong amount of standardization for all variables at Quiahuixtlan.

Table 10. Coefficient of Variation values for terraces among the six Ocotelulco neighborhoods. Values above 57% show no evidence for standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are strongly standardized.

Terrace Organization Among Ocotelulco Neighborhoods

Neighborhood	Area	Width2	Length	Perimeter	Orientation
Oco1	186.81	78.56	44.57	53.22	16.94
Oco2	65.48	41.88	44.25	40.7	50.61
Oco3	76.99	45.14	36.17	34.44	17.65
Oco4	50.39	35.81	33.77	30.19	51.39
Oco5	53.46	45.62	31.79	31.72	18.02
Oco6	55.00	33.62	41.33	37.59	50.03

Table 11. Coefficient of Variation values for terraces among the five Quiahuixtlan neighborhoods. Values above 57% show no evidence for standardization. Values 57%-50% are non-random. 49%-40% are moderately standardized. Values 39% and below are strongly standardized.

Terrace Organization Among Quiahuixtlan Neighborhoods

Neighborhood	Area	Width2	Length	Perimeter	Orientation
Q1	50.4745	34.51894	35.94485	32.72	19.19799
Q2	57.45641	25.81585	40.55227	38.34	22.71057
Q3	69.69697	39.88958	46.96948	46.78	52.89227
Q4	63.97002	18.86792	47.42171	45.45	33.6078
Q5	72.81507	43.2013	46.49665	44.69	80.43521

At Tepeticpac, terrace length and total perimeter length demonstrate mostly a strong-to-moderate level of standardization (Table 12). This same occurrence is also noted for terrace width, except for in one neighborhood. Orientation in this part of the city is highly affected by topography, as four of the ten neighborhoods are strongly oriented in a single direction due to the steep slopes surrounding this hilltop center. Two neighborhoods were weakly standardized in terms of orientation angle, and four are oriented in a random fashion. Terrace area is weakly to moderately standardized within 5 neighborhoods, with 5 showing no standardization. There are three neighborhoods at Tepeticpac (3, 5, and 6) which demonstrate standardization of terrace configuration across all variables.

Table 12. Coefficient of Variation values for terraces among the ten Tepeticpac neighborhoods. Values above 57% show no evidence for standardization. Values 57%-50% are weakly standardized. 49%-40% are moderately standardized. Values 39% and below are strongly standardized.

Terrace Organization Among Tepeticpac Neighborhoods

Neighborhood	Area	Width2	Length	Perimeter	Orientation
Tep1	62.73666	41.90955	39.4053	35.66	56.89446723
Tep2	64.24965	31.18285	45.10342	46.09	30.21943703
Tep3	51.64875	49.50959	10.05457	11.09	11.11693637
Tep4	85.92362	59.41142	49.01258	49.32	67.33764076
Tep5	43.76976	32.26429	28.44821	25.28	53.40605652
Tep6	57.51563	44.58434	27.18747	37.59	10.4401477
Tep7	72.28687	46.9261	42.71427	42.32	36.53871146
Tep8	53.75958	44.71798	33.81621	30.97	82.72615437
Tep9	30.35883	27.31595	15.42036	12.47	76.46078669
Tep10	58.7076	33.11884	41.93578	39.95	63.84950877

Summary of Plaza and Terrace Construction Strategies

The number, size, and shape of public plazas (a type of public good), differ across the three districts which composed Tlaxcallan. Given the importance these spaces had in serving the economic, civic, and religious needs of the polity, this finding is a significant contribution to our understanding of Late Postclassic Tlaxcallan. At Late Postclassic Tlaxcallan, public plazas were designed and constructed based on decisions situated at the district level of governance, and not the central state apparatus. This is seen by the weak evidence for the standardization of plazas when CV is calculated for all plaza locations regardless of context.

Plaza variables appear standardized within districts, however, suggesting that a district-level authority (an official or council) organized the construction of these locations within each district. The use of higher elevations throughout the three districts to construct plazas supports this conclusion. If a centralized state institution was supervising plaza construction for each district, a stronger degree of standardization would be anticipated across the three districts. Instead, it is likely that district-and neighborhood-level elites coordinated to determine how many plazas were needed, and where they should be constructed. Given the founding and relatively rapid construction of the city during the later end of the Early Postclassic period, followed by rapid growth during the Late Postclassic period (Fargher et al. 2010:316; López et al. 2021:5), it is likely that higher-level elites were focused on other aspects of political organization and defense, and left the details of terrace organization to intermediate and lower-level elites.

Ethnohistoric accounts also suggest that different districts utilized this public good for different purposes. As the seat of economic power, Ocotelulco housed the largest marketplace in Tlaxcallan. It is likely that the plazas located in Ocotelulco were the largest and most centrally

located in the Tlaxcallan capital city because these spaces were important economic sources of power and revenue. Plazas located in the Tepeticpac district differ in size and quantity than those located in Ocotelulco, because Tepeticpac was the seat of religious power. Dispersed plazas constructed throughout the neighborhoods of Tepeticpac, where individuals could engage with, produce, and reproduce the religious and political messages of the state, was the focus of these locations. Thus, two different functions of plaza spaces are reported in ethnohistoric accounts, and the archaeological data supports those accounts.

At the neighborhood level, residents had different amounts of plaza spaces available to them in each district. For example, all neighborhoods in Tepeticpac contained at least one plaza, but six neighborhoods had more than one plaza. At Ocotelulco, one neighborhood had no plaza within its boundaries, while two neighborhoods had two or more plazas, and three neighborhoods had only one plaza. All neighborhoods in the Quiahuixtlan district had at least one plaza, while two neighborhoods had more than one plaza available.

The abundance of neighborhood plazas at Tepeticpac can be contrasted against the smaller number of plazas constructed at Ocotelulco and Quiahuixtlan. The abundance of plazas located at Tepeticpac was likely an intentional strategy utilized by urban planners there, probably because intermediate elites in this district derived legitimacy from the shared religious practices venerating the state deity Camaxtli, whose remains were kept in this district. The comparatively fewer plazas in other districts, most notably the Ocotelulco district, was also probably an intentional strategy because wealth and prestige was derived differently there. It should be noted that despite land having been a fixed and relatively scarce resource throughout Tlaxcallan, due to the need for elevated and easily defensible spaces, a particular type of land was sought in all three districts to construct plazas. The choice to utilize land at higher elevations implies some

decision making about where plazas should be placed across the polity, even if each district organized the placement of those plazas independently.

Based on the variation in the dimensions and placement of terraces when the Tlaxcallan urban dataset is viewed as a whole, there appears to have been no state-level control over how neighborhoods constructed terraces. The construction of commoner house-lots likely fell outside the purview of elites who were mostly focused on higher-level issues of governance, like state defense, international relations, and law-making.

At the district level, there is weak to moderate evidence for standardized terrace construction. District elites were likely more focused on maintaining market and religious festival rotations, tax-collection, and organizing corveé services. Ethnohistoric research from intermediate-level elites in Puebla, also supports this conclusion (López and Hirth 2012).

It is only when terraces are examined at the neighborhood level do signs of standardization based on length, perimeter, width, area, and orientation emerge. This data suggests that construction of terraces was coordinated at the neighborhood level, likely through either cooperation among residents or coordination by neighborhood heads. Roughly 40%-50% of neighborhoods in each district demonstrate three or more variables that show evidence of standardization, but which variables differ per neighborhood.

In Tlaxcallan, public plazas played a central role in the everyday lives of Tlaxcaltecan residents by serving the economic, religious, and political needs of neighborhoods. These spaces were non-excludable and non-rivalrous, making their utilization a public good to Tlaxcallan residents. These plazas were placed in nearly every neighborhood, and in each Tlaxcallan district, making their construction ideal for testing if state, district, or neighborhood level elites planned their construction.

Given the important role these locations played in maintaining the social and economic order, it is no surprise that urban planners sought out specific locations and characteristics for their construction. Yet, there is no evidence pointing to a centralized expression of state authority in terms of plaza placement within each district. Plaza size, number, and percentage of area dedicated to public space differs throughout the three districts. For example, at Tepeticpac more than 10% of all land is public space, and this significantly differs from Ocotelulco and Quiahuixtlan, for which public space only composed 5.3% and 4.48% of the land area respectively. It is clear that urban planners in Tepeticpac sought and utilized public spaces more than those located at Quiahuixtlan or Ocotelulco.

Terrace construction in neighborhoods also differed, and state sponsored centralized planning or construction is not evidenced. Instead, neighborhood construction practices point to local planning, as terraces differ in length, width, area, and orientation angle, depending on which district and neighborhood is being analyzed. This pattern is similar to what has been observed at El Palmillo, Oaxaca, in which collective labor used for construction was organized at the neighborhood level (Carballo and Feinman 2016).

However, public goods are not evenly distributed throughout the city. Tepeticpac represents a case where plazas were constructed in a significantly higher frequency than similar public goods constructed at Quiahuixtlan and Ocotelulco. This is likely an intentional strategy by urban planners. Given that no evidence for state centralized planning exists regarding the construction of these spaces, it is likely that this strategy was enacted at the intermediate levels of government, seated at the district scale.

Probably most telling of how urban planners in different districts planned public space is seen in the fact that despite representing nearly double the size of either Tepeticpac or

Quiahuixtlan, Ocotelulco has the smallest number of plazas overall. Ocotelulco also has the smallest average number of plazas per neighborhood. Additionally, Ocotelulco has the smallest average percentage of plaza space when compared to the other districts, and it is the only district that does not have at least one plaza in every neighborhood. In fact, the neighborhood in Ocotelulco that does not have a plaza equates to roughly one-third of the land area which comprises Quiahuixtlan and Tepeticpac, respectively. It should be noted, however, that a possible round temple dedicated to Ehecatl has been identified in this neighborhood. A possible plaza location may have existed in this neighborhood, but was possibly destroyed and covered by modern constructions. However, given the size of this area, several plazas would need to be located here to affect the results of this research.

Given the higher percentage of plaza area to total area in Tepeticpac and Quiahuixtlan and given the comparative underproduction of public goods in Ocotelulco, I suggest that some neighborhoods in this district may have been less engaged with the broader Tlaxcallan political system. Taken together, urban planners utilized different strategies in organizing the intermediate socio-spatial units of Tlaxcallan's neighborhoods. While a high degree of collectivity may have occurred across the landscape, as has been previously discussed by multiple authors, some locations show less public goods production than others; at least in terms of public plazas, one type of public good. This is most evident in one of the largest neighborhoods in Ocotelulco (Neighborhood 6 – the modern Contla neighborhood). While there was likely ample space at other public plazas for these residents, the comparatively fewer plazas at Ocotelulco in general is significant due to the functional use of these public spaces in maintaining the social and political order.

Intermediate socio-spatial units, like neighborhoods and their associated plazas represented locations where the social, religious, and political associations of the neighborhood could be constructed, affirmed, and modified among the many face-to-face interactions that took place within the bounds of those spaces. They were also essential spaces for the functioning of economic systems, as marketplaces and goods production were situated within these contexts. At Late Postclassic Tlaxcallan, it is probable that some neighborhoods participated less in at least one form of public goods consumption, while other neighborhoods chose to participate more. These choices, likely enacted at an intermediate level by urban planners, are probably related to differences in the wants and needs of different neighborhood residents. As collective action is inevitably a process that involves cooperation among many disparate groups, each with their own set of interests, the identification of variation in public goods consumption among large populations can be used to refine our understanding of the strategies utilized by different groups seeking to cooperate, like those of differing class, ethnicity, religion, political affiliation, or some other form of social distance.

Chapter 5 Pottery Iconographic and Chemical Analysis

I examine Codex-Style polychrome pottery because the iconography painted on this type of pottery and produced in Late Postclassic Tlaxcallan may match the inclusive iconography visible on public architecture located throughout the city (see Hernández 2010; Pohl 1998). I examine two ceramic datasets, Codex-Style sherds collected during the survey and those recovered from excavations within households. Both datasets were analyzed chemically to determine if any Codex-Style polychromes were produced using a unique set of materials, if they were produced locally, or if they were imported. If the production or exchange of Codex-Style polychromes was concentrated in any household, as would be evidenced by sherds of a single chemical group with a particular iconographic theme being present in comparatively higher amounts within a household, then it can be inferred that Codex-Style pottery was probably utilized by that household as a source of power. If pottery production and exchange was more dispersed among households, as evidenced by multiple chemical groups and multiple iconographic themes being recovered in households, then trade through the Tlaxcallan market system can be inferred.

The iconography was also categorized according to religious and political themes. If iconography on the pottery contains more inclusive themes (as presented later in this chapter), then it can be inferred that households engaged in more collective politics. If more exclusive themes are observed, then households likely engaged in fewer collective interactions, which would include exclusionary politics, economic competition, and support of personalized networks.

Materials – Polychromes Collected from Survey and Households

A total of 186 Codex-Style sherds was collected for chemical analysis, and the sample was recovered from each of the three districts of the capital city. The sample examined here included 60 polychrome sherds that were collected from archaeological survey (Table 13). The polychrome sherds that were obtained from the survey were collected from 12 of the 21 neighborhoods surveyed in Lane Fargher's Tlaxcallan Mapping Project. Examining production and consumption practices across Tlaxcallan's neighborhoods allows for the comparison of pottery consumption across the three districts, should any patterns exist. From survey collections, I sampled polychrome pottery from three neighborhoods in the Tepeticpac District (n = 27), five neighborhoods in the Ocotelulco District (n=18), and four neighborhoods in the Quiahuixtlan District (n=15).

Table 13. Number of sherds analyzed with Neutron Activation Analysis and Petrography by collection context.

District	Collection Context	# of Sherds	Method of Analysis
Tepeticpac	T30	35	NAA
Tepeticpac	T12	20	NAA
Tepeticpac	T4	26	NAA
Tepeticpac	Survey	27	NAA, Petrography
Ocotelulco	T6	23	NAA
Ocotelulco	Survey	18	NAA, Petrography
Quiahuixtlan	T36	22	NAA
Quiahuixtlan	Survey	15	NAA, Petrography
Total	--	186	--

A total of 126 Codex-Style sherds were collected from secure architectural contexts revealed by archaeological excavations during the Tlaxcala Archaeology Project (2015-2018). Of the structures that contained these materials, one non-residential context was in the Quiahuixtlan district (Structure T36), one 'other-status' household was in the Ocotelulco district (Structure T6-1), one high-status household was located in the Tepeticpac district (Structure T30), and two households of other-status were also located in the Tepeticpac district (Structures T4 and T12). Status identifications for all households examined here was previously assessed based on the size of architecture, the use of more intensive construction efforts, proximity to other important architectural complexes, diversity of materials recovered, and the amount of burials located within architectural complexes (Fargher et al. 2017; Fargher et al. 2020; Marino et al. 2020). The household in the Tepeticpac district, El-Fuerte neighborhood structure T30, was identified as high status prior to this research, and based on the fact that it was significantly larger than the others, had a finished façade and talud exterior, and was centrally located in proximity to other important public structures (see Fargher et al. 2020; Marino et al. 2020). Thus, household collection contexts from each of the 3 districts are represented in this study (see Appendix VIII for plan drawings). Chemical analysis of this sample allows for pottery production and consumption practices to be compared by household and status.

The iconography present on Codex-Style sherds was also examined to ascertain if any iconographic themes were preferred by households. Of the 126 sherds obtained from archaeological excavation and exported to the US for chemical analysis, 39 had Codex-Style motifs that were complete enough to identify a religious or political iconographic theme. An additional 191 sherds was examined iconographically in Mexico (see methodology below) to identify the political or religious themes presented on them.

Tlaxcala Geology that Influences Chemical Interpretation of Ceramic Compositional Data

The geology of the Tlaxcala Block is similar to that of the Basin of Mexico in the sense that it is primarily dominated by volcanic activity beginning in the Late Miocene (Castaneda 2009:495). Deposits in the Tlaxcala Block are largely comprised of felsic-intermediate materials like andesite, basaltic andesites, and rhyolite. These formations are superimposed in the valleys and other lower lying areas by a layer of lacustrine clays, silts, and sands, comprised of material reconsolidated from these volcanic layers, that likely formed during the Pliocene. Further eruptions during the Pleistocene and Holocene left layers of ash and pumice deposited from pyroclastic flows as ignimbrite. Alluvium and colluvium eroded from these strata have been continuously deposited during the Holocene.

Prior petrographic analysis by Lane Fargher examined the distribution of clay-sized (matrix), silt-sized, and sand-size grains using point-counting (Blanton et al. 2010). These analyses demonstrated that silt proportions were very low and showed little variation. Fargher and colleagues concluded that this demonstrated that potters either acquired very fine clays from well-sorted alluvial deposits or levigated raw clays to remove larger grains. These clays were then tempered with sand from colluvial deposits (grains were moderately mature, showing subangular-subrounded profiles, which would be consistent with colluvial contexts) located within and around the site. Therefore, sand-sized inclusions were used to separate ceramic fabrics into groups based on the mineral composition of the sands (Lane Fargher, personal communication; Blanton et al. 2013).

Prior research was also completed by Lane Fargher regarding the mineralogical composition of the Tlaxcallan ceramics recovered from survey (Blanton et al. 2013). The mineral composition of the tempering materials and the presence of volcanic glass led researchers to

believe that Tlaxcallan pottery was produced with sands eroded from local volcanic deposits. According to Lane Fargher and colleagues (Blanton et al. 2013:6), mineral species included primarily pyroxene (both clino and ortho), amphiboles (mostly hornblende), biotite, plagioclase, K-feldspar (orthoclase or sanidine), quartz, and epidote as an alteration product. Mafic minerals (pyroxenes and amphiboles) occurred in low frequencies (<35% of minerals) indicating that source bedrock is felsic-intermediate. The presence of high temperature K-feldspar (orthoclase or sanidine) as opposed to low temperature K-feldspar (microcline) indicated that source bedrock was igneous extrusive. However, rare inclusions of fully holocrystalline igneous rock fragments and microcline indicated that in a few cases a stray fragment of basement rock was included in the fabric.

Considering that the source material for temper was felsic-intermediate igneous extrusive bedrock, an IUGS style ternary plot of quartz, plagioclase, and k-feldspar was used to classify the temper in sample thin sections. Samples were plotted and assigned to a rock type (e.g., Rhyolite, Dacite, Andesite-Basalt, Quartz Trachyte, and Quartz Latite). In the case of Quartz Trachyte and Quartz Latite, samples were not sufficiently diverse to justify separate groups, so the samples were collapsed into a single group (Quartz Latite-Trachyte).

These finalized composition groups were then combined with texture data to refine the overall classification of ceramic fabrics. Ternary plots and Wilcoxon rank-sum tests were again used to identify groups. The classification produced eight composition-texture groups with three outliers. Once groups had been defined, matrix and sand were subjected to additive logistic ratio transformations for final statistical analysis. Based on these data, Fargher and colleagues (Blanton et al. 2013) believed that the compositional-textural groups represented distinct paste recipes used by different potters. The highly uniform nature of these paste groups also indicated

that production was specialized, and the majority of the pottery they examined was produced locally.

Chemical Analysis of Pottery

The two datasets were examined chemically using neutron activation analysis (NAA) after being exported to the University of Missouri Research Reactor (MURR), as a part of this dissertation. Sixty of these sherds had previously been examined using petrography, and the results from that analysis demonstrated that the pottery was produced within the three districts that comprised the Tlaxcallan core city (see Blanton et al. 2013; and discussion below). These 60 sherds allow a comparative dataset of local goods to be established, allowing any foreign Codex-Style sherds to be identified in the expanded dataset of samples obtained from survey and excavation.

Chemical datasets obtained from archeological projects can be analyzed using methods following the 'provenance postulate,' which states that the differences in chemical composition between different sources exceeds differences observed within a given source (Weigand et al. 1977:24). "Source" refers to the location of potters or potting communities generally, and not a specific geographic location, although potters can be nucleated in specific locations such as workshops (Arnold 1985; see also Gosselain 2000). The behavior of potters is also important, including their use of other raw materials used in ceramic production, as the finished ceramics retain the chemical properties of both the clay, temper, and other products used in the pottery production chain, thereby aiding in the identification of different potting practices and the strategies employed by different potting communities (Arnold et al. 1991, 2000; Neff et al. 1989; Sillar and Tite 2000; Stoner 2013).

Important ethnographic work among contemporary potting communities has shown that potters will typically not travel farther than one kilometer to obtain clay and slightly further to obtain tempers (Arnold 1985). Clays are typically low-value, high-bulk materials, and because clays and tempers are situated at different points on the landscape, and because potters will typically not travel far to exploit raw materials used in production, different chemical patterns found in paste recipes can be used to infer different potting communities, or different communities of practice, because different potting communities will use different raw materials in pottery production (Joyce 2012).

NAA Sample Preparation

Standard methods at MURR for the preparation of ceramic samples entail removing a 1 cm^2 ceramic piece and grinding the surface using a Dremel tool with a silicon-carbide burr attachment. This will remove any paint, slip, or soil from the sherd body to avoid any misclassification. The sample is then rinsed in deionized water and allowed to dry. Once dry, samples are ground into a fine powder using an agate mortar.

Two sets of the same sample are prepared at MURR from each specimen, 150 mg of powder is placed in high-density polyethylene vials and is used in the short count irradiation. 200mg of powder (from the same specimen) are placed in clean high-purity quartz vials used for long irradiations. Samples are sealed prior to irradiation and included with them are NIST standard reference materials: Coal Fly Ash (SRM-1633a), SRM-688 (Basalt Rock). In-house quality control standards used at MURR include SRM-278 (obsidian rock) and Ohio Red Clay (Glascock 1992; Neff 2000).

Element concentrations are modeled by submitting ceramic samples for irradiation by neutron bombardment, making the sample radioactive. The gamma rays emitted during radioactive decay after irradiation are subsequently counted to determine intensities at different energy signatures, which are converted to elemental concentrations (Glascock and Neff 2003:1516). The formula to express this process follows is listed in Figure 15.

$$a + A \rightarrow [X] \rightarrow b + B + Q$$

Figure 14. NAA irradiation process and energy calculation. From Glascock and Neff 2003

The symbol *a* represents the incident particle, *A* is the target nuclide, [*X*] is the compound nucleus in a state of excitation, *B* is the radioactive product nuclide, *b* is the exiting particle or radiation, and *Q* accounts for the amount of energy released or absorbed during the reaction. If *Q* is positive, the reaction is exoergic, if *Q* is negative the reaction is endoergic (Glascock and Neff 2003:1517). Neutron activation analysis typically results in an exoergic reaction, where the incident particle (neutron) absorbed by the target nuclide exceeds the energy threshold of the reaction, releasing a prompt particle and prompt gamma ray. The product particle is likely to still be radioactive and a second, delayed gamma ray is released, and this delayed measurement is the one collected at MURR (Glascock and Neff 2003:1518).

Irradiation procedures at MURR occur in two intervals and gamma ray counts are taken at 3 intervals, a short count, middle count and long count. Elemental data is collected as parts per million (Glascock 1992; Neff 2000; Pierce and Glascock 2016). A short irradiation period occurs for 5 seconds, and gamma ray spectra are counted and calculated after a 720-second period. This count period measures the nine ‘short-life’ elements: Al, Ba, Ca, Dy, K, Mn, Na, Ti,

and Va. A second irradiation period occurs in which samples are radiated for a 24-hour period and then allowed to decay for a 7-day period, and then counted for an 1800 second period (the middle count). Spectral peaks are calculated on seven middle-count elements: As, La, Lu, Nd, Sm, U, and Yb. After an additional three-to-four-week decay, 17 long-half-life elements are counted: Ce, Co, Cr, Cs, Eu, Fe, Hf, Ni, Rb, Sb, Sc, Sr, Ta, Tb, Th, Zn, Zr.

NAA Results of Codex-Style Polychromes

Chemical analysis of the 186 Codex-Style sherds was performed using Neutron Activation Analysis (NAA) and identified two chemical groups (see below). Methods utilized in this dissertation to test the placement of samples within statistical groups were t-tests, analysis of variance (ANOVA), and multiple analysis of variance (MANOVA). Proper procedures for classifying samples using these tests call for the presence of at least five times more samples per group than elements used to perform the test, with at least 10-15 sherds per context examined (Bishop et al. 1982:279; Sayre 1975:11). The initial PCA identified that the 9 rare earth elements (REEs) introduced the most chemical variation into the dataset (Figure 16), and that there was a probable chemical group containing roughly 50 samples. The nine REEs were subsequently used to refine the placement of samples within chemical groups, and to perform a MANOVA to test chemical group classification. The MANOVA test identified that the two chemical groups were statistically distinguishable (Figure 17a). However, incorporating all 22 elements used in the initial PCA produced the exact same result as only using the nine REEs (Figure 17b).

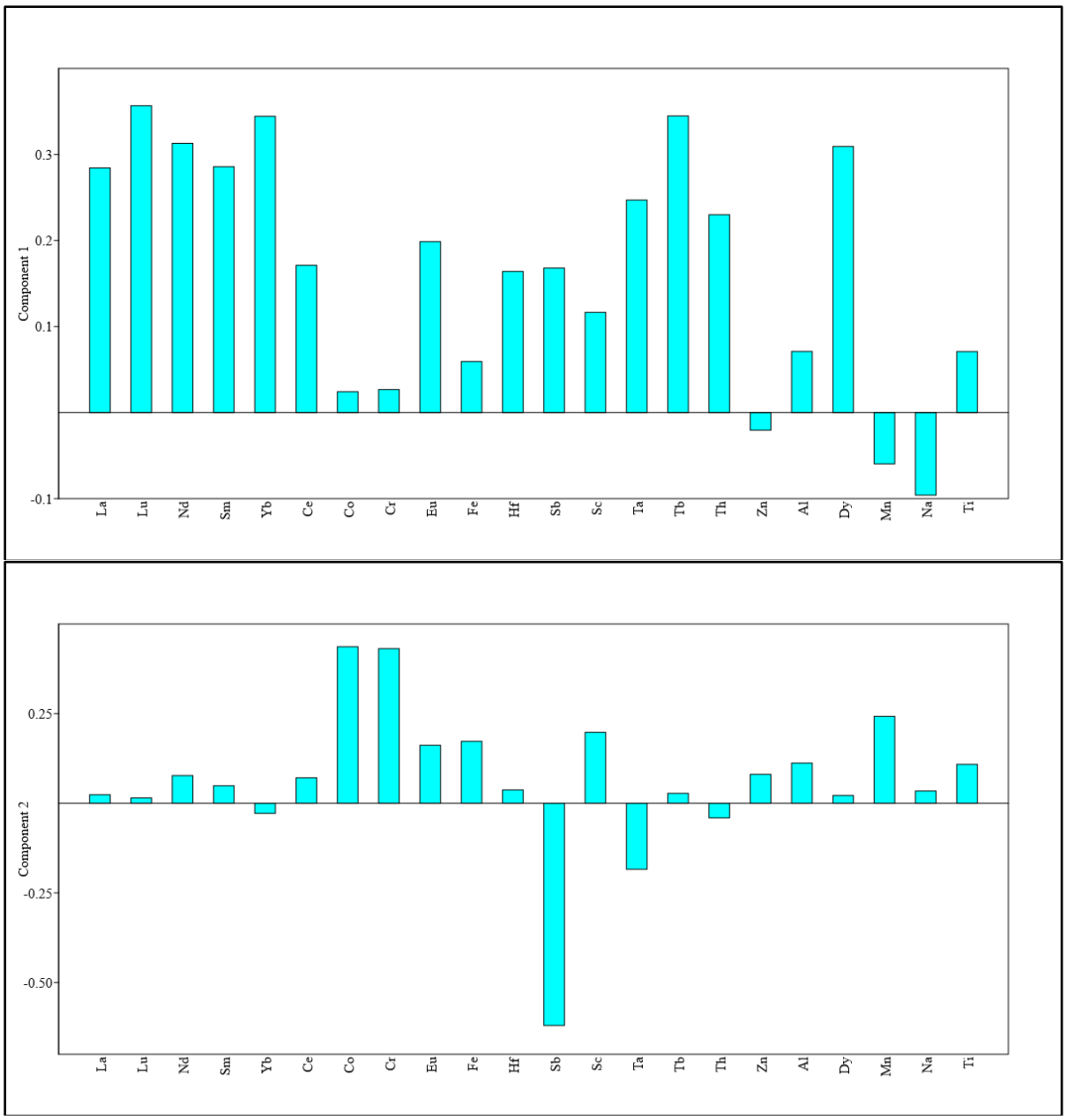


Figure 15. The PCA loadings plot on components 1 and 2 for all sherds showing the 22 elements used in the initial classification. Note the nine rare earth elements introduced the most chemical variation on both components 1 and 2.

A).

Wilks´ lambda:	0.2165	**Pillai trace:**	0.7835
df1:	9	**df1:**	9
df2:	170	**df2:**	170
***F*:**	68.37	***F*:**	68.37
***p* (same):**	7.438E-52	***p* (same):**	7.438E-52

B).

Wilks´ lambda:	0.1965	**Pillai trace:**	0.8035
df1:	22	**df1:**	22
df2:	157	**df2:**	157
***F*:**	29.18	***F*:**	29.18
***p* (same):**	1.893E-44	***p* (same):**	1.893E-44

Figure 16. (A) Results of MANOVA test using nine REEs to separate groups 1 and 2. (B) Results of MANOVA using 22 elements that could be validated for precision and accuracy.

Differences in the pottery textures, as identified by the petrographic analysis accomplished by Lane Fargher, likely drove the chemical variation observed in the dataset of Tlaxcallan Codex-Style pottery. The identification of variable sizes and amounts of sand and ash grains used to temper the paste, likely introduced the chemical variation to this dataset. For example, because the districts in Tlaxcallan were located in close proximity to one another, and there are no significant differences in geological variation within the city, chemical groups tend to grade together. Potters used similar materials procured locally, but each community likely mixed them using different proportions, and that produced the variation observed here. Because the clays used to make the pottery were so heavily levigated, and because the materials added as temper were available to all districts, no geochemical "marker" can be used to identify production occurring in a specific district or household.

The two chemical groups identified here point to more than one pottery production workshop being present in the city. According to site reports, nearly 20% of the pottery recovered by excavations in the capital city was of the Codex-Style. If one workshop alone was supplying the entire city of Codex-Style polychromes, one might expect a single group with little

internal variation. If a 1:1 ratio between chemical recipe and the number of pottery workshops is assumed, which can be problematic, the presence of two relatively distinct chemical groups, and possibly several production locations given the gradual grading of one chemical group to the next, points to multiple contexts of production within the city.

Supporting this finding, and similar to the petrographic and the chemical study, archaeological survey had previously identified two or more probable pottery production areas based on the presence of undecorated waster sherds and kiln furniture (Blanton et al 2013:10). These possible production areas were located on at least three terraces in the Tepeticpac and Ocotelulco districts. Because all three studies are in agreement, the pottery analyzed in this dataset can be confidently attributed to local production.

There were six outliers identified for the entire dataset of 186 sherds. These six outliers were sampled from the districts of Tepeticpac (n = 3) and Ocotelulco (n = 3). These outliers do not form a coherent chemical group and do not come from a single household or even neighborhood. Because they are so few in number, are all from different households, and do not cluster in either chemical or geographical space, they are simply interpreted as probable non-local trade goods. While they represent some form of exchange, like gift giving or perhaps were passed down as family heirlooms, there is no way to determine this based on so few samples. Exchange goods procured at the local market is also a possibility, as this type of exchange for Codex-Style ceramics is well documented in other locations (Levine et al. 2015).

NAA Summary of Polychromes Recovered at the District Level

It is evident from the chemical analysis that Group 1 and Group 2 polychrome ceramics were available in all Tlaxcallan districts. Group 1 ceramics made up 26.3% of the recovered

Codex-Style sherds overall (Table 14). Group 2 sherds made up roughly 71.4% of the samples recovered from survey and excavation. Outliers comprise roughly 3.2% of the ceramic sample from Tepeticpac and Ocotelulco.

Table 14. Summary statistics for Groups 1 and 2 examined with NAA from sherds recovered during the Tlaxcala Mapping Project and the Tlaxcala Sourcing Project

District	Grp1	Grp1%	Grp2	Grp2%	Outlier	Outlier%	Total	Total %
Tepeticpac	33	30.56	72	66.67	3	2.78	108	58.06
Ocotelulco	8	19.51	30	73.17	3	7.32	41	22.04
Quiahuixtlan	8	21.62	29	78.38	0	0.00	37	19.89
Total	49	26.34	131	70.43	6	3.23	186	100.00

An important question to researchers that study the production, consumption, and exchange of Codex-Style ceramics, is whether these ceramics were produced locally in Tlaxcallan, or whether they were produced outside the city and brought in through some form of trade. The 60 sherds previously analyzed with petrography by Lane Fargher and identified to be locally produced, completely overlap in chemical space with the 126 sherds obtained from excavation that were also analyzed with NAA. This finding is observed when component scores are plotted using the nine REEs which were identified as important with a PCA. However, when the component scores were plotted for all 22 elements which could be validated, this pattern was repeated (Figure 18).

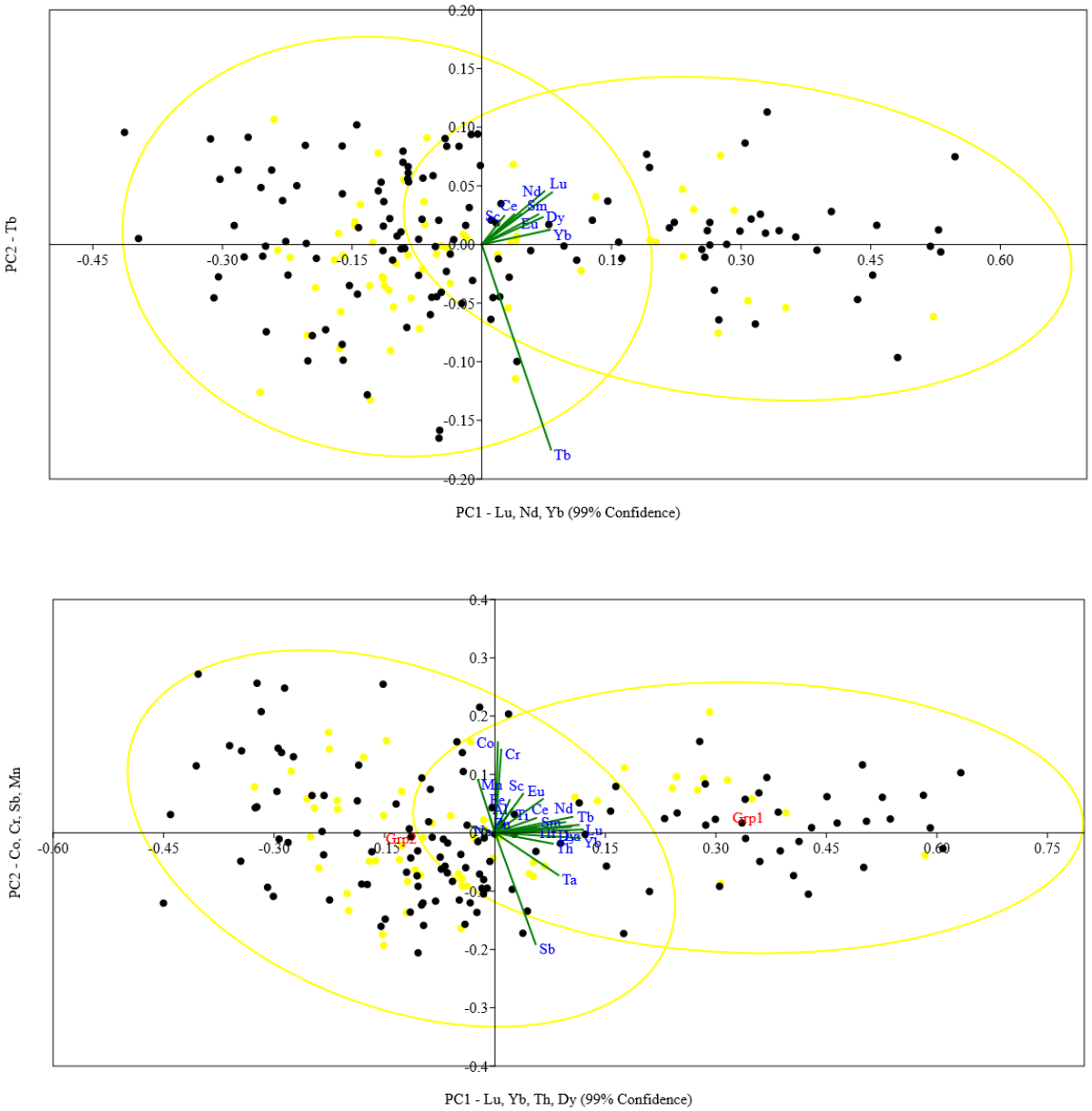


Figure 17. Separation of Codex-Style sherds collected from survey (yellow) and excavation (black) into two groups by plotting of component scores using elements (Top) Lu, Nd, Sm, Yb, Ce, Eu, Sc, Tb, and Dy; and (Bottom) the full twenty-two elements which could be validated for this dataset.

The sherds that were previously identified as locally produced using petrography, completely overlap in chemical space with the sherds recovered from archaeological excavations. If pottery was being imported from multiple locations, then multiple chemical

groups would be expected. The discovery that only two chemical groups were identified for the entire city, and that these completely overlap with the locally produced sherds examined with petrography, strongly suggests that the majority of Codex-Style pottery consumed within households was locally produced. Given that roughly 20% of all pottery consumed in Tlaxcallan was of this type, this finding suggests that Tlaxcallan was a major producer and consumer of these goods. Prior research by Neff (et al. 1994) suggested a possible production source of postclassic Codex-Style polychrome pottery in Tlaxcallan, but this was never corroborated chemically until now.

Based on iconographic analysis of Codex-Style pottery, Hernández (2010) had also suggested Tlaxcallan as a major production center of this pottery, because iconography on Tlaxcallan pottery differed from Codex-Style ceramics recovered at other locations in Mesoamerica. John Pohl (1998) had made a similar assertion based on the similarity between iconography on public architecture in Tlaxcallan, and that observed on Codex-Style pottery recovered from the city (Pohl 1998). Based on the criterion of abundance, the chemical data obtained here with NAA also supports the hypothesis made by Pohl (1998), Hernández (2010), and Fargher (Blanton et al. 2013), that Codex-Style pottery was produced within the city. The discovery that 97% of all Codex-Style pottery either recovered from survey or excavation was produced locally in Tlaxcallan, suggests that Tlaxcallan was a major producer of this good. This is a new finding in Mesoamerican archaeology.

NAA Summary of Polychromes Recovered at the Neighborhood Level

The 60 sherds collected during a systematic site-wide survey provide an opportunity to examine differences in neighborhood consumption patterns of Codex-Style polychrome pottery (Table 14). The assignment of these 60 sherds to Groups 1 and 2, which were recovered throughout the three districts, was corroborated with an Hierarchical Cluster Analysis (HCA) and plotting of the component scores obtained with Principal Components Analysis (PCA) (see Figure 19). Of the total Codex-Style polychrome pottery sample obtained from survey, 13 sherds were assigned to Group 1 and 44 were assigned to Group 2.

The distribution of Group 1 and Group 2 ceramics among Tlaxcallan districts allows for the identification of any preferences in the consumption of this pottery. Of the Group 1 sherds recovered in each of the three districts, roughly 15% were recovered from Tepeticpac. Group 1 sherds accounted for 22% of the Codex-Style sherds recovered from Ocotelulco. Quiahuixtlan also contained Group 1 Codex-Style sherds, with 33% of the Codex-Style sherds recovered there being comprised of Group 1 ceramics (Table 15). In terms of preferences, Group 1 sherds were preferred most among the Quiahuixtlan district, and the least among the Tepeticpac district.

Table 15. Summary statistics for Groups 1 and 2 examined with NAA from sherds recovered during the Tlaxcala Mapping Project.

District	Grp1	Grp1%	Grp2	Grp2%	Outlier	Outlier %	Total	Total %
Tepeticpac	4	14.81	23	85.19	0	0.00	27	45.00
Ocotelulco	4	22.22	11	61.11	3	16.67	18	30.00
Quiahuixtlan	5	33.33	10	66.67	0	0.00	15	25.00
Total	13	21.67	44	73.33	3	5.00	60	100.00

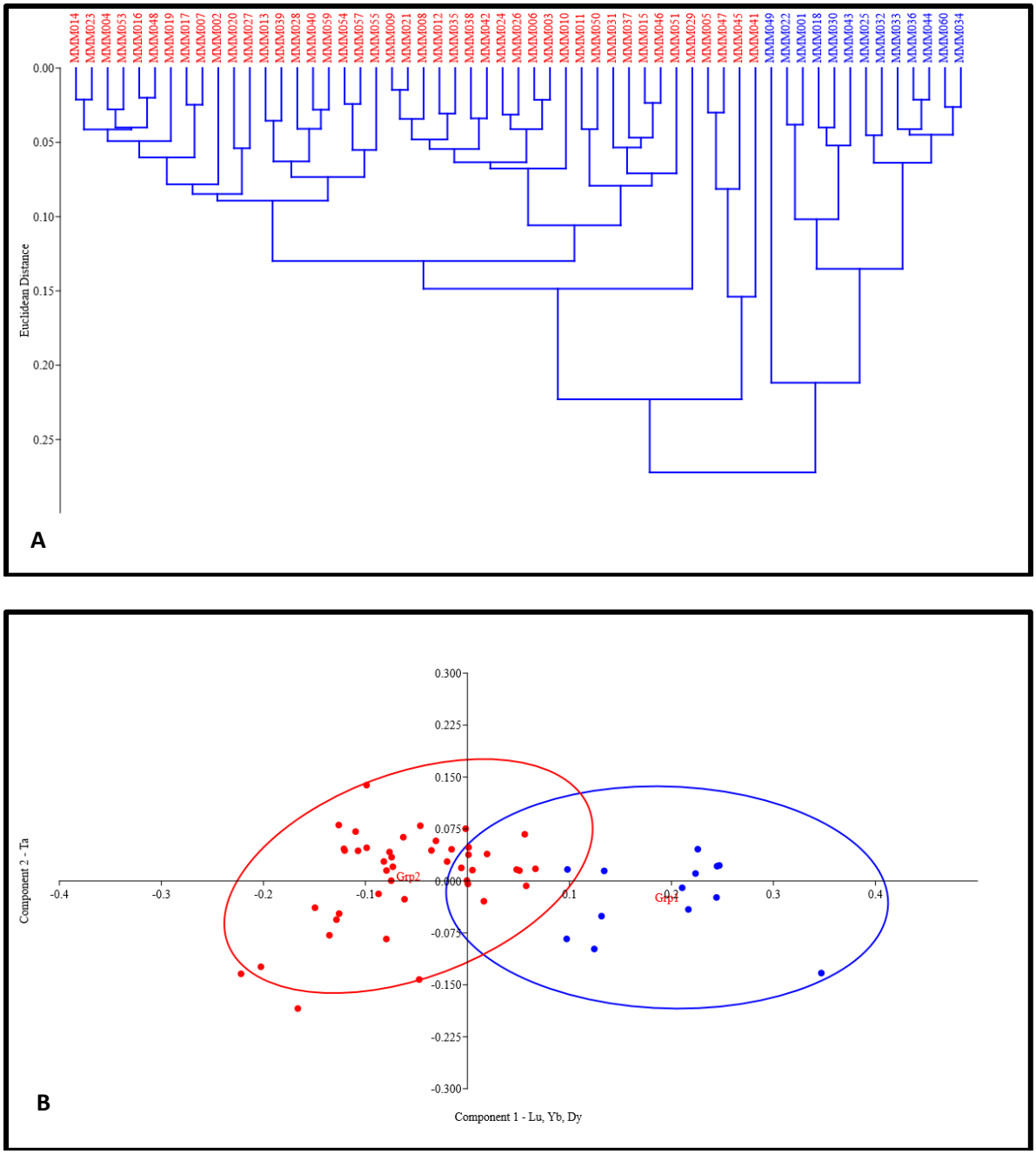


Figure 18. Separation of Codex Style sherds collected from survey into two groups using A). Hierarchical Cluster Analysis and B.) plotting of component scores using elements Lu, Yb, Tb, Ta.

Preferences differ for Group 2 ceramics recovered from within the city, and Group 2 ceramics comprise 85% of the Codex-Style sherds recovered from Tepeticpac. Of the Codex-Style sherds recovered from Ocotelulco, 61% were from Group 2. At Quiahuixtlan, 67% of the

Codex-Style sherds were from Group 2. In terms of Group 2 ceramics, the Tepeticpac district contained the most sherds, and Ocotelulco the least. The only outliers recovered from the site-wide survey were from Ocotelulco and numbered only three. However, this equates to 16% of the sample for that district, supporting ethnohistoric accounts which mention that the largest market was located in this district.

Examining the specific neighborhoods from which Group 1 and Group 2 ceramics were recovered allows for the identification of neighborhood preference in polychrome pottery consumption. Group 2 ceramics are found in the most diverse contexts, and out of the 13 neighborhoods sampled across the three districts, Group 2 ceramics were recovered from 12 of those neighborhoods (Table 15). The areas with the highest percentage of Group 2 ceramics are Tepeticpac neighborhoods 1 and 10, where 35% of all Group 2 polychromes were recovered.

In contrast, Group 1 ceramics are found in only 6 out of the 13 neighborhoods sampled, with no apparent pattern in their consumption. The most Group 1 ceramics were recovered from Quiahuixtlan Neighborhoods 2 and 3, where roughly 38% of all Group 1 sherds were recovered. Tepeticpac Neighborhood 1 is the only neighborhood where Group 1 ceramics were recovered at Tepeticpac. At Ocotelulco, the most Group 1 sherds come from Neighborhood 5, with two other neighborhoods each having a single sherd.

These results tentatively suggest that ceramics were exchanged freely throughout the site. This is evidenced by the fact that Group 1 and Group 2 ceramics are found throughout the three districts, with no apparent pattern to their consumption, although some preferences are indicated. This finding tentatively suggests that pottery consumption was not being controlled or nucleated in any district, but that ceramics were likely exchanged freely.

NAA Results of Polychromes Recovered from Household Excavations

Examining ceramics obtained from household excavations allows for differences in consumption preferences to be explored by status, if any preferences existed. The assignment of the 126 sherds obtained from household excavations to Group 1 and Group 2 was corroborated by plotting the component scores obtained with PCA (Figure 20). Group 1 ceramics recovered from household excavations comprised 36 samples, and Group 2 ceramics are represented by 88 sherds. Both Group 1 and Group 2 ceramics were recovered in every household examined here (Table 16).

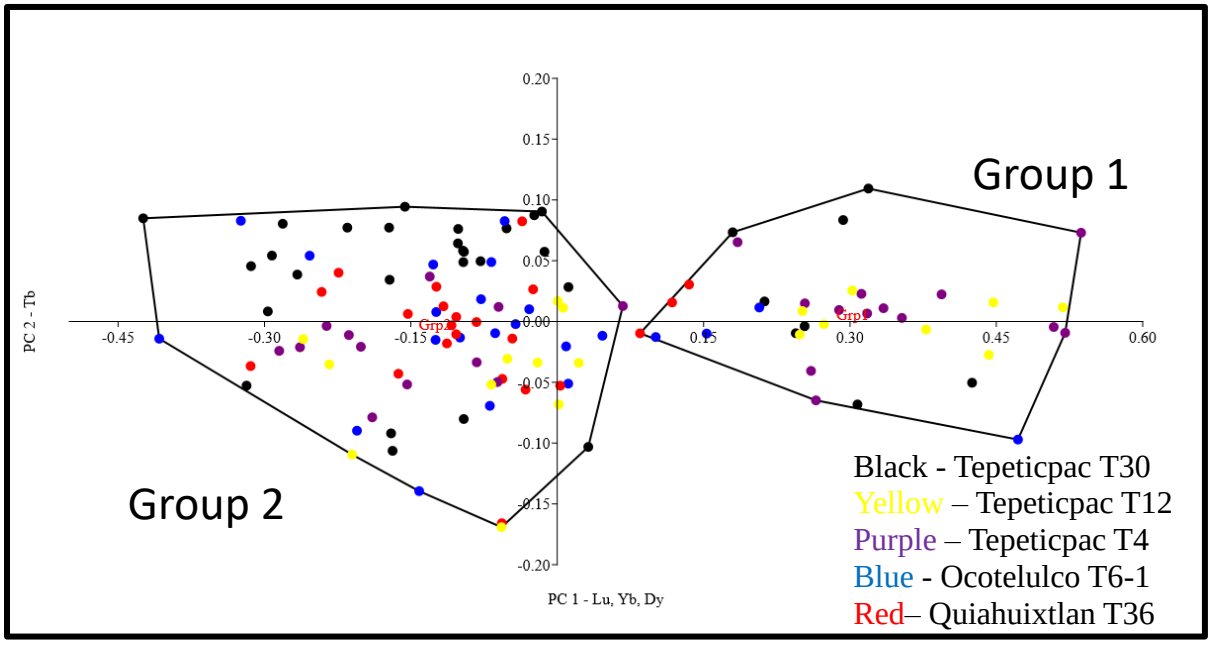


Figure 19. Assignment of Group 1 and Group 2 ceramics among 126 excavated sherds.

Table 16. Distribution of Group 1 and Group 2 ceramics throughout the neighborhoods within the 3 barrios of Tlaxcallan.

Tepeticpac				
Group	Neighborhood 1	Neighborhood 4	Neighborhood 6	Neighborhood 10
Grp1	4	0	0	0
Grp2	12	1	1	9
Outlier	0	0	0	0

Ocotelulco					
Group	Neighborhood 1	Neighborhood 3	Neighborhood 4	Neighborhood 5	Neighborhood 6
Grp1	0	0	1	2	1
Grp2	1	3	4	0	3
Outlier	0	2	1	0	0

Quiahuixtlan				
Group	Neighborhood 2	Neighborhood 3	Neighborhood 4	Neighborhood 5
Grp1	2	3	0	0
Grp2	5	1	3	1
Outlier	0	0	0	0

Examining the distribution of Group 1 and Group 2 ceramics throughout the five structural contexts supports the finding that their consumption was not controlled, because no patterns are identified in their distribution. Group 1 ceramics were consumed in the least proportion among all the households located across the three districts (Table 17). However, among all households, Group 1 ceramics are represented in much smaller percentages in the Tepeticpac district than in Quiahuixtlan and Ocotelulco.

Group 2 Codex-Style polychromes were more popular throughout the city overall, where these sherds represent roughly between 13% to 29% of household samples. The NAA data also

points to Group 2 being more popular in Ocotelulco and Quiahuixtlan, than in Tepeticpac. Simply put, NAA of the Codex-Style polychromes highlights a decentralized and unrestricted system of production and exchange. With at least two different production 'sources' available for consumption, this research points to the fact that *people could choose what pottery they wanted to consume, with no restrictions on access being present.*

Table 17. Sherds assayed with NAA and color coded by household.

Structure	Neighborhood	District	Total	Grp 1	Grp1 %	Grp2	Grp2%	Out	Out%	Status
EFT30	El Fuerte	Tepeticpac	35	8	22.86	26	74.29	1	2.86	High
EFT12	El Fuerte	Tepeticpac	20	8	40.00	11	55.00	1	5.00	Other
EFT4	El Fuerte	Tepeticpac	26	13	50.00	12	46.15	1	3.85	Other
T6	Acxotla	Ocotelulco	23	4	17.39	19	82.61	0	0.00	Other
T36	Los Reyes	Quiahuixtlan	23	3	13.04	20	86.96	0	0.00	Public

Methods Iconographic Analysis of Pottery:

Methods for identifying iconography on the Codex-Style ceramics followed those reported by several previous authors, primarily Gilda Hernández-Sanchez (2004, 2010), Michael Lind (1994), Aurelio López (2019), Jaime Forde (2016), and Lane Fargher (2010). Iconography was photographed in the field lab, on washed sherds only. All sherds that had visible symbols were examined, and iconographic analysis was performed only on sherds recovered within secure architectural contexts.

In total, a sample of 648 Codex-Style ceramics (roughly 130 per structure) were randomly selected from each of the five structures excavated by the Tlaxcala Archaeological Project. Of this random sample, 334 sherds had iconography that was not completely eroded. Of the 334 sherds with iconography, 104 sherds had symbols that were simple decorations and shapes, and did not represent any iconographic theme (i.e. repeating lines or circles). A total of 230 sherds displayed iconography that could securely classify sherds according to the motifs and symbols illustrated in prior research throughout Mesoamerica (see Fargher et al. 2010; Forde 2016; Hernández-Sánchez 2004, 2010; Levine et al. 2015; Lind 1994; López 2019; Olko 2014; Taube 1989; 2010).

Iconographic Results of Household Polychromes

In total, 15 thematic groups were classified following previous studies (Hernández 2010; López 2019) (Table 18). There were nine thematic groups associated with aggrandizement, or with a focus on personal power, nobility, and concepts of elite divinity (Figure 21). These noble themes were recovered in every household (Figure 22).

Iconography associated with the state deity, or impersonal themes relating to agriculture and religion were also recovered in every household. For example, there were six thematic groups associated with the state deity Tezcatlipoca, the Cult of Tezcatlipoca, and associated themes of death, rebirth, smoke, and darkness. The nine complexes that are related to themes of noble elites, wealth and aggrandizement are described below, followed by a description of the six themes associated with the state and impersonal ideologies:

Table 18. Iconographic Complexes on Codex-Style pottery by Excavated Households.

Symbolic Complex	Tepeticpac Other Status				Tepeticpac High Status		Ocotelulco Other Status		Quiahuixtlan Public Structure		
	Str. EFT4	%	Str. EFT12	%	Str. EFT30	%	Str. OCOT6	%	Str. QXT36	%	Total
Complex of Crossed Bones	2	3.23	2	3.23	3	3.53	2	2.38	3	7.32	12
Complex of Death and Tezcalitpoca	4	6.45	3	4.84	9	10.59	3	3.57			19
Complex of Eagles							4	4.76			4
Complex of Fine Textiles	1	1.61	1	1.61			2	2.38			4
Complex of Luxury Vases			1	1.61							1
Complex of Agricultural Propitiation	1	1.61			1	1.18	1	1.19	1	2.44	4
Complex of Smoke and Darkness	4	6.45	4	6.45	8	9.41	4	4.76	2	4.88	22
Complex of White Flowers							2	2.38			2
Complex Xochicuicatl-Xochilhuitl	3	4.84	3	4.84	2	2.35	4	4.76			12
Complex of War, Sacrifice, and Nobility			1	1.61	7	8.24			3	7.32	11
Machiyotl Glyph Complex	12	19.35	13	20.97	6	7.06	13	15.48	10	24.39	54
Solar Band Complex	4	6.45	4	6.45	2	2.35	1	1.19	4	9.76	15
Teocuitlatl Complex	5	8.06	6	9.68	12	14.12	14	16.67	4	9.76	41
Tlamatchli Complex					10	11.76	3	3.57	1	2.44	14
Complex of Death and Tlillan	3	4.84	4	6.45	3	3.53	5	5.95			15
Plain/Fragment/ Incomplete/ Eroded	23	37.10	20	32.26	22	25.88	26	30.95	13	31.71	104
Total Sherds	62		62		85		84		41		334

The Complex of Eagles: Comprised of thick eagle feathers, precious stones, and thicker lines that mirror the form of an arrow. Arrow-like patterns depict the base of an eagle feather. Other symbols depict solar rays, eagles, and precious stones which represent nobility (Hernández 2008:117).

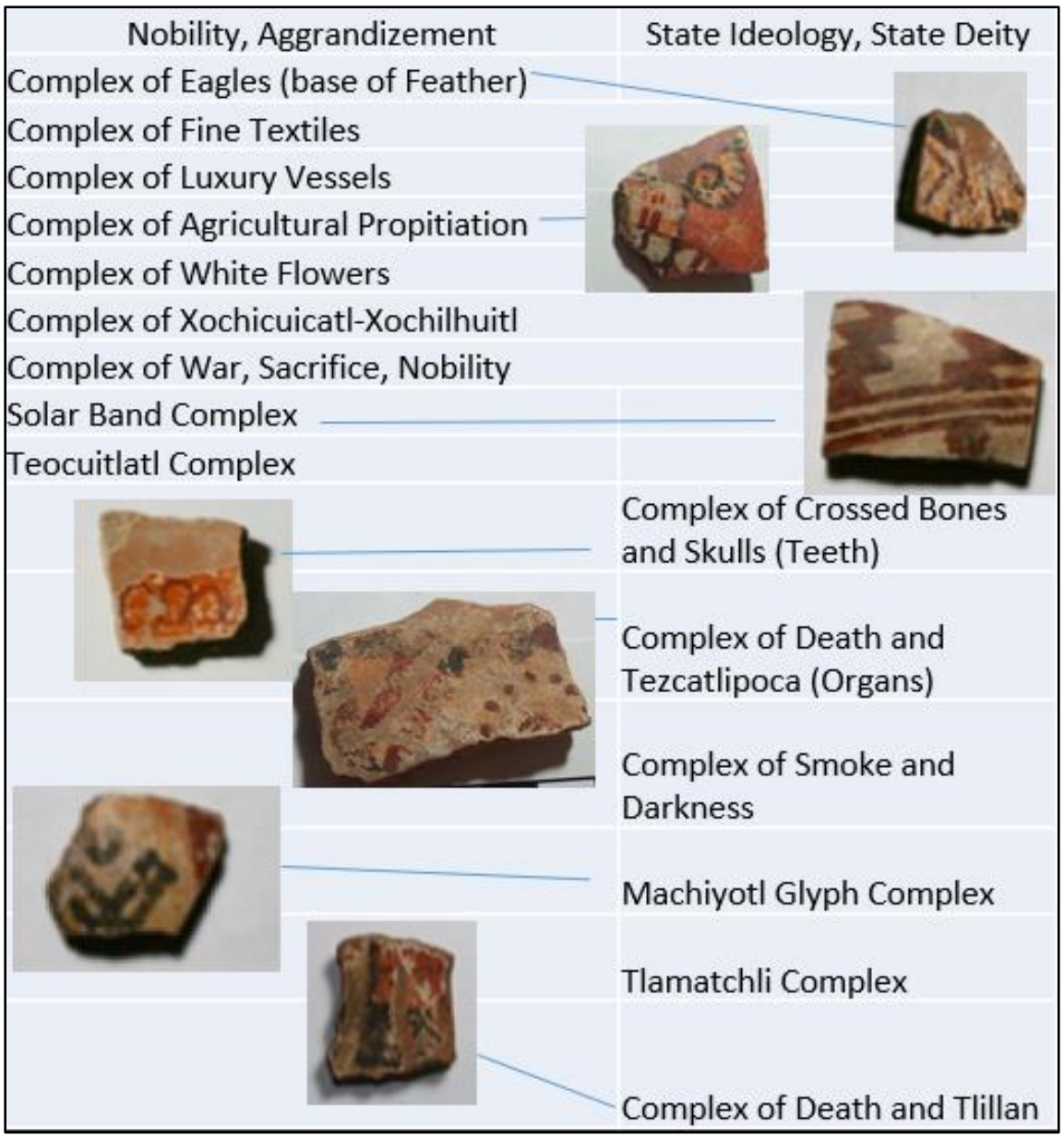


Figure 20. Fifteen ideologic complexes were identified in this research, and their association with inclusive strategies or strategies of aggrandizement. For a complete view of motifs see Appendix II.

The Complex of Fine Textiles: Represented by multiple intersecting (woven) lines forming a diamond like pattern. Multiple intersecting rows of crossed hatching, such patterns also depicted

by square borders forming layers and rows. This complex represents the weaving of fine textiles, primary colors are orange and red (Hernández 2005:116).

The Complex of Luxury Vessels: Identified by precious stones, agave thorns, and stylized flower symbols in various J-motif forms. The primary colors are black, orange, and red (Hernández 2005:117; 2005:77 for J symbol).

The Complex of Agricultural Propitiation: Represented by an orange band with eagle feathers, and has previously been identified as a symbol for the skin of the feathered serpent, or dried earth. Also indicated in this complex are motifs relating to the feathered headdress, which symbolize rulership. Scenes in the Codex Borgia related to this complex are also associated with Tlaloc (Hernández 2010:262).

The Complex of Xochicuicatl-Xochilhuitl: comprised of flower imagery, such as stems and leaves, painted in white and black, with red and black for the petals. Sometimes the painted glyph for song and festival is included, indicating that the intended use of the vessel was for celebrations to Xochipilli, a primary deity of nobles (López et al. 2019:340).

The Complex of White Flowers: Comprised of flower petals, step frets and precious stones. While this complex is called this primarily by Hernández (2010), it is similar to the Complex of Flowers and Feathers mention by López and colleagues (López et al. 2019:340). Primary colors are white, grey, red, and yellow (Hernández 2010:259).

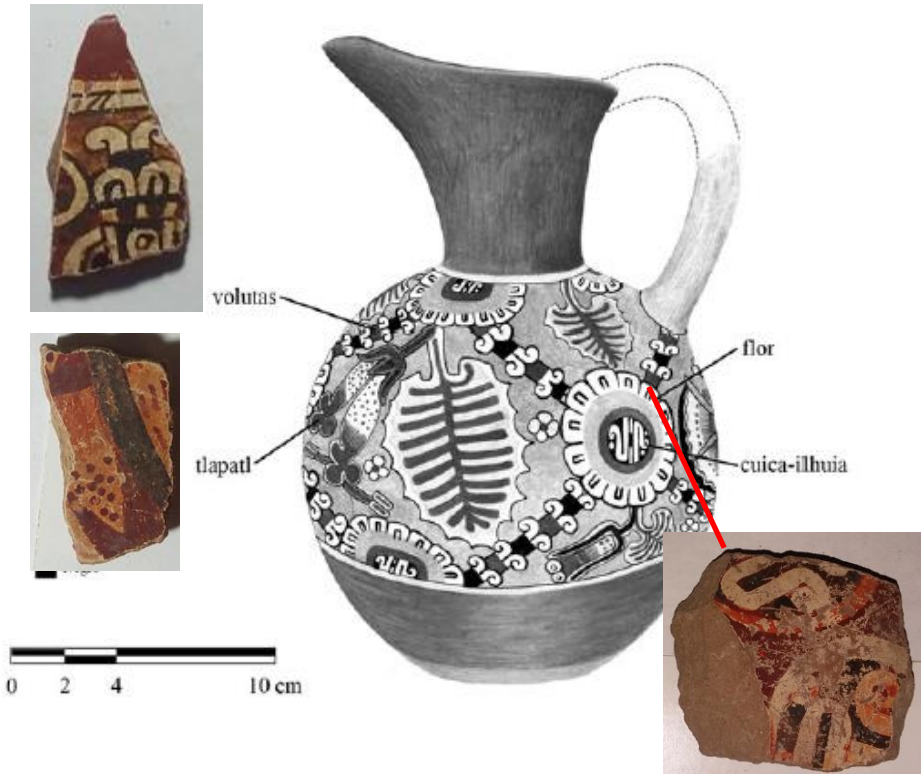


Figure 21. Example of Codex-Style vase recovered from Tepeticpac, Tlaxcala exemplifying the *Complex of Xochicuicatl-Xochilhuitl.* Drawing from López et al. 2019. Codex-Style sherds recovered in excavations from Ocotelulco, Tepeticpac, and Quiahuixtlan, demonstrating their consumption in every district.

The Complex of War, Sacrifice, and Nobility: Comprised of headdress imagery, sometimes with a shell at the base, and jaguar spots are often present. This iconography is frequently associated with a bone awl. The colors are primarily red outlined in white, and when combined with the awl, indicates the state deity Tezcatlipoca. In contrast, the feathered headdress is primarily associated with nobility (López et al. 2019:341).

The Solar Band Complex: Comprised of orange and yellow bands, red hooks or vertical lines, often in association with precious stones, solar rays, and thorn icons to indicate sacrifice. The sun frequently symbolized sacred ancestry, nobility, and rulership. (Hernández 2010:261).

The Teocuitlatl Complex: Comprised of scrolls, lines, and hook sequences that were finely painted and represented more investment in effort and skill over other complexes. Orange painting indicates gold and precious stones, and divinity (López et al. 2019:342).

The six complexes associated with death, rebirth, and the state deity Tezcatlipoca are:

The Complex of Crossed Bones and Skulls: Associated with Tezcatlipoca, Camaxtli, and represented by skulls, teeth, bones, and spheres. The primary colors are red, grey, yellow, and black (Hernández 2010:265).

The Complex of Death and Tezcatlipoca: Represented by stellar eyes on a black or grey striped background. Often depicted with a white rim just below the rim of the vessel. Additionally, iconography associated with organs, lungs, or other body parts is included. The primary colors are white and red (Hernández 2010:264).

The Complex of Smoke and Darkness: Primarily depicted by bands and volutes, in contrasting black and white patterns, also associated with spheres, and spots depicting serpents or jaguars. Primary colors are red, white, black, and orange (Hernández 2008:119).

Machiyotl Glyph Complex: Thick, crude lines depicting generalized motifs of insects, animals, obsidians, and quadripartite icons that were probably associated with generalized themes of deities (the *Tzitzimi*), Camaxtli is especially depicted by deer iconography, such as antlers and hunting iconography. The primary colors are orange, black, white, and red (López et al. 2019:346).

Tlamatchli Complex: Simple geometric designs. Comprised of *grecas* and lines. Lines and shapes are thinly made and simple. Primary colors are red and black (López et al. 2019:347).

The Complex of Death and Tlilan: Comprised of stellar eyes, precious stones, agave thorns, and the symbol "I" which is probably a border identifying the mythical place of *Tlilan*. Primary colors are red, white, grey, and black (Hernández 2010:259).

The iconography on the sample of 39 assayed sherds demonstrates that the Ocotelulco-Acxotla household has the highest percentage of pottery with elite-affirming or network themes (20%), while the high-status household in Tepeticpac has 17% (the next highest). The remaining households have roughly 5%- 7% of sherds with elite affirming themes (Figure 23). Small sample size may play a factor here, and to bolster this hypothesis, the larger dataset examined in Mexico should be considered.

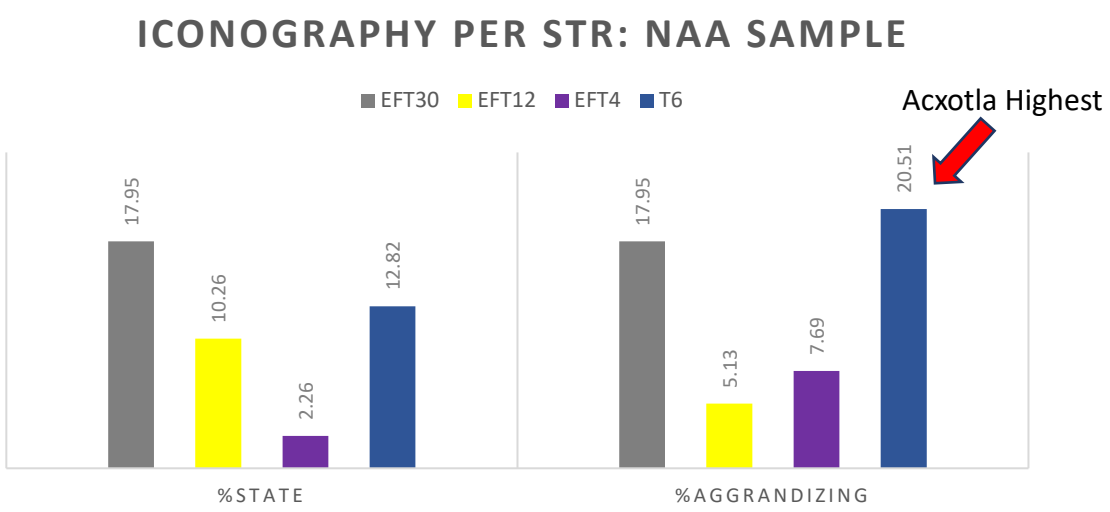


Figure 22. Percent of State and Aggrandizing iconography on 39 sherds examined with NAA demonstrating that no district controlled the production of a particular iconographic style. Note, T30 (Grey), T12 (Yellow), T4 (Purple), T6-1 (Blue), (T36 had no iconography visible on the assayed sherds).

The larger sample of 230 sherds examined in Mexico, which includes those examined with NAA, demonstrates that the highest percentage of elite affirming symbology is again found in the Ocotelulco-Acxotla household (48%). The high-status household in Tepeticpac consumed roughly 39% of elite-affirming themes. Surprisingly, the public structure at Quiahuixtlan also utilized fairly high amounts of aggrandizing iconography, with roughly 43% of iconography consumed indicating elite-affirming ideology (Figure 24).

When network themes are expressed as a ratio to inclusive state themes, the Ocotelulco Structure T6-1 had roughly one aggrandizing theme painted on Codex-Style pottery for every inclusive state theme painted on Codex-Style polychrome pottery, the most in our sample (Table 19). In comparison, at the high-status household located in Tepeticpac (T30), for every three inclusive themes found on Codex-Style pottery, there was only one statement of aggrandizement.

At the public structure in Quiahuixtlan (T36), for every four inclusive statements or themes, there were three statements of aggrandizement. This is important because it demonstrates that households were utilizing these different themes (either inclusive or network) in different amounts.

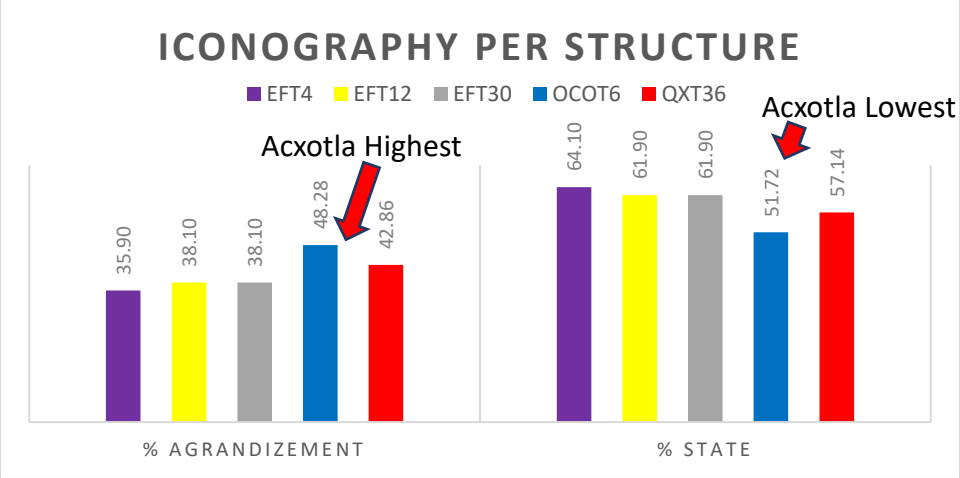


Figure 23. Percent of State and Aggrandizing iconography on 230 sherds examined in Mexico. Note Ocotelulco Barrio Acxotla household has the highest amount of iconography using aggrandizing themes, and the least amount of collective themes. Structure T4 (Purple), T12 (Yellow), T30 (Grey), T6-1 (Blue), and T36 (Red).

Table 19. Summary of Iconographic Themes by Excavated Context.

Str. Number	District and Status	Network Themes	State Themes	Total Sherds	Network/ State	% Network	% State
EFT4	Tepe-Other	14	25	39	0.56	35.90	64.10
EFT12	Tepe-Other	16	26	42	0.62	38.10	61.90
EFT30	Tepe-High	24	39	63	0.62	38.10	61.90
OCOT6-1	Ocotelulco-Other	28	30	58	0.93	48.28	51.72
QXT36	Quiahuixtlan-Public	12	16	28	0.75	42.86	57.14

Chapter 5 Summary

Households at Tlaxcallan had access to multiple sources of Codex-Style pottery, with a diversity of iconographic themes presented. In Tlaxcallan, at least two different 'sources' were identified through NAA, but there were no strong patterns of preference for one or the other in the social units studied in this dissertation. The result is that pottery could be freely acquired from different locations or workships likely a market system that provided unrestricted access, a similar scenario as observed in the Late Postclassic Mixteca Alta region (Levine et. al. 2015).

The Ocotelulco-Acxotla household (T6-1) consumed the highest percentage of pottery with elite affirming iconography among all 5 households examined, as identified in this dataset. This district also contains the least amount of public plaza area, as discussed in the preceding chapter. The following chapter will add to the divergence of this household from the norm by demonstrating a higher rate of green obsidian and projectile point use than other structures (see also Marino et al. 2020).

At the higher levels of political organization, collective and inclusive themes in iconography are evidenced. While the state promoted inclusive symbols on public architecture, more of a mix of inclusive and exclusive symbols were employed on pottery within households. One household in particular, Ocotelulco Structure T6-1, seems to have embraced an exclusive ideology more than others.

At the intermediate levels of political hierarchy, as identified in the preceding chapter, different numbers of plazas and different amounts of total plaza area were constructed in each district. As the neighborhood plaza was also the location where the inclusive policies, specifically those promoted at the higher levels of political organization, would have been disseminated to household members, it is interesting to note that the Acxotla household is the

location where collective behaviors are compressed in comparison to other locations. This is also the district with the least amount of public space.

This study indicates that household members at LPC Tlaxcallan chose to reproduce state ideologies within households and communicated and shared those ideologies with fellow citizens. The iconography that reproduced state ideologies was available for use on Codex-Style pottery, as was iconography that promoted personal achievements, wealth, and aggrandizement. The active choice of utilizing state ideologies within households, and communicating that ideology in semi-public events, points towards active participation among commoners and elites in affirming and reproducing the state. Thus, the household and community, and not just the public plaza becomes the arena where political performance is produced and reproduced. Equally as important was the message that was being produced and reproduced in households, that of an inclusive theme, and not one of elite aggrandizement, as in other locations (see Pauketat and Emerson 1991 for example).

However, nearly 50% of the pottery consumed at the Ocotelulco-Acxotla household contained self-aggrandizing ideology, the highest proportion of use of such symbols in the sample. This district contained the fewest number of plazas where state ideology could be produced publicly, and the use of aggrandizement seemingly support ethnohistoric accounts which state that tensions existed between the Ocotelulco district and others. This analysis thus far supports the findings of others, that tensions among districts and discussed in ethnohistoric accounts probably existed. It is likely that the state put strategies into place to reduce these internal pressures, such as the use of egalitarian ideology, a shared origin story utilizing a deity that was the 'enemy' of the Aztecs, and a focus on limiting the trade of Aztec goods, such as

green obsidian. The iconographic analysis points to these strategies being embraced in different amounts among the different households and districts of Tlaxcallan.

Chapter 6 Obsidian Blade and Projectile Point Analysis

In this chapter, I explore whether households controlled the production or exchange of obsidian goods at Late Postclassic Tlaxcallan. I also examine if a personalized exchange network oriented towards exclusive economic gain was utilized by any household. The primary supplier of obsidian during the Late Postclassic period in Central Mexico was the Aztec Triple Alliance, who were fighting a decades long war with the Tlaxcallan state. Because obsidian traders had to cross international boundaries to obtain obsidian at the raw source area, or purchase obsidian in enemy marketplaces, it is likely that any Aztec obsidians brought into the site were a result of a personalized exchange network, which would have allowed for the formation of bottlenecks in the distribution of this good (see Chapter 3).

Currently, 19,000 obsidian artifacts have been analyzed, including 102 projectile points. However, only obsidian (n = 11,199) and projectile points (n= 53) associated with structures were included in this analysis. These materials were recovered from a terrace with a public function located in the Quiahuixtlan district and called Terrace 36 (T36). Three "other-status" households were examined from Terrace 6, located in the Ocotelulco district and Acxotla neighborhood (T6-1, T6-2, T6-3). Lastly, three houses located in the Tepeticpac district, El Fuerte neighborhood, were also examined. One household was of possibly "high-status" on Terrace 30 (T30), one of other-status was located on Terrace 12 (T12), and one of other status was located on Terrace 4 (T4). Overall, each of the 3 districts are represented in our study, and structural contexts of high-status (n = 1), lower-middle status (n = 5), and public space (n = 1) are examined.

Chemical analysis of obsidian artifacts was performed in Mexico during the field lab season of 2020, using pXRF. The purpose of the chemical analysis was to identify if any

household consumed obsidian from a specific volcanic source in higher proportions than the others. If any household primarily utilized a specific source in greater proportions, then that household was better situated to access that raw source material than the other households, or preferred that source material. In the case of green obsidian, this probably was a result of a personalized exchange network focusing on that resource.

Obsidian tools and debitage were examined technologically in Mexico during the field and lab seasons of 2016-2019. The purpose of the technological analysis of obsidian artifacts was to identify if any households controlled the production, consumption, and exchange of tools. If a household had a greater proportion of a specific tool, production debitage, and a greater proportion of a specific raw material source, then that location likely sought to profit from its relatively unique position to access that specific raw material source. In the case of green obsidian, this would likely represent a scenario where a bottleneck had occurred around a production chain.

Brief Recap of Late Postclassic Obsidian Sources Used in Tlaxcallan

Portable X-ray fluorescence analysis suggests that multiple volcanic sources were supplying Tlaxcallan markets with obsidian nodules and prismatic cores (Fichman 2014; López 2021; López et al. 2015; Millhauser et al. 2015). Importantly, all sources were located outside the borders of the Tlaxcaltecan polity, with most under Aztec control or in disputed regions. The most utilized source in Tlaxcallan, as suggested by previous research from a sample of obsidian obtained from a site-wide survey, was El Paredón located roughly 70 km away and outside the political boundaries of Tlaxcallan. Green obsidian from the Pachuca source, the most common material utilized in Central Mexico during the Late Postclassic, originated well within the Aztec

empire approximately 100 km distance. Neither of these volcanos was the closest source to Tlaxcallan, however, with Malpaís (51 km) and Otumba (63 km) being located closest to the capital city which hosted the largest marketplace.

There are several possibilities regarding how obsidian was traded and consumed among Tlaxcallan households. The closest obsidian sources to Tlaxcallan (Malpaís and Otumba) should be the most utilized resources if procurement was solely focused on a least-cost path in terms of distance. If the closest resources were utilized, then traders, producers, and consumers were focused on utilizing the easiest and most convenient resources available, regardless of any political influence.

Another possibility is that the Pachuca volcano, the most utilized obsidian source during the Late Postclassic period for Central Mexico, was used to supply Tlaxcallan households with obsidian. However, due to geopolitical forces influencing the exchange of some goods in Late Postclassic Central Mexico, previous research suggests this outcome was unlikely (see Millhauser et al. 2015). Because Tlaxcallan and the Aztec Triple Alliance were perpetually at war, and obsidian was a critical resource needed to construct weapons such as blades and projectile points, perform domestic tasks such as crafting and agricultural production, and accomplish ritual tasks needed to sustain the religious and political system, the triple alliance may have tried to restrict its sale to Tlaxcallan merchants. An embargo including this item has previously been suggested for Tlaxcallan (see Millhauser et al. 2015). However, a recent reanalysis of ethnohistoric accounts suggest that if an embargo existed, it might have lasted only 15 years, and may be difficult to detect archaeologically (López 2021).

A third possibility is that a volcanic source outside the Aztec sphere of geopolitical influence was used to supply Tlaxcallan. The Tlaxcallan state could have utilized a geopolitical

strategy to promote a source outside the Aztec sphere of influence and prohibited the trade of Aztec obsidians in favor of local goods. This would have deprived Aztec merchants of monetary payments and access to one of the largest markets in Central Mexico, which was located in the Ocotelulco district. Previous research has identified that one of the smaller hinterland cities that was also geopolitically reliant on Ocotelulco (see López et al. 2021:486) consumed Aztec obsidians in unusually small amounts (~9%). This finding seemingly supports the possibility that trade in Aztec goods may have been prohibited by Tlaxcaltecan elites. The same site also predominantly used El Paredón obsidian, with more than half of its sample being represented by decortation flakes and other debitage associated with procuring and shaping raw materials (see López et al. 2021). This household was probably a key location where raw materials were brought to be processed into more refined goods. In this scenario, the economic gain would have been realized for local Tlaxcaltecan merchants, and a sense of economic independence from the Aztec political economic network which was focused on the use of Pachuca green obsidian, would have been fostered. A local Tlaxcaltecan identity based on egalitarianism, independence, and reciprocity would have been fostered if Tlaxcaltecan producers were able to break free from the larger Aztec-controlled obsidian trade network which dominated Central Mexico during the Late Postclassic period, and several authors have already suggested this outcome of independence and "exceptionalism" (see Fargher et al. 2010:244; Fargher et al. 2011; Millhauser et al. 2015; 2017).

The last possibility, and the one I argue to be supported by the data in this research, is that producer and consumer preferences among Tlaxcaltecans may have favored the use of local supply chains, among merchants, shopkeepers, and producers, instead of foreign supply chains. I argue that local preferences among consumers and producers could have been the reason an

economic network favoring local merchants was established in Tlaxcallan, and not any top-down policies. The public would have undoubtedly favored the use of local goods and merchants, as opposed to foreign goods, during a time of war, and the use of a foreign good like green obsidian, would have been easily identified during use. Given that it was a critical resource used for the construction of foreign weapons and a readily identifiable indicator of Aztec economic imperialism, green obsidian would have probably been an unpopular good, as foreign goods typically are within nations at war. The use of green obsidian would also have represented the economic support of Aztec merchants instead of local merchants and producers.

If any households preferred Aztec controlled obsidian sources, then it is likely that those households chose to defect from the more inclusive strategy of utilizing local merchants and local exchange networks which would have benefited local economic growth. This could also likely have been seen as an act of support for the Aztec state, especially since Aztec merchants, the *pochteca*, were known to be Aztec spies. Utilizing Aztec obsidians would have also financially benefited foreign merchants and the Aztec state, given the size of the Tlaxcaltecan marketplace located in Ocotelulco, which was stated to be one of the largest in Mesoamerica. In countries at war, recognizable goods coming from enemy territories are typically boycotted in favor of local goods, and their use in Tlaxcallan would have undoubtedly been noticed.

As stated in more detail in Chapter 3, but summarized also below in Table 19, the patterns associated with each production, consumption, and exchange possibility would be visible archaeologically. If a least-cost distance procurement network was utilized, then the Malpaís and Otumba sources should be recovered in the highest proportions at Tlaxcallan, because they were the closest sources of high-quality materials. If Aztec sources were prohibited, then Aztec obsidians should occur in proportions of 5% or less in every household, and other

obsidians would be present in relatively equitable amounts (see Table 19). If Tlaxcaltecan political architects mandated the use of El Paredón obsidian, then that source should be present in amounts of 95% or more among households. If a resource was simply more popular among the population, probably due to social solidarity in supporting local merchants, those obsidians (El Paredón in this case) should be apparent in proportions between 30%-70% (see Table 19). Other sources should have been present in less amounts among the community, but with multiple options present, suggesting consumer preference was the driving factor of exchange (Table 20).

Lithic Technological Analysis Methods

Obsidian was classified first as either occurring as a result of biface (flake technology) or prismatic blade (blade-production) technology. However, biface production at the site is nearly absent, and the entire assemblage is almost exclusively focused on blade production technology, as is typically observed in Central Mexico. Following a *chaine operatoire* or production chain analysis (see Bleed 2001; Sellet 1993) each stage of the obsidian production chain was examined. As some households were probably producers of obsidian tools, others were consumers, and others may have been involved in finishing tools, examining the production chain of lithic tools can help identify which households engaged in which behavior(s) (see Kovacevich 2012; Sheets 1975 for examples). While the control of resources is commonly referenced in lithic technological literature as occurring at the procurement stage of production and exchange, such as what likely occurred at Late Preclassic Colha, Belize (see Shafer and

Table 20. Archaeological correlates of different trade relationships discussed.

Trade Relationship Discussed	Archaeological Correlate	Example in Mesoamerica
State Sponsored Trade	Frequencies Greater than 90%-95%, Other Readily Substitutable Obsidians Present in Trace Amounts	Green Obsidian in Aztec Central Mexico (Olson 2001; Smith 1991:157)
State Prohibited Item	Frequencies Less than 5%, Multiple Other Sources Present in Comparatively Greater Amounts	Green Obsidian in Tarascan Michoacan (Pollard 2003; Waldon et al. 2017)
Market Exchange but with Geopolitics Promoting One Resource	Frequencies around 30%-60%, but Preferred Source Greater than Other Resources. Temporal Increase in Preferred Resource in Conjunction with Political Expansion into New Region	Pico de Orizaba Obsidian in Late Postclassic Oaxaca (Levine et al. 2011); Pachuca Obsidian in Veracruz (Venter 2012:245)
Market Exchange but with Consumer Preference of One Resource	Frequencies around 30%-70%, but Preferred Source Significantly Greater than Others. Other Sources Readily Available, but Not Utilized, Reflecting Consumer Choice	Paredon Obsidian in Tlaxcallan, 30%-60% in All Households, Alternatives Readily Available but in Proportions of 10%-20%, Suggesting Choice

Hester 1975), a bottleneck could have formed around any stage of the production chain. For example, at Late Classic Cancuen, Guatemala, the initial procurement and shaping of jade ground stone items occurred in commoner households. However, it was the finishing and distribution of the final products that was controlled by elite sponsored crafters, and this restriction point on the exchange of the item allowed for a bottleneck to form around finished goods, even if all households had access to raw materials (Kovacevich 2012).

The presence of cortex flakes, macro-flakes, proximal flakes, and flake fragments are used to identify procurement and initial shaping among households. The identification of shatter, biface thinning flakes, and flake fragments are also useful in identifying areas of intensive lithic reduction, although these flake types can occur at any stage of production and were also rare in our excavations. Because they occur in such small amounts, their presence can only be used to suggest an area where lithic reduction occurred and are not used to identify a particular stage in the production chain. It is likely that residents at most households engaged in some form of lithic procurement and initial shaping as part of their domestic economy, a pattern observed in most households across Mesoamerica (see Hirth 2010). However, if a household utilized a statistically greater proportion of materials associated with procurement and initial shaping activities, then that household was noted to be a location where production meant for extra-household exchange probably occurred. Statistical methods commonly used to perform such analysis are a t-test, ANOVA, chi-square test, fishers exact test, among others (see Hirth 1998; Marno et al. 2020).

Methods for reporting recovered lithic materials typically focus on calculating a ratio between a common good recovered within households, and another independent variable also found within households, such as ceramics, chert artifacts, soil screened, or area excavated, to compare varying amounts of items recovered from different excavation units (see Hirth 1998:472). Calculating a ratio in this fashion serves as an important method for normalizing differences in excavation area, and is used in this dissertation. However, only reporting a ratio between lithic tools and some other material, may obscure low sample sizes in lithic materials recovered. For this reason, I first report raw counts of materials recovered, followed by the ratio of materials recovered divided by surface area (see Marino et al. 2016; 2020).

Early-stage reduction practices were identified by the presence of percussion blades, feather blades, first and second series blades, macro-blades, crested blades, prismatic cores, and errailure flakes. All of these are byproducts of prismatic core shaping. While they are representative of prismatic core production, each of the aforementioned artifact types were also useful tools and could have been purchased at the local market (except for errailure flakes). Their repeated occurrence in statistically significant proportions is what can be used to identify an actual production locus.

Later stage reduction practices are evidenced by the presence of plunge blades, final series blades, blade-core rejuvenation flakes, rejuvenation blades, and retouch flakes. Similar to shatter, errailure flakes are also included in this category, as they can technically occur at any stage of the reduction process. However, for the purpose of this research, shatter and errailure flakes are simply used to infer a production locus in conjunction with other stages of production. Finished tools are also included in this category, as finishing, reshaping, and resharpening occur at the end of the production chain on finished tools.

Production and consumption patterns would indicate what position households occupied within the production chain. Bottlenecks that formed around any position in the chain would indicate an attempt to control or profit off that stage or good. If a bottleneck in tool production occurred in conjunction with a bottleneck around a raw material source, then it is likely that individuals within that household sought to profit off their position to access that raw material. In the case of green obsidian, this would lend significant support to a household seeking to aggrandize their position in Tlaxcallan (see explanation in Chapters 2 and 3).

Lithic Chemical Analysis Methods

Methods for chemically classifying the obsidian first entailed assessing the Olympus Vanta's factory 'Geochem' calibration. This was accomplished using the MURR obsidian standard source library, which MURR developed in partnership with Bruker, consisting of 40 obsidian source materials providing a wide range of elemental concentrations necessary to calculate precision and error (Johnson et al. 2021). Each of these standards was assayed 5 times at MURR with the Vanta pXRF, and the reliability and error were assessed (Figure 25).

Elements suitable for analysis based on the reliability and accuracy of results obtained with pXRF, and widely used to characterize the Mesoamerican volcanic sources in decades of previous research, are manganese (Mn), iron (Fe), rubidium (Rb), strontium (Sr), yttrium (Y), and niobium (Nb) (Glascock et al. 1998). Each element was subsequently normalized to zirconium (Zr), a common practice for pXRF analysis in Mesoamerica and others (Frahm 2019; Johnson et al. 2021; Stroth et al. 2019).

After the Geochem factory calibration was determined to produce accurate and precise results, accomplished by comparing the expected and measured chemical values through regression, 98 secondary source materials from 15 Mesoamerican volcanic sources were assayed as reference materials (see Glascock 1998; Johnson et al. 2021:2). These were again calculated as ratios to Zr, and elements Mn, Fe, Rb, Sr, Y, and Nb were again included.

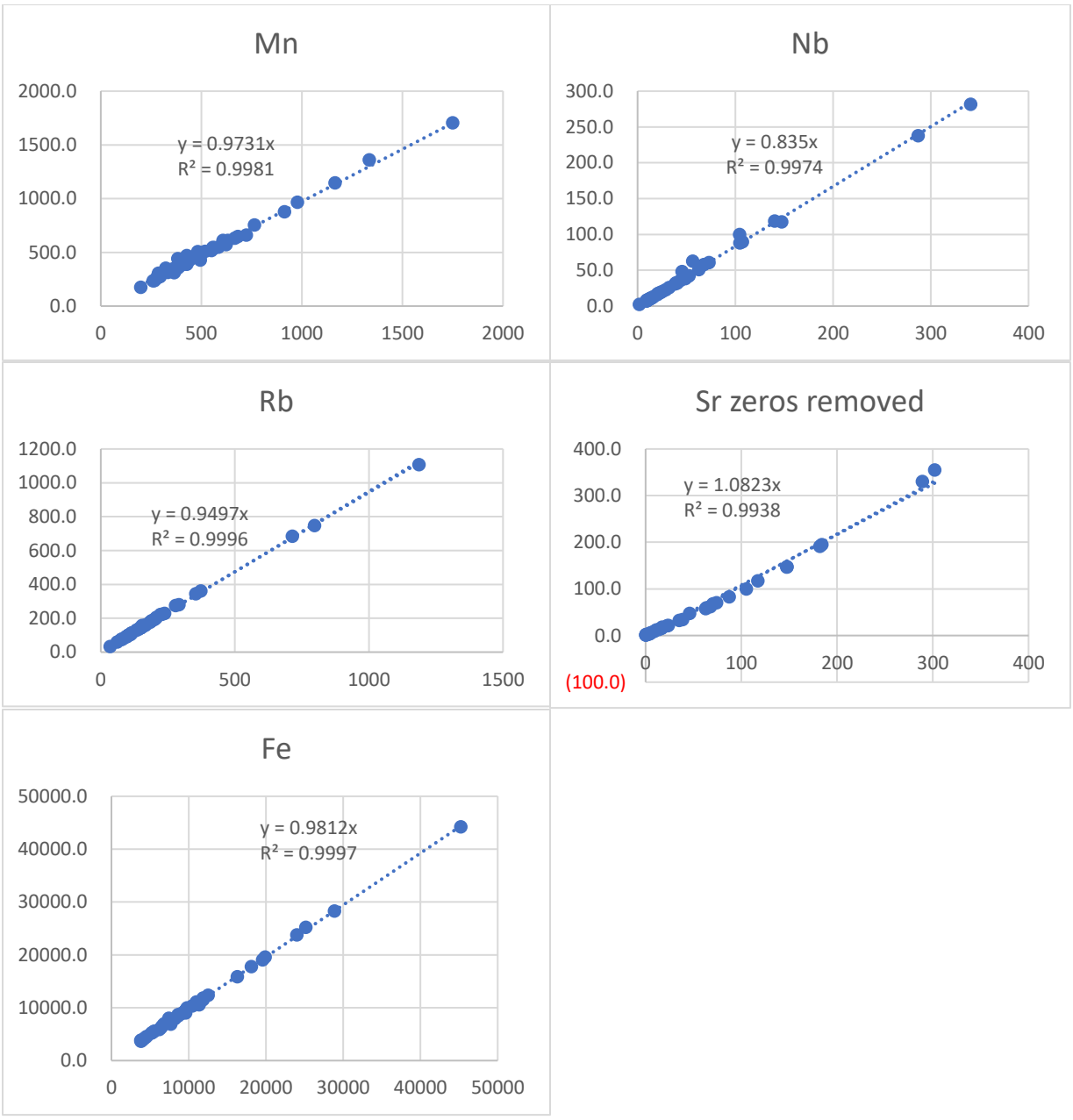


Figure 24. Forty Bruker/MURR Obsidian Standards Confirming the Effectiveness of the Vanta GeoCHEM Calibration. X-axis is the measured value; y-axis is the expected value of the Bruker/MURR obsidian standard.

Classifying the obsidian samples excavated from Tlaxcallan and analyzed by the Vanta pXRF occurred by first corroborating prior studies regarding the importance of Mn, Fe, SR, Y,

Rb, and Nb in Mesoamerican obsidian datasets. To accomplish this, principal components analysis was calculated to understand the contribution of each element to the variability found within the dataset of 98 reference materials. Elements Mn, Fe, and Sr were shown to contribute the majority of chemical variability to the dataset on the first two principal components, with Rb, Y, and Nb contributing a small amount to the remaining components. This confirmation was again repeated for the unknown samples collected in archaeological excavations.

Accordingly, probable source groups were constructed using the MURR Gauss statistical software package, by assigning samples that were found to cluster together to tentative source groups using elements Mn, Fe, Sr. A hierarchical cluster analysis (HCA), in combination with mahalanobis distance (MD), was used to test if the previously unknown samples, now assigned to chemical groups, could be independently replicated by the clustering algorithm (HCA). After this process was repeated until source groups were constructed, the source groups were plotted against the 98 reference materials provided by MURR to further corroborate the effectiveness of their classification.

Lastly, the finalized source groups I constructed, and the reference groups constructed using the 98 reference materials provided by MURR, were tested with a MANOVA. The MANOVA compared the mean and standard deviation of the source groups to the mean and standard deviation of reference groups and indicated that no statistical difference was apparent. There were five samples in the dataset that were not assignable to any established reference group, although they likely represent samples from a lesser utilized volcanic flow from the area known as Paredón B (Millhauser et al. 2017). Additionally, the Malpaís and Ucareo sources, which are represented by few samples in our dataset, could not be tested statistically due to small

sample sizes. However, these sources are far removed from others in terms of compositional space and fall within the 90% confidence ellipses of their plotted reference materials (Figure 26).

Results: Site-Wide Patterns as Identified with Portable X-Ray Fluorescence at Tlaxcallan

Portable x-ray fluorescence analysis revealed sitewide patterns of obsidian consumption that both confirm and disprove previous models formulated for Tlaxcallan. On the one hand, eight volcanic sources were utilized to supply the city with obsidian. Sources were located in Central Mexico (Malpaís, Otumba, Pachuca, Tulancingo), Puebla/Hidalgo (Zaragoza-Oyameles, El Paredón), Veracruz (Pico de Orizaba), and Michoacan (Ucareo), supporting previous research (Table 21) (see López et al. 2015, 2021; Millhauser et al. 2015, 2017). Those sources not associated with the Aztec Triple Alliance are the sources primarily consumed within the core city, and El Paredón is the most consumed material throughout the polity (n=878, 65.0%). Yet, the second most frequently utilized raw material is Pachuca green obsidian (n=227, 16.8%), with Zaragoza-Oyameles obsidian being the third most utilized (n=157, 11.6%). Otumba obsidian represents the fourth most consumed material (n=41, 3.0%), and obsidian from Pico de Orizaba is the fifth most utilized (n=34, 2.5%). The remaining 4 sources, Malpaís, Tulancingo, Ucareo, and probable Paredón B or Acolihuia, are represented by less than 4 artifacts each. Combined, Aztec sources (Pachuca and Otumba) comprise roughly 19.9% of all obsidian consumed in Tlaxcallan in this study.

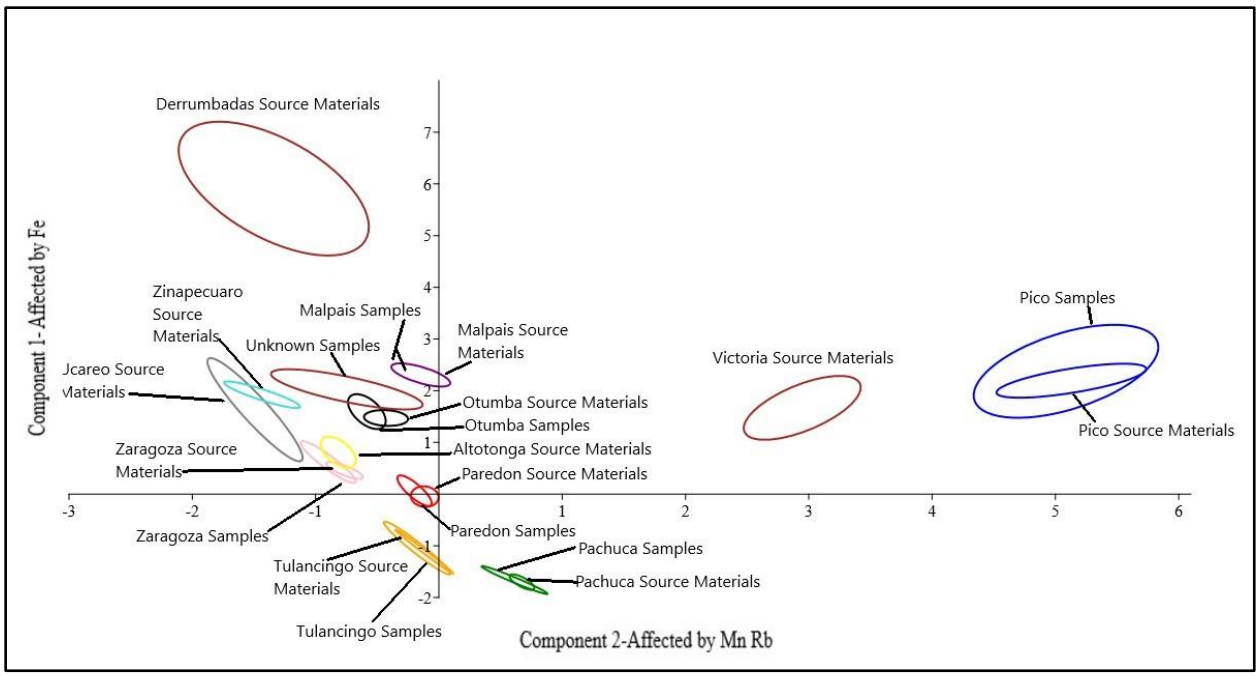


Figure 25. Secondary source materials and classified samples plotted with Principal Components Analysis for Components 1 and 2. Samples identified as unknown are likely Paredón B.

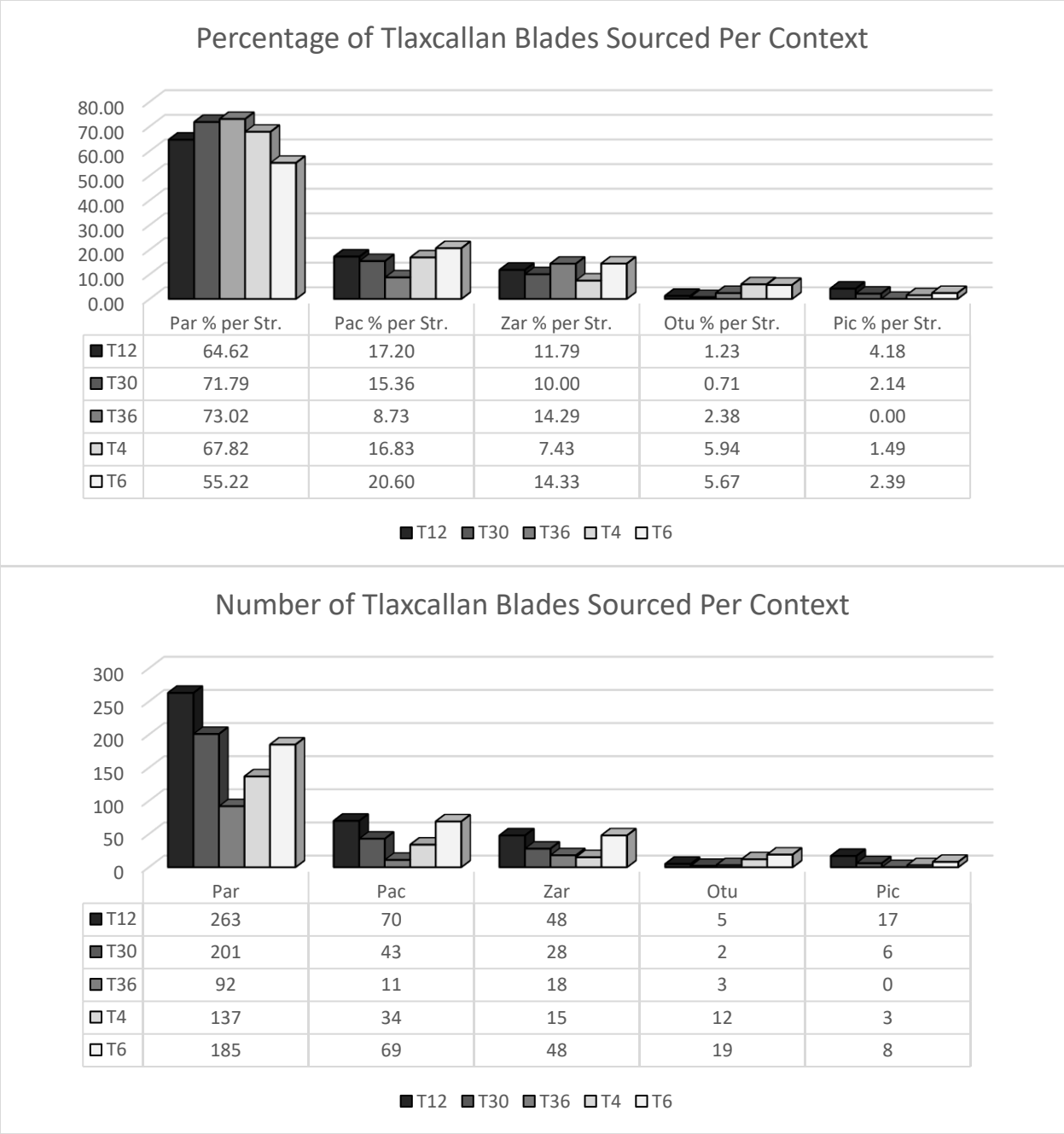
Table 21. Obsidian Sources Consumed by Structure in Late Postclassic Tlaxcallan, Mexico. Structures located in the Tepeticpac District are T12, T30, and T4. Quiahuixtlan is represented by T36. Ocotelulco is represented by structure T6.

Str	Par	Par % per Str.	Pac	Pac % per Str.	Zar	Zar % per Str.	Otu	Otu % per Str.	Pic	Pic % per Str.	Mal	Mal % per Str.	Tul	Tul % per Str.	Uca	Uca % per Str.	Unk	Unk % per Str.	ParB	ParB % per Str.	Total
T12	263	64.62	70	17.20	48	11.79	5	1.23	17	4.18	1	0.25	2	0.49	0	0.00	0	0.25	1.00	0.25	407
T30	201	71.79	43	15.36	28	10.00	2	0.71	6	2.14	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00	280
T36	92	73.02	11	8.73	18	14.29	3	2.38	0	0.00	0	0.00	0	0.00	1	0.79	1	0.79	0.00	0.00	126
T4	137	67.82	34	16.83	15	7.43	12	5.94	3	1.49	1	0.50	0	0.00	0	0.00	0	0.00	0.00	0.00	202
T6	185	55.22	69	20.60	48	14.33	19	5.67	8	2.39	0	0.00	2	0.60	0	0.00	1	0.30	3.00	0.90	335

Results Household Patterns as Identified with Portable X-Ray Fluorescence at Tlaxcallan

The site-wide patterns of obsidian exchange are replicated in household obsidian assemblages (Figure 27). The El Paredón source was preferred among all households. Pachuca obsidian is the second most consumed source in most households, although in one context it is significantly lower. Surprisingly, the household that consumed the most Pachuca obsidian was not the high-status household located in the Tepeticpac district, or the public structure located in the Quiahuixtlan district. In fact, these two contexts have the lowest percentages of Pachuca obsidian (15.3% and 8.7% respectively), and the highest amounts of El Paredón obsidian (71.7% and 73.0%) of all the sampled locations. Otumba obsidian is also consumed in the lowest, and second lowest amounts at these two contexts. When the percentages of Otumba and Pachuca obsidians are combined, the high-status house is represented by roughly only 16.1% of obsidians controlled by the Aztec state, and the public structure is represented by only 10.1%, the lowest in our study.

In contrast, the household that consumed the highest percentage of green obsidian was located in the Ocotelulco district, the location mentioned in ethnohistoric accounts to contain the largest market, and probably the wealthiest individuals in Tlaxcallan, they were also possibly the district heads of the Metepec hinterland city (López et al. 2021). When the Otumba source is combined with the Pachuca source, roughly 26.2% of the obsidian blades consumed in this Ocotelulco house originate from sources controlled by the Triple Alliance. In contrast, only 55.0% of the obsidian consumed here was from the El Paredón source, making Ocotelulco Structure 1 the location with the least amount of El Paredón obsidian consumed.



	Par % per Str.	Pac % per Str.	Zar % per Str.	Otu % per Str.	Pic % per Str.
T12	64.62	17.20	11.79	1.23	4.18
T30	71.79	15.36	10.00	0.71	2.14
T36	73.02	8.73	14.29	2.38	0.00
T4	67.82	16.83	7.43	5.94	1.49
T6	55.22	20.60	14.33	5.67	2.39

	Par	Pac	Zar	Otu	Pic
T12	263	70	48	5	17
T30	201	43	28	2	6
T36	92	11	18	3	0
T4	137	34	15	12	3
T6	185	69	48	19	8

Figure 26. Tlaxcallan blades consumed per context. Structures located in the Tepeticpac District are T12, T30, and T4. Quiahuixtlan is represented by T36. Ocotelulco is represented by structure T6. Note Malpais, Tulancingo, Ucareo, and Paredón B are left out due to having few sources.

Lastly, some households also consumed a higher percentage of secondary and tertiary sources than others. For example, of the 34 blades characterized by pXRF as originating from the Pico de Orizaba volcano, 17 blades (50.0%) come from a single household located in the Tepeticpac district (Structure T12). While this only represents 4.0% of that household's total obsidian sample, when compared to other structures, the next highest amount of Pico de Orizaba obsidian is found in the Ocotelulco household at 2.4%. The high-status household in Tepeticpac possessed a small proportion of Pico de Orizaba obsidian (2.1%). Structure T12 also has the most diverse assortment of obsidian from anywhere in our sample, with all 9 identified sources present, only Ucareo was not present.

Other sources, such as Otumba and Ucareo materials, also have interesting patterns in their consumption. Of the forty-one blades attributed to the Otumba source, thirty-one (75.6%) were recovered from two structures, the Ocotelulco structure (T6-1), and a structure of other status in the Tepeticpac district (Structure T4). While these blades only make up 5.8% and 5.9% of the blades characterized by pXRF from these structures individually, the next highest proportion of blades from the Otumba source were found at Structure T36, a public context in Quiahuixtlan (2.4%). Otumba blades at Structure's T4 and T6 are more than twice that observed at other structures in terms of percentages. Structure T4 also has the smallest percentage of blades from the Zaragoza-Oyameles source, but this source was relatively equally represented among households. Blades originating from the Ucareo source, located in the Tarascan Empire in present-day Michoacan, are only represented by a single artifact recovered from the public structure in the Quiahuixtlan district (T36). No blades originating from Pico de Orizaba were recovered at that structure.

Results Household Level Patterns Identified with Technological Analysis

The technological analysis revealed that obsidian blade production occurred in every household, but in different stages of the obsidian production-chain. In terms of obsidian procurement and initial shaping, there is little evidence to suggest that any obsidian source was brought into the core city as a raw nodule and prepared within households, unlike at the hinterland city of Metepec (see López et al. 2021). Total flakes are represented in our sample of seven structures by only 912 specimens, and all households but one (T30) had less than 100 proximal flakes (Table 22). The categories of decortication flakes and primary series flakes were so few that they needed to be combined and were still represented by less than 10 flakes in nearly every household (except T30). Several of the initial procurement categories examined within the seven household assemblages were left empty, because no artifacts belonging to these categories were recovered.

In the case of green obsidian, the majority of households were completely lacking debitage that fit within the category of procurement and initial shaping for this material. The entire lithic sample of green obsidian, recovered from the seven structures excavated as a part of this research, had a combined total of less than 100 flakes, either proximal flakes or otherwise. Based on these data, neither green obsidian, nor any other obsidian sources in any amount that could indicate extra-household trade, was being prepared from a raw nodule in our sample of seven households.

Table 22. Procurement and initial shaping evidence excavated from seven households.

Initial Shaping, Testing, and Procurement (Counts)							
District, Neighborhood, Structure	All Flakes	Proximal Flakes	Macro-flakes	Bifacial Thinning Flakes	Decortation & Primary Flakes	Retouch Flakes	Bipolar (Flakes)
Tepeticpac , El Fuerte, T30	261	118	6	10	30	9	4
Tepeticpac, El Fuerte, T12	80	29	2	1	1	0	0
Tepeticpac, El Fuerte, T4	137	81	3	3	3	12	5
Ocotelulco, Acxotla, T6-1	220	85	2	7	8	1	9
Ocotelulco, Acxotla, T6-2	123	41	0	4	1	0	3
Ocotelulco, Acxotla, T6-3	54	26	1	1	4	0	2
Quiahuixtlan, Totolac, T36	37	16	0	3	4	0	2

The finding that obsidian was not brought into the capital city as a raw material needing to be shaped, but as either early-stage prismatic cores or finished tools (see below), differs significantly from the hinterland city of Metepec, where over 50% of all materials were focused on reducing raw nodules (see López 2021:488). This discovery indicates that household members within our sampled contexts were not working with raw or unprepared materials that were collected at the source location. Instead, household crafters in the core city acquired already prepared cores through a trade network, either through a personal or impersonal network. The first node in the production chain occurred outside of the excavated locations in the core city,

and likely occurred among several subsidiary households in the hinterland, like at Metepec. Because less than 3% of the obsidian recovered at Metepec was green Pachuca obsidian, and this household was focused on reducing raw materials, it is possible that the procurement networks which supplied the city with Paredón and Pachuca obsidian were completely distinct.

Unlike debitage associated with categories of procuring raw materials and initial shaping of those materials, evidence for early-stage prismatic core production is found in every household, based on the presence of production related debitage and prismatic cores (Table 23). Proximal first and second series blades, or those blades that were initially removed from a roughly shaped core, equated to nearly 219 specimens. Nearly a third of these were concentrated in a single household, marking it as a location of probable blade production. In fact, the household with the most prismatic cores and early-stage production debitage was Structure T6-1, located in the Ocotelulco district, Acxotla neighborhood. Ocotelulco Structure T6-1 had two to three times more early-stage production debitage than all other structures, including the largest structure located in Tepeticpac, despite being half the size of that high-status household.

One biproduct of prismatic core production that could immediately be used as a tool was the macroblade. These tools were often exchanged in markets across Tlaxcallan like regular prismatic blades. Nearly 40% of the macroblade sample recovered in Tlaxcallan was recovered from Structure T6-1 (n = 185 out of 492). The recovery of such a high percentage, in conjunction with the high percentages of other early-stage production debitage, points towards this structure producing prismatic cores and blades.

Table 23. Early-stage reduction and prismatic cores excavated from seven households.

Early Stages of Reduction (Count)								
District, Neighborhood, Structure	1st-2nd Blades (proximal)	1st-2nd Blades (all)	Prismatic Cores	Other Cores	Bipolar Blade Production	Macro Blades	Percussion Blades	Total
Tepeticpac, El Fuerte, T30	17	24	21	2	17	22	25	128
Tepeticpac, El Fuerte, T12	10	10	8	1	10	24	5	68
Tepeticpac, El Fuerte, T4	38	45	19	4	11	86	20	223
Ocotelulco, Acxotla, T6-1	76	89	46	3	38	185	61	498
Ocotelulco, Acxotla, T6-2	40	41	19	3	17	91	18	229
Ocotelulco, Acxotla, T6-3	23	32	13	2	11	45	8	134
Quiahuixtlan, Totolac, T36	15	23	13	6	9	39	13	118
Total	219	264	139	21	113	492	150	1,398

When green obsidian was considered separately, the same pattern was repeated at T6-1. Green obsidian was recovered in amounts two to three times that of other structures (Table 24). Again, first and second series blades and macroblades occur in extremely large proportions at this structure, pointing towards production occurring here. Structures T6-2 and T6-3, also located in the Ocotelulco district, Acxotla neighborhood, had the second and fourth highest amounts of green obsidian. This discovery points to the households in the Acxotla district as having easier access to green obsidian, or a greater preference for that material.

Table 24. Green obsidian early-stage reduction and cores from seven excavated households.

Early Stages of Reduction (Count)							
District, Neighborhood, Structure	1st-2nd Blades (green-proximal)	1st-2nd Blades (green-all)	Prismatic Cores (green)	Bipolar (green)	Macroblade (green)	Percussion Blade (green)	Total
Tepeticpac, El Fuerte, T30	0	0	3	1	1	3	8
Tepeticpac, El Fuerte, T12	3	3	0	2	1	0	9
Tepeticpac, El Fuerte, T4	5	5	4	3	9	4	30
Ocotelulco, Acxotla, T6-1	16	18	7	13	26	9	89
Ocotelulco, Acxotla, T6-2	6	6	1	5	10	4	32
Ocotelulco, Acxotla, T6-3	5	4	0	1	3	1	14
Quiahuixtlan, Totolac, T36	2	2	1	2	3	2	12
Total	37	38	16	27	53	23	194

To account for any differences in the areas excavated within each structure, the number of lithic materials recovered within each structure was divided by the area of each structure excavated. After such a calculation was made, Acxotla Structure T6-1 again contained a significantly greater ratio of early-stage production debitage and cores (Table 24). For example, for all categories of early-stage production debitage, the ratio of materials recovered in the Ocotelulco T6-1 structure is five to ten times larger than those recovered in the high-status household located in Tepeticpac, despite that structure being nearly twice the actual size of the Ocotelulco household (Table 25).

Table 25. Ratio of early-stage reduction debitage and cores divided by structural area

Early Stages of Reduction Sequence by Area						
District, Neighborhood, Structure	Area	1st-2nd Blades (proximal)/Area	1st-2nd Blades (All)/Area	Prismatic Cores /Area	Macroblades/ Area	Percussion Blades/ Area
Tepeticpac, El Fuerte, T30	398	0.043	0.060	0.053	0.055	0.063
Tepeticpac, El Fuerte, T12	80	0.125	0.125	0.100	0.300	0.063
Tepeticpac El Fuerte, T4	120	0.317	0.375	0.158	0.717	0.167
Ocotelulco, Acxotla, T6-1	160	0.475	0.556	0.288	1.156	0.381
Ocotelulco, Acxotla, T6-2	80	0.500	0.513	0.238	1.138	0.23
Ocotelulco, Acxotla, T6-3	88	0.261	0.364	0.148	0.511	0.091
Quiahuixtlan, Totolac, T36	80	0.188	0.288	0.163	0.488	0.163

I calculated the same ratio for the green obsidian early-stage production debris divided by excavation area (Table 26). Again, for all categories, early-stage production debris, including first and second series blades and macroblades, were found in the greatest ratios in Structure T6-1. Prismatic cores were again found in greatest frequency there also.

Table 26. Ratio of green obsidian early-stage reduction debitage and cores divided by structural area, from seven households excavated by the Tlaxcala Archaeological Project.

Green Obsidian Early Stages of Reduction Sequence by Area						
District, Neighborhood, Structure	Area	1st-2nd Blades (Green-proximal)	1st-2nd Blades (Green-all)	Prismatic Cores (Green)/Area	Macroblades (Green)/Area	Percussion Blades (Green)/Area
Tepeticpac, El Fuerte, T30	398	0.000	0.000	0.008	0.003	0.008
Tepeticpac, El Fuerte, T12	80	0.038	0.0375	0.000	0.013	0.000
Tepeticpac, El Fuerte, T4	120	0.042	0.042	0.033	0.075	0.033
Ocotelulco, Acxotla, T6-1	160	0.100	0.113	0.044	0.163	0.056
Ocotelulco, Acxotla, T6-2	80	0.075	0.075	0.013	0.125	0.050
Ocotelulco, Acxotla, T6-3	88	0.057	0.045	0.000	0.034	0.011
Quiahuixtlan, Totolac, T36	80	0.025	0.025	0.013	0.038	0.025

Evidence for later-stage production by raw counts was again generally recovered in the greatest amounts at Structure T6-1, with a few exceptions. Aside from platform preparation flakes and feather blades, later-stage debitage occurred at this location in proportions two to three times higher than any other structure (Table 27). Because later-stage production debitage is also associated with tool refurbishment, and not necessarily tool production, it is expected that this category demonstrates more diversity in which households contained the highest amounts of this category.

Table 27. Late-stage reduction debitage from seven households excavated by the Tlaxcala Archaeological Project.

Later Stages of Reduction (Counts)								
District, Neighborhood, Structure	Hinge Blade	Ribbon Blade	Crested Blade	Platform Rejuvenation Flake	Platform Preparation Flake	Feather Blade	Errailure Flake	Total
Tepeticpac, El Fuerte, T30	2	6	24	0	13	5	9	59
Tepeticpac, El Fuerte, T12	7	3	11	1	0	12	1	35
Tepeticpac, El Fuerte, T4	9	10	6	1	4	0	5	35
Ocotelulco, Acxotla, T6-1	50	18	24	5	10	8	7	122
Ocotelulco, Acxotla, T6-2	0	11	8	1	4	8	9	41
Ocotelulco, Acxotla, T6-3	10	7	6	0	1	0	1	25
Quiahuixtlan, Totolac, T36	4	2	2	1	3	3	2	17

When Aztec-controlled green obsidian is considered separately, this pattern was again observed (Table 28). However, later-stage production debitage was represented by few numbers in all households, except for Acxotla Structure T6-1. Based on this finding, there is little evidence to suggest that any significant amount of tool production or finishing occurred at any other structures in our sample, aside from T6-1. Again, this discovery points to tool production at other structures as having been focused on basic household functions relating to subsistence, and not oriented towards extra-household exchange.

Table 28. Green obsidian late-stage reduction debitage from seven households excavated by the Tlaxcala Archaeological Project.

Green Obsidian Later Stages of Reduction (Counts)								
District, Neighborhood, Structure	HB (green)	RB (green)	CB (green)	PRF (green)	PPF (green)	FB (Green)	EF (Green)	Total
Tepeticpac, El Fuerte, T30	0	0	5	0	2	0	0	7
Tepeticpac, El Fuerte, T12	1	2	2	0	0	1	0	6
Tepeticpac, El Fuerte, T4	2	1	1	0	1	0	1	6
Ocotelulco, Acxotla, T6-1	8	4	3	3	1	2	1	22
Ocotelulco, Acxotla, T6-2	0	2	1	0	0	0	1	4
Ocotelulco, Acxotla, T6-3	2	0	1	0	0	0	0	3
Quiahuixtlan, Totolac, T36	0	0	0	0	0	0	0	0

To account for differences in the areas excavated, I again calculated a ratio of tools and late-stage production debitage divided by structure size (Table 29). Again, the households in the Acxotla neighborhood had the highest ratio of later-stage production debitage. The only structure that had a greater ratio of later stage production debitage than Structures T6-1 and T6-2 was Structure T12 located in the Tepeticpac district, El Fuerte neighborhood. However, this ratio is based on the recovery of only 12 feather blade specimens, a relatively rare item, and is therefore probably due to low sample size. Because no samples were recovered in households when green obsidian was examined for these categories, a ratio of green obsidian artifacts divided by area was not calculated.

Table 29. Late-stage reduction debitage from seven households and divided by area excavated during the Tlaxcala Archaeological Project.

Later Stages of Reduction (By Area)								
District, Neighborhood, Structure	Area	Hinge Blade /Area	Ribbon Blade /Area	Crested Blade /Area	Platform Rejuvination Flake /Area	Platform Preparation Flake /Area	Feather Blade /Area	Errailure Flake /Area
Tepeticpac, El Fuerte, T30	398	0.005	0.015	0.060	0.000	0.033	0.013	0.023
Tepeticpac, El Fuerte, T12	80	0.088	0.038	0.138	0.013	0.000	0.150	0.013
Tepeticpac, El Fuerte, T4	120	0.075	0.083	0.050	0.008	0.033	0.000	0.042
Ocotelulco, Acxotla, T6-1	160	0.313	0.113	0.150	0.031	0.063	0.050	0.044
Ocotelulco, Acxotla, T6-2	80	0.000	0.138	0.100	0.013	0.050	0.100	0.113
Ocotelulco, Acxotla, T6-3	88	0.114	0.080	0.068	0.000	0.011	0.000	0.011
Quiahuixtlan, Totolac, T36	80	0.050	0.025	0.025	0.013	0.038	0.038	0.025

Formal tools were recovered most frequently in Structure T6-1, located in the Acxotla neighborhood (Table 30). With the exception of bifaces, which were recovered in the greatest amount from the Tepeticpac district in structure T4, the majority of every category of tool was more concentrated in structures T6-1 and T6-2, and this includes finished obsidian blades. The concentration of projectile points also occurred in structure T6-1, a surprising factor since green obsidian is also found in the greatest amounts here.

Table 30. Formal tools recovered from seven households excavated by the Tlaxcala Archaeological Project.

Obsidian Formal Tools (Count)							
District, Neighborhood, Structure	Total Obsidian	Blades (proximal)	Blades (all)	Biface (all)	Scraper (all)	Drill-Graver (all)	Points (all)
Tepeticpac, El Fuerte, T30	2737	495	2009	3	12	5	5
Tepeticpac, El Fuerte, T12	691	115	481	2	12	1	3
Tepeticpac, El Fuerte, T4	1903	297	1364	5	11	6	11
Ocotelulco, Acxotla, T6-1	3805	592	2740	1	35	6	18
Ocotelulco, Acxotla, T6-2	1715	267	1216	0	11	5	8
Ocotelulco, Acxotla, T6-3	765	107	505	0	6	2	3
Quiahuixtlan, Totolac, T36	583	104	376	3	7	0	5
Total	12,199	1,977	8,691	14	94	25	53

When the ratio of count divided by excavation area is calculated, this pattern again holds (Table 31). While bifaces were found the most at Tepeticpac Structure T4, they were only represented by a total of 5 incomplete specimens and were probably only used for basic domestic functions.

Table 31. Formal tools recovered from seven households and divided by area excavated during the Tlaxcala Archaeological Project.

Obsidian Formal Tools/Area								
Site	Area	Total Obsidian/Area	Blades (proximal)/Area	Blades (all)/Area	Biface (all)/Area	Scraper (all)/Area	Drill-Graver (all)/Area	Points (all)/Area
Tepeticpac EFT30	398	6.877	1.244	5.048	0.008	0.030	0.013	0.013
Tepeticpac EFT12	80	8.638	1.438	6.013	0.025	0.150	0.013	0.038
Tepeticpac EFT4	120	15.858	2.475	11.367	0.042	0.092	0.050	0.092
Acxotla T6-1	160	23.781	3.700	17.125	0.006	0.219	0.038	0.113
Acxotla T6-2	80	21.438	3.338	15.200	0.000	0.138	0.063	0.100
Acxotla T6-3	88	8.693	1.216	5.739	0.000	0.068	0.023	0.034
Quiahuixtlan T36	80	7.288	1.300	4.700	0.038	0.088	0.000	0.063

When the ratio of green obsidian divided by structure area is calculated for all tool categories, structure T6-1 still contains the highest number of blades and projectile points (see Table 32). However, green obsidian bifaces were recovered more at Quiahuixtlan Structure T36, comparatively. Scrapers were recovered in equal proportions at Tepeticpac Structure T4, as they were at Structure T6-1. Green obsidian drills and gravers were also found in higher amounts at Acxotla T6-2. For all green obsidian formal tools other than blades, however, these results should be taken with a grain of salt due to small sample sizes.

Table 32. Green Obsidian formal tools recovered from seven households and divided by area excavated during the Tlaxcala Archaeological Project.

Green Obsidian Formal Tools/Area							
District, Neighborhood, Structure	Total Obsidian (green)/ Area	Blades (green-proximal)/ Area	Blades (green-all)/ Area	Biface (green)/ Area	Scraper (green)/ Area	Drill-Graver (green)/ Area	Points (green)/ Area
Tepeticpac, El Fuerte, T30	0.809	0.095	5.048	0.000	0.005	0.013	0.013
Tepeticpac, El Fuerte, T12	1.250	0.250	6.013	0.013	0.038	0.013	0.038
Tepeticpac. El Fuerte, T4	2.258	0.383	11.367	0.000	0.025	0.050	0.092
Ocotelulco, Acxotla, T6-1	4.550	0.806	17.125	0.000	0.038	0.038	0.113
Ocotelulco, Acxotla, T6-2	3.150	0.525	15.200	0.000	0.000	0.063	0.100
Ocotelulco, Acxotla, T6-3	0.966	0.102	5.739	0.000	0.000	0.023	0.034
Quiahuixtlan, Totolac, T36	0.813	0.163	4.700	0.025	0.013	0.000	0.063

Obsidian Blade and Point Exchange Discussion

Obsidian tools, including finished blades, projectile points, scrapers, drills, and bifaces, were recovered in every structure at Tlaxcallan, indicating comparatively equal access to these items. However, the production and consumption of these items, in conjunction with the source material used to produce them, indicates that some households behaved in a self-aggrandizing manner. For example, the production of prismatic cores and blades, in conjunction with higher

amounts of green obsidian (two to three times more), indicates that Structure T6-1 either had easier access to this network, indicating a personalized exchange network, or chose to utilize goods more readily identifiable with the Aztec Triple Alliance.

Other items, including projectile points (Figure 28), occurred in much greater amounts in Structure T6-1, at Acxotla. A chi-square test reveals a significant difference in consumption of points among households ($\chi^2 = 18.16$, $p = 0.002$, $df = 5$, n = 50). The house (Ocotelulco T6-1) that contains a significantly higher number of points (n = 18) is a comparatively humble residence with about half the surface area of Structure T30, the high-status house located in the Tepeticpac district. In fact, 50% of structures excavated at Tlaxcallan have equal or more points than those found in the high-status context, despite all being comparatively smaller than this structure and all having lower excavation volumes than the high-status residence.

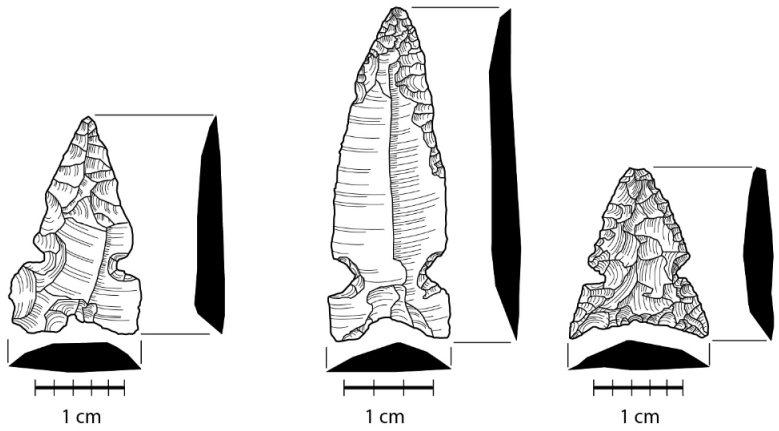


Figure 27. Typical Obsidian Side-Notched Projectile Points from Tlaxcallan, Mexico (from Marino et al. 2020).

At Tlaxcallan, high-status individuals did not monopolize access to obsidian projectile points or other non-local items, and low to middle status houses had ample access to them. All of the obsidian was imported, which suggests that large numbers of individuals had access to non-local materials and goods across social sectors and geographic space. Such a pattern is consistent with "open" markets and market management strategies designed to resolve cooperation problems and encouraged exchange among strangers, foreigners, and locals, across social sectors. This suggests that households could consume projectile points, and source materials for points based on consumer choice.

Data from LPC Tlaxcallan demonstrates that the state did not monopolize or manipulate the distribution of obsidian tools, source materials, or projectile points, a pattern that did occur at other Late Postclassic states. In his description of the Ocotelulco market in Tlaxcallan, Cortés noted that commercial transactions occurred both within the Ocotelulco market and in various other plazas dispersed throughout the city. It is clear from these descriptions that public goods/services were provided to market attendees in the form of market infrastructure, including market security (e.g., judges and police [*topiles*]), marketplaces (plazas), as well as temples. Again, these ethnohistoric accounts indicate that producers and consumers had several choices in their consumption practices.

However, Structure T6-1 in the Ocotelulco-Acxotla neighborhood contained the largest number of obsidian blades, and statistically higher amounts of projectile points than the high-status household in Tepeticpac (and all other households). This is likely reflective of a mid-tier power strategy oriented towards aggrandizement in this district. For example, all terraces and households had *access* in comparable amounts, which indicates that the markets for obsidian were not restricted at the upper echelons of political organization (the state). However, because

Acxotla Structures T6-1 and T6-2 comprise the highest amounts of projectile points and green obsidian, it is suggested that the residents of these locations sought to make a statement of power and prestige that was organized lower than the state-levels of governance.

Obsidian Exchange Network Discussion

Based on these results, and those of previous studies (Fichman 2014; López et al. 2021), it is clear that cities within the Tlaxcallan State, including at hinterland sites such as Metepec and Calcahuas, consumed different proportions of Aztec-controlled obsidian. At Metepec, Pachuca and Otumba obsidian account for only 9% of the obsidian consumed, significantly less than the core city. At Calcahuas, Pachuca and Otumba obsidian account for 33% of the obsidian consumed, higher than the core city. They did not, however, possess statistically different amounts of the El Paredón material. Second, in the core city, there is also a clear difference among households in consumption of Aztec obsidians, as is evident when Ocotelulco and Quiahuixtlan are compared (26.2% compared to 10.1% respectively). Again, however, the El Paredón materials were consumed in higher frequencies at all households and contexts (55.0% to 73.0%). Third, it is clear from the differences in household consumption of the lesser consumed obsidians in the core city, that Tlaxcallan households had access to multiple options in what obsidian was available for consumption. Considering that many households were located on adjacent terraces, and consumers presumably procured obsidian from the same marketplace (see Fargher et al. 2010; 2011), the difference in materials consumed indicates that several options were available.

Discussion of Goods Blockade in Tlaxcallan

Taken together, these results demonstrate that an embargo on Aztec obsidian items was not in place. Obsidians associated with the Triple Alliance should occur in much lower proportions, likely below 5% (see Pollard 2003; Rebneggar 2010; Walton et al. 2017), if such a blockade existed. Instead, Pachuca (green) and Otumba obsidians combined comprise nearly a fifth of our sample, and Pachuca obsidian was typically the second most popular source among household contexts. This is also supported by a recent re-analysis of the ethnohistoric data (see López 2021:492), which determined that if a goods blockade occurred, it might only have lasted fifteen years, and may have left a small to undetectable mark in the archaeological record.

Amounts of other sources not controlled by the Aztec Triple Alliance are also not observed in large enough proportions to support an Aztec blockade. The Zaragoza-Oyameles source, a high quality and easily accessible resource that was popular in previous periods and not controlled by any nation-state, should have exceeded the use of Aztec obsidians given a blockade. Instead, Zaragoza-Oyameles obsidian is typically the third most consumed good within our household contexts. These results indicate that factors occurring *within* the Tlaxcallan political and social system, and not external to that system, such as Aztec policy, affected trade and exchange at the site.

Discussion of State Interference in Obsidian Trade

There is little evidence to support an argument that the Tlaxcallan state directly enforced the consumption of El Paredón obsidian, either in response to Aztec economic aggression or as a strategy geared towards state finance and legitimization. The proportions of El Paredón obsidian

in households were too small in relation to other sources recovered, to support the argument that its use was enforced by the state. In other locations, where the state enforced the use of one good over alternatives, the preferred good composed 90%-95% or more of the materials utilized. No structure in our sample has El Paredón obsidian recovered in such a proportion.

Additionally, the amount of El Paredón obsidian consumed at the public structure in Quiahuixtlan, at the public structures examined by other authors in the Tepeticpac district (see López-Corral 2021), and at the high-status household in the Tepeticpac district, is too small in amount to lend evidence for state enforcement of El Paredón obsidian. Individuals at these locations likely engaged in conspicuous consumption (i.e., performing rituals associated with reproducing state ideologies), and would have utilized state or sponsored goods, including obsidian, if it was used to promote a state or elite identity. This is especially true since the state deity, Camaxtli, was depicted with an obsidian mirror and possessing obsidian projectile points in the murals and codices that originated in Tlaxcala (Hernández 2010; López et al. 2019; López 2021; Pohl 2003). Instead, this data again suggests that while the El Paredón source was preferred, it was not found in high enough amounts to suggest a state-sponsored item. It is important to note, however, that these locations do represent the locations where Aztec obsidians occurred in the lowest proportions (see below).

Additionally, if El Paredón obsidian were the official state obsidian, one would expect that efforts would have been enacted to prohibit Aztec obsidians from the site. The relatively high percentage of Aztec sources found in households at Ocotelulco, and in the hinterland at Calcahuas, where they account for roughly one out of every three or four blades, do not support the theory that the state sponsored El Paredón obsidian and associated merchants, and prohibited access to their main competitors (the Pochtecatl) in any way. Results from the Tlaxcallan

Mapping Project also identified Pachuca obsidian comprising one out of every five blades (Millhauser et al. 2015).

Thus, consumption patterns from across the city indicate no evidence for the control of either El Paredón or Aztec obsidians. While El Paredón obsidian *is* found in high frequencies in all contexts, the only indicator of El Paredón obsidian having any imbued social significance is the lack of Aztec sources being preferred at socially important contexts. While these local patterns of obsidian consumption are undoubtedly important in these contexts, they do not support a case for state investment in this good. A scenario that would suggest state investment would be evidenced by the attached production of the resource, the restriction of that resource from certain consumers, or proportions of consumption greater than 95%; similar to what is observed in other locations in Central Mexico for controlled obsidians (Olson 2001; Smith 1990). The technological analysis in conjunction with the pXRF analysis simply does not support such a scenario of obsidian consumption.

Discussion of Tlaxcallan Citizens Preferring El Paredón Obsidians

It is clear that Tlaxcallan merchants and everyday citizens preferred El Paredón obsidians. Its popularity is indicated by its use exceeding that of Malpaís and Otumba, despite being located farther away than these other volcanoes. The greater frequencies of El Paredón obsidian indicate that this material was preferred locally but did not occur in large enough frequencies to have been sponsored by any elite or group (i.e., they do not comprise 90% or more of the sample). Instead, the use of Paredón obsidian was probably a local response to the war with the Aztec Triple Alliance and their imperial economic policies.

The preference for El Paredón obsidian at public and private high-status structures suggest that the item likely played a role in constructing a local Tlaxcallan identity or possibly served as a symbol of resistance to Aztec aggression. The lack of Aztec obsidians consumed at these locations, in conjunction with the consumption of non-Aztec goods, is further evidence that this good served as a symbol of inclusivity among Tlaxcaltecans. Its consumption in public contexts where ritual performance occurred, like at the public structure in Quiahuixtlan (T36), at the public structures in Tepeticpac (see López 2021), and at the high-status household in Tepeticpac (T30), suggests its importance in serving as a symbol of solidarity and support for the Tlaxcallan state. Given the reduced but freely traded consumption of Aztec obsidians and given the relatively high consumption of El Paredón obsidian, it can be inferred that a response of some kind did occur in Tlaxcallan, and such a response was likely the combined effort of Tlaxcallan merchants, producers, consumers, and political office holders alike, but not officially organized at the higher echelons of government.

Chapter 6 Summary

Based on the survey and excavation data, the size of the polity, and the amount of El Paredón obsidian consumed by households, both within the city and in the hinterland (55-70% per household), I identify three broad conclusions. First, Tlaxcallan represents a significant consumption network uniquely utilizing the Paredón obsidian source within Late Postclassic Mesoamerica. As of yet, El Paredón and Tlaxcallan are completely left out of discussions that summarize models of exchange for Late Postclassic Mesoamerica and are mentioned peripherally with a summarizing sentence alone, if mentioned at all (see Braswell 2003; Golitko and Feinman 2015; Feinman 2019). For example, in his summarizing analysis of Late Postclassic

Mesoamerican obsidian exchange spheres, Braswell (2003:147-150) lists El Paredón obsidian occurring at proportions of less than 3% for every Late Postclassic city across Central Mexico and Mesoamerica (Braswell 2003, Table 20.3). El Paredón is not even listed in Golitko and Fenman's (2015) summary of obsidian exchange during Late Postclassic Mesoamerica.

As the City of Tlaxcallan represented one of the largest cities in Mesoamerica during the Late Postclassic period, and as many other important cities were incorporated into the Tlaxcallan state (i.e., Huejotzingo), and as the market at Tlaxcallan reportedly consisted of tens of thousands of individuals on the busiest days (see Cortez 1986 [1525]), it currently represents one of the largest exchange networks not readily discussed in Late Postclassic Mesoamerica. I call for recognition of this unique exchange network to be added to the widespread research identifying other networks within Late Postclassic Mesoamerica, such as those surrounding the Pachuca source for the Aztec Empire, the Michoacan sources for the Tarascan Empire, and the Pico de Orizaba source for Veracruz.

Second, evidence suggests that geopolitical top-down pressures were not responsible for reducing the rate of Pachuca and Otumba obsidian consumption within Late Postclassic Tlaxcallan. Conversely, state-facilitated exchange is also not responsible for the high amounts of El Paredón obsidian consumed throughout the city. Instead, bottom-up consumer choice is the most likely driver of these frequencies. To create an exchange network of sufficient size to satisfy the local consumption needs of such a large population, cooperation among political architects, merchants, consumers, and producers alike would have been required, as well as to resist Aztec economic intrusions. Cooperation of this nature would have required large amounts of public goods, including the construction of transportation networks, public spaces necessary to hold markets, and security forces to protect transportation corridors and market-goers.

Utilizing a local exchange network would have contributed to local economic growth, reduced economic benefits to Tlaxcallan's enemies, increased local incomes, and reduced incomes going to Aztec Pochteca, who were known spies. Thus, favoring local obsidians over Aztec imports would have visibly demonstrated altruistic, 'good' behaviors focused on local and state sentiment. These actions would have fostered trust by enhancing feelings of respect and inclusion. Participants would have also been enmeshed in a system of social solidarity, as contributing effort and work to a system that benefited all would have embedded participants in an arrangement of reciprocity. Evidence this occurred is visible in the fact that households with the highest collective symbolism also have the highest amounts of El Paredón obsidians. Households with the lowest amounts of collective symbolism also have the lowest proportions of Paredón obsidians and the highest amounts of Aztec obsidians. Importantly, this analysis demonstrates that trust, reciprocity, retribution, and altruism are important factors in reducing collective action dilemmas at *large* scales of organization.

Third, pXRF data does show that not all households participated in the shared goal of resistance to Aztec economic incursions. Significantly, at least one household utilized Aztec obsidians in much higher frequencies than other locations. The Acxotla Structure T6-1 household located in the Ocotelulco district, did engage significantly in Aztec exchange networks more than the other households. The cause for this pattern in consumption could be resulting from the residents of this household, and possibly this neighborhood, either seeking economic gain through the use of a personalized network, or seeking power and prestige. In Tlaxcallan, the heightened use of non-Aztec goods likely created economic opportunities for those who engaged with Aztec merchants, probably through personal exchange networks

centered in familial ties and lineage systems. This would have created bottlenecks around the exchange of Aztec obsidians, allowing for significant increases in income.

Conversely, if economic gain was not the primary purpose of consumption of these items, then their consumption would have probably been an indicator of attempts to gain power and prestige through aggrandizement. Consuming Aztec goods at Late Postclassic Tlaxcallan would have been an obvious statement, because they were at war with the Aztec Empire. Given the consumption of other items at this household, like projectile points, it is likely that aggrandizement played a role in the exchange and consumption of goods at this location. It is important to remember that all households could produce projectile points, the same as they produced obsidian blades, yet the Structure at T6-1 is the highest in green obsidian, prismatic blades, and projectile points.

Lastly, this research demonstrates a case where the exchange of highly visible items among different groups likely reduced collective action dilemmas at large scales. The use of Paredón obsidian was a visible indicator of participation in a local obsidian network that benefitted local economies. Increased trust among different group members would have been built among merchants, consumers, and producers alike by increasing social solidarity among groups. These data then contribute to the broader research directed at identifying what mechanisms support cooperation among large-scale groups or organizations. The importance of trust among individuals is broadly and empirically supported as a mechanism to increase cooperation in small-scale groups or organizations. By increasing visibility among group members in large organizations, witnessed here by the variable consumption of easily identified goods representative of two different political organizations, group participation was enhanced. Importantly, some groups still chose to defect from the collective good, either for the purpose of

pursuing economic gain by using a personal economic exchange network or to concentrate prestige through aggrandizement.

Chapter 7: Discussion

Summary of Questions and Four Proposed Models

This dissertation sought to answer the questions: *How were the social and economic systems at Late Postclassic Tlaxcallan Organized? How did they reflect polity governance strategies? How were competitive tensions reduced among the multi-ethnic population?* To address these questions, four models were proposed to explore different governance strategies (Table 33). The use of egalitarian ideology throughout the site, visible through inclusive iconography, as well as the amount of economic egalitarianism, identified by cooperative economic strategies, were the two axes used to explore if a sense of trust and social solidarity were fostered to promote cooperation.

The four models are the collective model, the defection model, the collective with defection model, and the non-collective model. The datasets to explore these models consist of five separate lines of evidence: locations of public plazas in neighborhoods throughout the city, iconographic themes presented in public versus private spaces, patterning of polychrome pottery consumption, patterning of obsidian exchange networks as assessed through source analysis, and patterning of obsidian blade and projectile point production and consumption among households. These four models, while presented in Table 1, are summarized below again in Table 33.

The **collective model** proposes that commoners and elites willingly and consistently reproduced state themes within their households, by incorporating state ideologies in semi-public rituals that occurred within their households, such as birthday celebrations, naming rituals, agricultural festivals, and market festivals. Iconographic motifs found on pottery, also visible on public architecture, largely supported ideas of symbolic egalitarianism. In Tlaxcallan, these were

represented by motifs focusing on the state deity Camaxtli/Tezcatlipoca, who could be viewed as the antithesis to Quetzalcoatl, the Aztec god associated with wealth, nobility, and divine ancestors.

Table 33. Four Models Proposed

	Participation in Inclusive Iconography	Participation in Competitive Iconography
Cooperative Economic Interactions	1.1 *Collective Model* Use of inclusive iconography Cooperative economic strategies of resource pooling and promoting a group identity	1.3 *Collective with Defection Model* Use of competitive iconography Cooperative economic strategies of resource pooling and promoting a group identity
Competitive Economic Interactions	1.2 *Defection Model* Use of inclusive iconography Competitive economic strategies of accumulation and individualized prestige	1.4 *Non-Collective Model* Use of competitive iconography Competitive economic strategies of accumulation and individualized prestige

In this model, economic competition would have been reduced and differences in social status would have been 'compressed.' This is the currently accepted model in the extant literature (see Fargher et al. 2010; 2011; 2020). This model would be supported by relatively similar levels of consumption of polychrome pottery across households, no significant differences in household obsidian procurement networks, no significant differences in projectile point consumption among households, or no significant differences in obsidian tool production among households. The construction and area of public plazas would also not significantly differ

throughout the site, indicating that all neighborhoods and districts had equal access to public space, and placed an equal amount of importance on this public space.

The **collective with defection model** proposes that commoners and elites again willingly reproduced egalitarian state themes within households, using iconographic motifs on pottery that supported ideas of symbolic egalitarianism. Again, motifs associated with egalitarianism promoted by the state would be presented on pottery in most households. However, some households should present evidence of consuming a higher frequency of pottery which displayed motifs of self-aggrandizement. Economic egalitarianism would also be observed in most households; however, the use of more personalized networks would be observed in some households. The construction of public plazas would be equally distributed throughout the city, which would indicate that all neighborhoods and districts had access to public space equally. This would indicate that the governmental system supported a collective model, but also that not all households were engaging with it (thus some were defecting). Defecting households might have utilized more of the Aztec-controlled green obsidian (indicating the use of a personalized obsidian network), consumed more projectile points (a source of power), sought to control the production and distribution of obsidian (a source of economic wealth), or was controlling the exchange of Codex-Style pottery.

The **defection** model proposes that state themes were willingly and equally reproduced within households, using iconographic motifs on pottery that supported the state deity and themes of symbolic egalitarianism. However, economic egalitarianism would not be observed in this model, and economic competition would have been high. This would represent a scenario where people claimed to participate in state ideology, claimed to support the state system, but in reality, pursued personalized strategies to attain wealth and prestige. This model would be

supported if the majority of households utilized a personalized obsidian exchange network, utilized green obsidian, utilized a personalized pottery exchange network, controlled obsidian projectile point production, or controlled obsidian blade production. Additionally, public plazas would be equally distributed throughout the city.

The **non-collective** model proposes that households were not willingly engaging in state rituals using egalitarian iconography on pottery, and state themes of symbolic egalitarianism were not reproduced within households. This would be evidenced by iconographic motifs focused on personalized themes of wealth and nobility in the majority of households. Additionally, economic competition would have been high, including the use of exchange networks that would have profited non-local merchants and the enemies of Tlaxcallan. In other words, people were rejecting state ideology, identifying with Tlaxcallan's enemies, and possibly supporting Tlaxcallan's enemies through consumer practices. This would be evidenced by elites also controlling obsidian production and exchange or controlling polychrome pottery exchange. In the non-collective model, public plazas would also not be equitably placed throughout the polity but would be concentrated in fewer locations, requiring some to travel greater distances.

Evaluation of Models According to Material Correlates

Iconography

Iconography found on pottery throughout the polity and within the households indicates three clear findings. First, the majority of the iconography found on the Codex-Style polychromes points towards site-wide participation in a shared ritual ideology that largely promoted state themes. The motifs on the majority of this pottery are associated with themes of

darkness, smoke, celestial eyes, and other symbols associated with the cult of Camaxtli such as skulls, bones, and dismembered body parts. Camaxtli was often depicted as a skull emerging from a flint or obsidian knife in the Codex Borgia, and a similar image has been identified and painted on the temple located in Ocotelulco, Tlaxcallan (Pohl 1998:187).

Second, the local patterning of this iconography on this pottery demonstrates that it was utilized most frequently at the high-status household located in the Tepeticpac district. As the ashes of the State Deity Camaxtli/Tezcatlipoca were noted to be kept in a temple located within this district, this finding increases our understanding of the importance of this deity. In fact, of the five households examined, the three households in the Tepeticpac district all had the highest amounts of iconography related specifically to Tezcatlipoca, or themes of death, smoke, and darkness.

Third, the household in the Ocotelulco-Acxotla district utilized iconography promoting self-aggrandizing themes the most frequently. Nearly half (48%) of all sherds examined from this household utilized themes related to nobility, wealth, or civilized life. Because the Ocotelulco district was noted to house the largest market, which was stated to be a source of this district's power in ethnohistoric accounts, this finding is also significant (Figure 29).

To summarize patterns of iconography observed in this study, the majority of households at Tlaxcallan utilized more egalitarian themes on Codex-Style pottery. One household, however, the Ocotelulco-Acxotla household, utilized significantly more iconography focusing on themes of self-aggrandizement, suggesting defection at this household. However, because the majority point towards collective themes of egalitarian concepts, a **collective with defection** model is supported here.

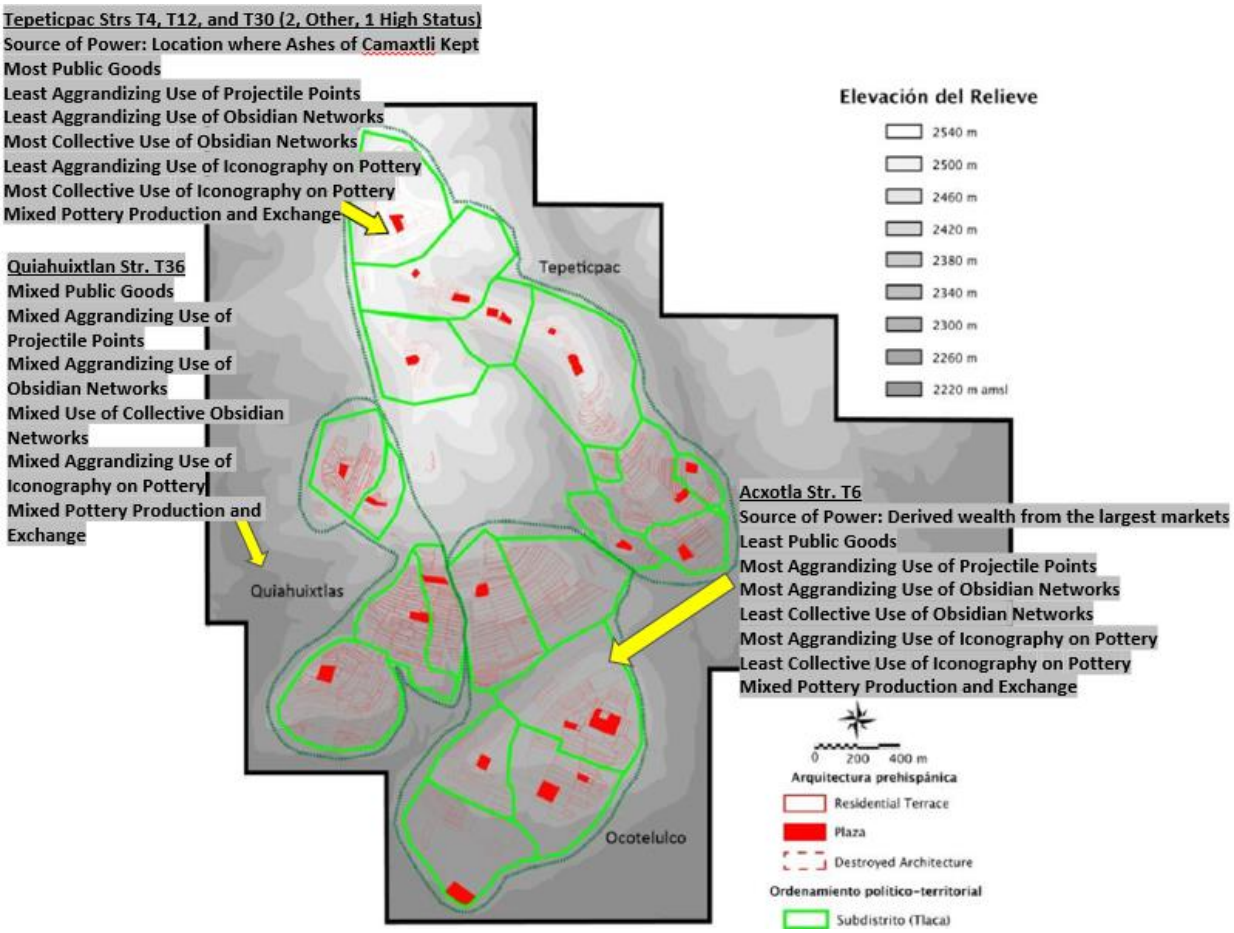


Figure 28. Results of lines of inquiry showing variation in how each barrio incorporated collective or non-collective behaviors. Variation is evident and co-occurs with different sources of power.

Pottery Exchange

The exchange of Codex Style polychrome pottery in Late Postclassic Tlaxcallan points to two key findings. First, the production and consumption of the majority of the Codex-Style pottery was local. This is an important finding because while pottery production in the Puebla-Tlaxcala Valley had been previously discussed, a major production center of this pottery local to Tlaxcallan had never been observed. The finding that pottery was produced locally, evidenced in

60 sherds previously identified as local by Lane Fargher using petrography, supports findings from Gilda Hernández-Sánchez (2010), John Pohl (1998) and Aurelio López (2019) who asserted that based on iconography motifs and themes present on Codex-Style ceramics found in Tlaxcallan, that a significant amount of this pottery was produced there. However, because production centers existed at sites like Cholula, the Basin of Mexico, and the Mixteca-Alta of Oaxaca, the possibility of this pottery being primarily imported to Tlaxcallan, and possibly exchanged through a personal network of gift giving, was a significant possibility prior to this study. The overlap in chemical space among the 60 sherds identified as local by Lane Fargher, and the 126 additional sherds obtained from excavations among the five households discussed in this research, demonstrates that nearly all Tlaxcallan Codex-Style pottery was produced locally (~97%). The finding that this pottery was locally produced increases our understanding of the political economy of Tlaxcallan, and the important role this pottery played in producing state ideologies.

This study also demonstrates that not only was Codex-Style pottery local to Tlaxcallan, it was not controlled by any household and was freely exchanged through the market system. With the presence of this pottery in every household, the possibility of redistribution or market exchange of this good existed before to this analysis. Because more than one chemical group has been identified, in conjunction with multiple iconographic themes, and no control over who had access to either recipe for making this pottery is evidenced here, it is clear that Tlaxcaltecans had choices over where they could procure this pottery, and with whichever iconographic theme they saw fit. Thus, this study shows that most Tlaxcaltecans chose to support the state's theme of symbolic egalitarianism. However as previously stated, not every household supported this theme fully.

The exchange of pottery, in terms of resources to make pottery, was not controlled in any way. The pottery was exchanged freely in the market and was primarily produced locally. All households had access to it, and because of this, this represents a focus on localized production and support of local exchange. Because of this, a **collective** scenario is supported above the others.

Obsidian Exchange

The exchange of obsidian blades throughout the city points to three clear findings. First obsidian from the Paredón volcano was the preferred source throughout the polity. This material was likely exchanged through the extensive market system that connected different localities within the polity, and no social single group or entity controlled its exchange. This marks a significant difference in the consumption of this obsidian source during the Late Postclassic period, as Tlaxcallan is the only state that consumed obsidian from this source in these frequencies in the entirety of Mesoamerica.

Second, the consumption of Aztec obsidians occurs in smaller frequencies, but not so small to suggest that an embargo was in place, such as at other locations in Mesoamerica during the Late Postclassic period. Aztec green obsidian was the second most consumed source, and the relatively smaller proportions of Aztec obsidian in Tlaxcallan compared to other polities in Mesoamerica is likely a reflection of the fact that Aztec green obsidian was a readily visible indicator of interactions with "the enemy". Because Tlaxcallan and the Aztec Triple Alliance were locked in a decades-long war, utilizing goods that expressed economic or social ties to the Aztec Empire (or its Pochteca traders) was possibly unpopular.

Third, one household boasted a significantly higher proportion of Aztec obsidian. Roughly a quarter of the obsidian consumed in the Ocotelulco-Acxotla household stems from an Aztec source. The concentration of this material within this household demonstrates it participated less in local Tlaxcallan exchange networks than other households. The fact that this was a highly visible good, points towards these individuals having the social capital to exchange this good freely without fear of stigmatization. Acquiring this amount of green obsidian would have also been evidence of either using a *personal* network to supply this household with green and other Aztec obsidians, or this house purposefully *chose* to acquire these materials in the marketplace.

In summary, all households participated in local economic networks focusing on the use of Parédon obsidians primarily. This indicates a high degree of egalitarian behavior symbolically, as supporting local networks would be a sign of solidarity with local merchants over foreign merchants. However, because the exchange of Parédon obsidian would have *required* the creation of new exchange networks during the Late Postclassic period, as the exchange of Parédon obsidian is not practiced to this degree during this time, this finding points towards the Tlaxcallan community expending a great deal of effort to create this local network.

Lastly, the common use of green obsidian in the three Ocotelulco-Acxotla households points towards these households deviating from the use of the local networks available throughout Tlaxcallan. This is important as it represents the use of a more personalized network or procurement method than other households. It also represents a location which chose to make a statement of defection from the norm. Because of this, obsidian production and exchange point most towards the **collective with defection** model.

Obsidian Blade and Projectile Point Production

There can be no doubt that projectile points were expressions of power during Late Postclassic Mesoamerica. In the Maya Lowlands, they are associated with elite burials and other rituals tying households to royal and divine ancestry (Chase 1988; Marino et al. 2020). While not so potent in Tlaxcallan, they were still symbols of power and warfare, and were frequently depicted as such in iconography. The Tlaxcallan state deity Camaxtli is himself depicted as a skull emerging from a flint or obsidian blade on Tizatlan Altar A, and in Codex Borgia (Pohl 1998:187). The concentration of these items in elite households could certainly be used to affirm an elite's noble status and symbolic power.

Findings in this dissertation show that projectile points were not concentrated exclusively in elite household settings. Instead, projectile points are found throughout the site in each of the seven households considered. However, the only concentration of these symbols of power that are found, are in a commoner setting in the Ocotelulco-Acxotla household. While previous research has identified that this house was one of 'other' status, and not a high-status household, the concentration of these items at this location demonstrates that certain households within Tlaxcallan chose to promote strategies oriented more towards self-aggrandizement.

Similar to the findings observed with obsidian blade sources, these findings identify behaviors aligned more with a collective with defection model. All households utilized this good, a phenomenon which is not surprising given that Tlaxcallan was at war. However, the concentration of these items within the Ocotelulco-Acxotla household points towards this household seeking to make an economic or social statement of power. Because of this, a **collective with defection** model is supported.

Public Architecture

Arrangement and construction of public plazas throughout the city point to public space being incorporated into the pre-planning strategies of mid-level elites, but not situated at the highest levels of state purview. Arguments for plazas being incorporated into district-level political strategies are evident by the construction of plazas at the highest elevations within each of the districts. Because Tlaxcallan was a hilltop center, plaza construction at the highest locations indicates that some of the most sought-after real estate was consistently selected for plaza construction. Variation in the number of plazas located within each district, however, does not support an argument for urban planning at the higher levels of government, such as the state level, as each district differed in the number of plazas constructed.

Variation in district construction is seen in greatest detail in the Ocotelulco district, as this location has the fewest number of plazas in the city. In fact, Ocotelulco is the only district that does not have at least one plaza constructed for every neighborhood. While there are fewer plazas located in this district, they are typically much larger than in other districts. In fact, four of the five largest plazas found within the city are located within the Ocotelulco district.

A large cluster of three plazas, including the largest plaza and the location of the principal market spoken of in ethnohistoric accounts, were constructed directly adjacent to each other in Ocotelulco. These three plazas account for half of the number of plazas found in the Ocotelulco district. This suggests centralization of public space there, possibly so elites could easily monitor plazas at these locations. As has been argued elsewhere (Marino et al. 2020) market locations were heavily monitored spaces to encourage economic transactions by protecting marketgoers in order to collect taxes and obtain revenues. The centralized construction of plazas in Ocotelulco is probably due to the fact that Ocotelulco elites derived their source of power (and wealth) from

the presence of the largest market in this location. Ethnohistoric accounts describe the Ocotelulco market as one of the busiest markets in Mesoamerica during the Late Postclassic period.

In contrast, the Tepeticpac district was the location of the greatest number of plazas within Tlaxcallan, with each neighborhood having access to at least one plaza, and more than half having access to more than one. In fact, this district held twice the number of plazas as the other two districts within the city. When the plaza area is calculated as a percentage of the total area, Tepeticpac has far more public plaza space than either Ocotelulco or Quiahuixtlan combined. For example, roughly 16% of all land in Tepeticpac is public plaza space, while 5% of land in Ocotelulco is public space; thus, there is 3 times more public space in Tepeticpac than in Ocotelulco. Ethnohistoric accounts indicate a source of political power in Tepeticpac was derived through religion because this location was believed to be where the ashes of the state deity, Camaxtli, were kept. If this was the case, the amount and dispersed nature of public space here supports this ethnohistoric account, because many dispersed plazas would have been better suited to reach Tlaxcallan's dispersed neighborhoods than fewer, more centralized plazas. Fewer, centralized, and larger plazas, while perhaps still available for all residents to utilize, would require more effort to reach by neighborhood residents living further away. Thus, while still *available* to all residents, they would not have been as equally *accessible* to all residents.

Because political architects placed such an emphasis on where plazas were constructed, evidenced by the fact they occupied the highest elevations within each district, these locations probably played an important role in the economic and political decision-making occurring within the districts. How each of the district chose to utilize this space, however, clearly differed. In Ocotelulco, plazas were larger, more centrally located, and probably more easily controlled. Ocotelulco was the location of the large marketplace that was mentioned to be a source of

income and power for district-level elites in this part of the capital city. In Tepeticpac, where religious ideology is believed to be the source of power, plazas were smaller, but were more in number and more dispersed throughout the neighborhoods. This probably coincided with how each district derived their source of power.

Like with iconography, projectile points, and obsidian exchange, plaza construction throughout the city shows clear differences between the three districts. The Ocotelulco district differs significantly from the Tepeticpac district and the Quiahuixtlan district, yet at the same time, nearly every neighborhood does contain a public plaza (even if the size of the plazas differs significantly). Because of this, a mixed model of **collective with defection** is observed in this dataset.

Taken together, several lines of evidence paint a complicated picture of social and political organization at Late Postclassic Tlaxcallan. Using the four models proposed in this work, it is clear that Tlaxcallan utilized several collective strategies to enmesh households within an identity of social egalitarianism and exceptionalism. This strategy was important because it facilitated collective resistance to Aztec encroachment and facilitated polity governance of a multi-ethnic population. However, it is also clear that not all households participated to the same degree, and overall the site fits best within a ***Collective with Defection Model***.

Answer to Proposed Questions of the Dissertation

How were the social and economic systems at Late Postclassic Tlaxcallan Organized?

It is clear that economic systems were organized at the household and district level. There has been no evidence to suggest that any economic goods production was controlled by state

policy, including obsidian (c.f. Millhauser et al. 2015; 2017). Most items were probably produced by household crafters and sold in the marketplaces which were located in the public plazas found throughout the city.

Due to the consistent location of plazas at the highest elevations in all three districts, some state-level coordination is indicated in plaza construction, or at least in *what* geographic qualities plazas should consist of (they should be at higher elevations, highly visible, etc.). Importantly, the number and size of plazas differ between districts and neighborhoods, however, indicating that mid-level elites at the district and neighborhood level maintained a certain degree of power in deciding where plazas *would* be placed. While economic production was not organized at the state level, the sale of goods in state monitored marketplaces did fall within the purview of the district level, and probably the upper-level elites. This was likely accomplished to maintain a free and open market system necessary to maintain production from which taxes could be drawn.

How did the social and economic systems reflect polity governance strategies?

Polity governance strategies are directly investigated in two ways in this dissertation. First, discussions of council governance recorded in ethnohistoric accounts mention iconography used in public architecture which was suggestive of inclusive policies, and themes of egalitarianism. If pottery within commoner and elite households matched the iconography found on public architecture, it would indicate that households freely promoted and engaged with state policies and themes. This study confirms that iconography found on public architecture was also found on pottery utilized in semi-public rituals within households.

Second, economic production was investigated between five households of varying status to ascertain the type of political and economic relationships that existed throughout Tlaxcallan. This dissertation investigated if differences in polychrome pottery production, which as mentioned above was directly reflective of state policies, existed among commoners and elites. Other items reflective of personal power, such as projectile points, and the control of obsidian production and exchange networks were also investigated.

This dissertation does not support a theory of elites controlling resources and organizing craft production as a major source of power throughout the city. Instead, this dataset points towards different districts utilizing different legitimization strategies to maintain their eminence. The heavy emphasis on state iconography and themes of symbolic egalitarianism in Tepeticpac, reflects a use of socio-religious beliefs as a source of authority at this location, a fact discussed in ethnohistoric accounts. In contrast at Ocotelulco, the heightened incorporation of economic competition points toward competition and production as being a source of wealth at this location. Because Ocotelulco was discussed in ethnohistoric accounts as being the location of the largest market, and this was a source of influence for elites in this district, these accounts are supported.

These findings are also supported by construction of public architecture throughout the city. While nearly every neighborhood had a plaza, plazas located in Tepeticpac are far more prevalent, and also far more dispersed than those in the Ocotelulco district. In the Ocotelulco district, plazas are larger and situated in central locations, suggesting the want or need for an easily controlled setting. Similarly, the construction of public architecture prevalently throughout the Tepeticpac district supports the finding that the socio-ritualistic incorporation of the population was an important aspect of life in this district.

The focus on egalitarian ideology on public architecture throughout the city points towards this being an upper-level state strategy of governance. However, because not every district incorporated this strategy, it is clear that mid-level elites maintained a high degree of freedom in how they could govern their districts. Again, this supports ethnohistoric accounts that speak of unilateral decision making by some district-level elites (intermediate-level), who were noted to unilaterally withhold troops during battle, delay negotiations, or engage an enemy with an army against council directives.

Were competitive tensions reduced among the multi-ethnic population?

This analysis does suggest that egalitarian ideology was utilized in state iconography with the *intention* to reduce competitive tensions among the multi-ethnic population of Tlaxcallan, although not all households incorporated these strategies to the same degree. Reduced economic tensions are indicated by all households participating in a local obsidian exchange network that benefitted all and would have required significant effort to build during the Late Postclassic period. This should also be contrasted with the ease that a household could defect from utilizing the local or preferred network(s), and instead choose to either make a statement of aggrandizement, support the Aztec state, or engage in a personal network that did not support the collective goal of martial and economic defense.

However, a lack of any bottlenecks in the exchange of items that could be a symbol of wealth or power, such as obsidian blade production, obsidian projectile points, or polychrome pottery, is also evidence of reduced economic competition. This dataset indicates that all of these items were consumed by all households, with no control over production or exchange. Perhaps most telling is the finding that the high-status household in Tepeticpac, which was the largest

private residence identified thus far in Tlaxcallan (see Fargher et al. 2020), did not utilize or produce any significant amount of craft goods. Instead, these items are more concentrated in households that are not of high-status.

Reduced competitive tensions are also indicated by the use of egalitarian ideology on polychrome pottery consumed among all households. This iconography promoted participation in state rituals, where privately owned pottery supported inclusive themes on public architecture. While other themes and motifs that supported a message of wealth, nobility, and power were available, they were not utilized as frequently in all households.

Importantly, however, there are significant indicators that not all households engaged with the message of symbolic egalitarianism and inclusion that was promoted politically. The Tlaxcallan State did promote collective behaviors, but some locations certainly defected from the collective good. At the household level, defection in this dataset is evidenced by the use of green obsidian in significantly higher frequencies by one household. That same household utilized more iconography emphasizing personal wealth and prestige, produced more obsidian blades, and contained more projectile points, which were items that were used as symbols of power.

At the neighborhood and district level, the construction of plazas again points towards a scenario where some locations engaged in collective ideology more than others. In the Tepeticpac and Quiahuixtlan neighborhoods, for example, at least one plaza is observed in every neighborhood, and this is not indicated in Ocotelulco. Additionally, plazas are more centralized in Ocotelulco, and much larger than anywhere else, suggesting a need to control the central market in this location. In Tepeticpac, plazas are more frequent, but smaller and more dispersed, suggesting more of a functional use as an area to enact ritual within each neighborhood.

Limitations of the Dissertation

One of the largest markets in Mesoamerica was located in the Ocotelulco district of Tlaxcallan. According to Cortes in his second letter to King Charles of Spain (1986:210) this market served 30,000 people on the busiest days. The control of the largest market in Ocotelulco by district elites is ethnohistorically documented, and this resulted in those district elites being identified as the 'wealthiest' and 'most powerful' in Tlaxcallan (Camarga 1984:96; Cortes 1986:207). It is likely that this area returned the most diverse number of artifacts in this study, and also returned the most artifacts which could be used to signal prestige, because of the proximity of the households in this district to this market.

While an explanation focused on proximity could have produced the pattern of artifact consumption observed in the Ocotelulco district, this argument reduces the procurement items used in ritual, and used to construct a personal and public identity, down to economic factors related to supply and proximity. The exchange of items in Mesoamerica occurred as part of multiple spheres of influence linked to the symbolic, religious, political, *and* economic realms that encompassed and informed Mesoamerican lifeways and worldviews (Stoner and Marino 2020). Proximity to this market is probably one factor regarding why households chose to consume polychrome pottery and obsidians linked to different political, symbolic, and economic interaction networks. However, the use of one factor alone to explain the totality of interaction motivations among households is problematic. In fact, "interaction primacy" will probably never be identified from one single type of interaction sphere alone (Stoner and Marino 2020:317).

Chapter 8: Conclusion

Trust, Cooperation, and Ritual in Late Postclassic Tlaxcallan, Mexico

This dissertation examined how a large organization, in this case, a pre-Hispanic state, sought to reduce collective action problems by building trust among a diverse population separated by distance, class, ethnicity, political affiliation, and religious identity. This is an important topic as similar problems exist in modern organizational structures like corporations, government agencies, NGOs, and political entities. Especially important in the modern case is that such interactions are becoming more frequent and rapid, as organizations traditionally separated by large distances and socio-economic factors are becoming increasingly connected via technology. One broad impact this dissertation provides is a case study of use to modern organizations.

To model how trust-building interactions are fostered, game theory has been used to understand interactions among small-scale groups, but increasingly larger datasets that include a greater number of participants are also examined. Among small-scale groups where individuals interact mostly face-to-face, trust is relatively easy to build because active and open communication among participants fosters several positive outcomes. For example, dissenting individuals in small groups tend to yield their personal beliefs and cooperate when faced with a group majority consensus. This is partly due to altruistic and reciprocal tendencies being prevalent in smaller groups, partly because group members in small groups are more likely to share a familial relationship, and partly because of the possibility of punishment for non-reciprocation is heightened in smaller groups. The majority consensus is known due to visibility and trust that others will not free-ride, and this knowledge is built on repeated and observed interactions.

As stated before, building trust at larger scales is harder to achieve, but modeling these interactions is growing increasingly important because of the increasing connectivity among larger organizations. Cooperation is harder to achieve because communication is reduced among cooperating members within large-scale organizations, due to an increase in interactions among strangers, and therefore an increase in interactions among those who might not be equal participators in the collective endeavor. Trust between large groups is harder to achieve when physical and social distance limit the proportion of society that someone can interact with directly, increasing collective action problems among larger groups. It is because of these factors, that the larger the collective goal, the less likely large groups can overcome behaviors that apply 'stress' to a collective endeavor (Jagers et al. 2019).

The intersection of the small and large scales at the intermediate socio-spatial units, such as at the public plaza situated within districts, would have been an ideal location to enhance visible evidence of participation, thereby increasing trust and collective action. Jagers et al (2019) mentions that "third party interventions" at intermediate scales (say the district level) can alleviate large-scale collective action problems (like state-level concerns). From the district scale, state issues can be communicated to neighborhoods and households (small-scale). A third party, according to Jagers et al. (2019), is any group not directly related to, or tangentially related to, the collective action goal. This could be represented by a mediator such as a religious specialist, a successful merchant, a successful general, or someone not directly related to government, but can serve more as an intermediator between religion, politics, and social life.

In the formation of states, rituals were used as a means to build social solidarity and trust in government systems. Public rituals, in particular, have seen much discussion as a mechanism to enmesh elites and commoners in a shared goal or endeavor (Pauketat 1991; Froese et al. 2014).

Public architecture and iconography are frequently used to demonstrate that political agenda and policy were often promoted in state rituals that occurred within public plazas. In fact, Froese and colleagues (Froese et al. 2014) suggest that public rituals occurring in plazas at Teotihuacan may have been an event that could have realigned commoner and elite agendas, similar to a type of intervention event suggested by Jagers and colleagues (Jagers et al. 2019), which may have been necessary to overcome competitive tendencies among Teotihuacan's barrios.

Public and private rituals were also enacted using portable goods. The iconography on portable items that promoted state themes may demonstrate 'support' for political agendas within households (see Levine et al. 2015 for a specific case with Codex-Style pottery). This dissertation sought to identify if households supported or dissented from political agendas based on iconography consumed. Economic cooperation was also examined to understand if promoting state symbols also promoted trust among households and groups.

Late Postclassic Codex-Style polychromes generally promoted either a message of inclusion, utilizing common deities and concepts that could be adopted by a multiethnic population, or a message which focused on aggrandizement, power, and wealth. Households could choose which message they wanted to promote during semi-public events. These festivals and ceremonies occurred throughout an individual's lifetime and focused on agricultural cycles, market festivals, weddings, birthday celebrations, and deaths in the community.

These ceremonies and festivals likely promoted a sense of inclusion and cooperation throughout Late Postclassic Tlaxcallan, and principles of symbolic egalitarianism and Tlaxcallan 'exceptionalism' were needed to ensure the martial and economic survival of a state at war with a larger and more powerful neighbor. It is likely that the state sought to capitalize on the ideology used in these public and semi-public festivals that promoted symbolic egalitarianism.

Festivals and semi-public rituals were deeply integrated into everyday life in Late Postclassic Mesoamerica. John Pohl (1998:188) identifies the iconography found on the public architecture at the Temples in Ocotelulco and Tizatlan as correlating with movable feasts that were intended to be enacted in public and private settings. Pohl (1998:188) identifies a correlation between these feasts and ritual descriptions depicted in the Codex Borgia, believed to have been written in Tlaxcala during the Late Postclassic period, which offers directions on how to enact these ritual ceremonies. The iconography on Altar A at Tizatlan, Tlaxcala, points to the deities of Tezcatlipoca, Tlahuizcalpantecuhtli, and the Tzitzimitl, all of which had calendrical feasts dedicated to them. This iconography has been found on Late Postclassic Codex-Style vessels within households, and in public spaces. The iconography on Altars A and B at Ocotelulco depicts iconography dedicated to the Tzitzitmi and Camaxtli/Tezcatlipoca deity, which again had festivals dedicated to them. Similar iconography has also been identified on Late Postclassic Codex-Style pottery. These deities were important for several semi-private ceremonies, such as birthdays, deaths, and agricultural cycles (Pohl 1998:189).

Iconographic analysis of Codex Style pottery recovered from five households of varying status was undertaken to determine if any households were preferring a particular complex. As stated, several complexes were available, with some promoting inclusive themes, and others promoting more personalized messages of wealth and status. To explore household patterns two datasets were considered, the first was a sample of Codex-Style polychromes that were assayed with NAA. A second expanded sample was examined in Mexico.

Results of the iconographic analysis identified that the majority of the symbols on all pottery in all households represented themes of fertility, warfare, and deities that could be used to affirm an all-encompassing system that included Otomí, Chichimec, and Nahuatl peoples. This facilitated the cooperation of multiple polities in a system of governance focused on collective

policies at the top echelons of interactions. For example, Tlaxcallan's ally, the Huejotzingo State, also venerated Camaxtli as their patron deity according to ethnohistoric accounts. However, while this message was communicated at the top echelons of society, not all households participated equally.

The household in the Ocotelulco-Acxotla neighborhood preferred a higher amount of pottery with specific aggrandizing symbols. This was evidenced in both the sample submitted for NAA analysis and the sample examined in Mexico. Because NAA analysis identified that pottery was being produced in at least two different recipes, and that neither of them featured significantly higher proportions of a particular iconographic style, the residents at the Ocotelulco-Acxotla household had clear options in what iconographic message it could choose to support. The findings of this dissertation revealed that this household chose to utilize the iconographic message with less inclusive themes.

The ceramic dataset also broadly supports the pattern observed in the placement of public architecture. The Ocotelulco district had the least amount of plaza space, the location where rituals would be performed to support state themes of inclusivity. The plazas in the Ocotelulco district were also the largest, the most centrally placed, and likely were for mostly economic functions. Ethnohistoric accounts point to this district containing the largest market in Tlaxcallan and suggest these economic functions as being a source of power and wealth for this district.

Obsidian data obtained from seven excavated households also supports the conclusions derived from the ceramic dataset. Green obsidian and other Aztec obsidians occur in the highest frequency in the Ocotelulco-Acxotla households. Green obsidian was associated with the Aztec Empire during this period, and nearly every major polity was affected in some way by the control of Aztec green obsidian, or affected by the exclusion from that network. The shift in obsidian consumption during this time is one of the most frequently discussed topics regarding

Aztec political and economic strategies during this period. The consumption of highly visible goods associated with the Aztec Empire would have been a significant statement in Tlaxcallan.

The consumption of projectile points also indicates that the Ocotelulco-Acxotla household did not participate in collective behaviors to the same degree as other locations in Late Postclassic Tlaxcallan. Projectile points were recovered there in statistically significant amounts. Projectile points were depicted in iconography as symbols of power and authority throughout Late Postclassic Mesoamerica, including in Tlaxcallan. The patron deity Camaxtli is painted in the Codex Borgia with several projectile points, is represented in the Codices as an animated flint, and is also depicted in the Ocotelulco Temple as an animated flint surrounded by many projectile points. Both Tezcatlipoca, as well as Camaxtli are frequently shown with arrowheads and spear throwers, as the lords of hunting. Other evidence for the importance of projectile points being symbols of power and authority comes from other regions in Late Postclassic Mesoamerica, where these items were associated with elite authority (see Chase and Chase 1988).

Final Thoughts

Ethnohistoric accounts make clear that tensions existed between districts in Late Postclassic Tlaxcallan at the time of conquest. Tensions among the district heads of Tlaxcallan, especially that of the Ocotelulco district and the Tepeticpac district (i.e. the rivalry between Maxicatzin and Xicontencatl Elder, respectively) is discussed frequently by Munoz-Camarga (1984:85; see also Pohl 1998:185). Factionalism, civil wars, and other competitive interactions are described before the time of the Spanish conquest in the ethnohistoric accounts also (Camarga 1984:55-57). In the Ocotelulco district, ethnohistoric accounts further mention

competition *within* the district itself; and one district ruler was murdered by his brother for rulership of the district (Camarga 1984:79). Such tensions are described by Cortes himself at the time of conquest, who noted that a general from the Tepeticpac district (Xicotencatl the Younger), led the attack on the Spanish without permission from the rest of the council (Cortes 1986:201).

Ethnohistoric accounts also make clear that a shared identity was constructed among the multiethnic peoples which comprised the Tlaxcallan state, focused on worship of the deity Camaxtli (see Fargher et al. 2010; Hernandez 2010; Pohl 1998). In Tlaxcallan, Camaxtli was the patron deity of the state according to the chroniclers, and his ashes were guarded in Tlaxcallan (Camarga 1984:5; Motolinia 1954:132-133). A portion of his ashes were given to Tlaxcallan's ally Huejotzingo as a gift (Camarga 1984:72), presumably to strengthen the alliance between the two states. Both Tlaxcallan and Huezotingo were locked in a perpetual war with their neighbors, including Cholula to the south (Cortes 1986:215,226).

According to the chroniclers, the patron deity of Cholula was Quetzalcoatl (Motolinia 1954:137), often personified as the anti-thesis of Camaxtli. This is unsurprising as most Nahua speaking peoples of Central Mexico, the Puebla-Tlaxcala Valley, and the Mixteca-Alta of Oaxaca, worshipped Quetzalcoatl (see Forde 2014; Hernandez 2010; Levine et al. 2015; Matos 1985; Pohl 1998) and this imagery was frequently found on temples and altars in those locations. Quetzalcoatl is noted by the chronicler Motolinia as having been painted on the large temple of Cholula, Tlaxcallan's nearest neighbor (Motolinia 1954:137). Quetzalcoatl, Ehecatl, and Tlaloc were also frequently depicted in the Templo Mayor complex located in Aztec Mexico (Matos 1985). Given that Nahua was the most spoken language within Tlaxcallan according to

chroniclers (Motolinia 1954:318), it is significant that Camaxtli was the deity chosen to be worshipped there.

Ethnohistoric accounts also point towards portable objects being used to create an inclusive identity surrounding the worship of the deity Camaxtli. In the Tepeticpac district, the funerary bundle of the deity was safeguarded by the head of that district (Camarga 1984:72). The chronicler Diego Duran mentioned festivals occurring in public plazas and private contexts focused on the veneration of this deity using serving wares (Durán 1971:273-286; Pohl 1998: 188). The Codex Borgia describes the rituals also, and the imagery from the codices is found on public architecture in Tlaxcallan and on Codex-Style serving wares (Hernandez 2010; Pohl 1998).

The use of ritual and religion in one district as a source of power, as well as the use of religion to encourage participation of other districts and council members, is also documented ethnohistorically using portable objects other than ceramics. Projectile points, flint knives, and obsidian were also part of the rituals used to venerate Camaxtli in both Tlaxcallan and Huejotzingo. The chronicler Munoz-Camarga (1984:62-64) specifically mentioned arrows as being included in offerings in temples for the deity Camaxtli during public events in Huejotzingo, and similar offerings and rituals were noted in Tlaxcallan. Camaxtli is depicted in the Codex Borgia with flint knives and arrows, and in imagery on temples in Tlaxcallan (Pohl 1998). The sharing of Camaxtli/Tezcatlipoca's ashes between Tepeticpac and Huejotzingo, and the use of rituals venerating this deity using public space, festivals, iconography, serving wares, projectile points, and obsidian knives (see Camarga 1984:72; Pohl 1998:185) demonstrates attempts by Tlaxcallan district heads to incorporate the participation of other council members in a shared identity.

There were several factors motivating Tlaxcallan participation in a system of shared governance, but two primary motivating factors were likely related to economic and military aggression, primarily coming from the aggressive Aztec and Cholula States during the Late Postclassic period. To promote cooperation among a multiethnic population that spanned several polities and cities, a sense of egalitarian ideology was fostered. This was likely attempted to build trust among a population that was separated by distances in geography, ethnicity, religion, and socio-economic status. To foster this sense of symbolic egalitarianism and Tlaxcallan exceptionalism, it is likely that inclusive symbology was painted on public architecture and used in rituals that could be communicated in public and semi-public settings within households.

The discovery of this ideology on Codex-Style pottery recovered from within households, is one example where differences in ethnicities, beliefs, religions, and wealth could be bridged through communication. The pottery communicated a specific message, and the use of this pottery in semi-public settings where individuals could share their beliefs through ritual consumption was a variation of face-to-face communication that could cross-cut cultural groups. Political beliefs were undoubtedly observed in public plazas, but they were probably spoken more readily within households and also more communicated within trusted settings. Semi-public rituals among friends facilitated this trusted communication, and these shared ideas could then be taken back to households in other areas and discussed throughout the polity in more trusted settings. The use of this symbology was a direct way to demonstrate one's personal ideas while creating visibility in settings that did not involve the public plaza where fear of retribution may have been felt.

Thus, the use of this ideology on portable artifacts constitutes a scenario where face-to-face interactions could be partially replicated. Regardless, the observation of beliefs increased

trust by decreasing anonymity, increasing accountability, increasing visibility among heterogenous populations, decreasing uncertainty, and increasing emotional attachment in an intervention event, or reset event, as discussed in the literature (Froese et al. 2014; Jagers et al. 2019).

While this occurred, this dissertation suggests that not all households participated equally in these goals, with evidence for several self-interested motivations. Nevertheless, overall state rituals and ideologies provided a venue for individuals to 'demonstrate' motivations, allegiances, or intentions to others who usually would not be able to physically see their intentions. These actions produced assurance that neighbors were supported by other individuals, thereby strengthening trust among groups. This served as a form of communication among neighborhoods, with strangers also able to see motivations in plaza-wide rituals observed within households.

It is clear that state-wide rituals enacted in public and private settings produced trust by facilitating communication and visibility among groups separated by distance, ethnicity, and other socio-economic factors. While not everyone participated equally, it did provide a powerful venue for small-scale social units to interact at mid-level scales, which could demonstrate either support or dissent from higher-level ideology. Thus, archaeology provides a broad example with modern and immediate opportunity to examine these theories which normally could only be modeled using experimental games. Here I demonstrate an example with widespread applications of how states can build trust in disparate groups by focusing on intermediate socio-spatial units (plazas within neighborhoods). These state themes can then be translated to households readily.

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Appendix I Iconography on NAA Sherds

ANID	Alternate ID	Site Number	Ceramic Type	TAP-B-40-2	Picture	Notes	Complex	Citation	Strategy
MMM061	TAP-E-110-1	EFT30	Codex Laca	TAP-B-40-2	IMG_4263.jpg IMG_4264.jpg	Grp2	Teocuitlatl Complex	López 2019:344	Network
MMM062	TAP-E-110-2	EFT30	Codex Laca	TAP-B-40-2	IMG_4265.jpg IMG_4266.jpg	Grp1	Complex of Pulque and Fertility	Hernández 2005:147	Other
MMM066	TAP-E-110-6	EFT30	Codex Laca	TAP-B-40-2	IMG_4273.jpg IMG_4274.jpg	Grp2	Complex of War Sacrifice and Nobility	López 2019:342	Network
MMM067	TAP-E-341-1	EFT30	Codex Laca	TAP-B-40-2	IMG_4275.jpg IMG_4276.jpg	Grp1	Machiyotl Glyph Complex	López 2019:349	Other
MMM068	TAP-E-341-2	EFT30	Codex Laca	TAP-B-40-2	IMG_4277.jpg IMG_4278.jpg	Grp2	Tlillan Complex	Hernández 2010:259	Network
MMM070	TAP-E-341-4	EFT30	Codex Laca	TAP-B-40-2	IMG_4281.jpg IMG_4282.jpg	Grp2	Tlillan Complex	Hernández 2010:259	Network

MMM071	TAP-E-402-1	EFT30	Codex Laca	TAP-B-40-2	IMG_4283.jpg IMG_4284.jpg	Grp2	Machiyotl Glyph Complex	López 2019:349	Other
MMM084	TAP-E-442-6	EFT30	Codex Laca	TAP-B-40-2	IMG_4309.jpg IMG_4310.jpg	Grp2	Complex of Crossed Bones and Skulls	Hernández 2010:265	Other
MMM097	TAP-E-110-7	EFT30	Codex Laca	TAP-B-40-2	IMG_4335.jpg IMG_4336.jpg	Grp2	Complex of Death and Tezcalitpoca (Mirror Backing)	Hernández 2004:20	Other
MMM098	TAP-B-40-1	EFT30	Codex Laca	TAP-B-40-2	IMG_4337.jpg IMG_4338.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341	Network
MMM099	TAP-B-40-2	EFT30	Codex Laca	TAP-B-40-2	IMG_4339.jpg IMG_4340.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341	Network
MMM101	TAP-B-40-4	EFT30	Codex Laca	TAP-B-40-2	IMG_4343.jpg IMG_4344.jpg	Grp2	Complex of Death and Tezcatlipoca	Hernández 2010:264	Other
MMM103	TAP-B-38-1	EFT30	Codex Laca	TAP-B-40-2	IMG_4347.jpg IMG_4348.jpg	Grp1	Complex of Death and Tezcalitpoca (Sectioned Skin)	Hernández 2010:119	Other

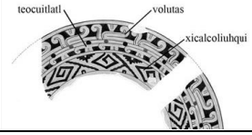
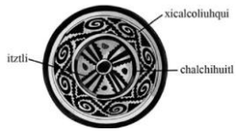
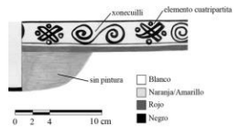
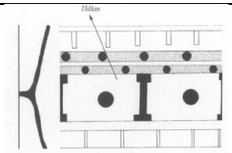
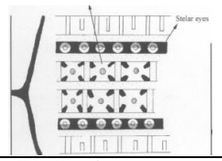
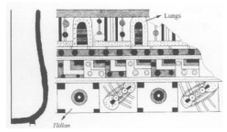
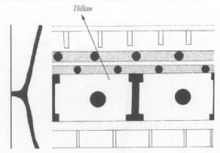
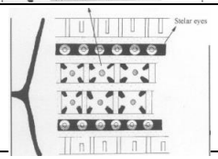
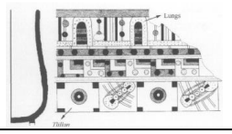
MMM104	TAP-B-38-2	EFT30	Codex Laca	TAP-B-40-2	IMG_4349.jpg IMG_4350.jpg	Grp2	Teocuitlatl Complex	López 2019:344	Network
MMM107	TAP-M-83-2	T6	Codex Laca	TAP-B-40-2	IMG_4189.jpg IMG_4190.jpg	Grp2	Complex of Tlillan	Hernández 2010:259	Network
MMM115	TAP-M-82-3	T6	Codex Laca	TAP-B-40-2	IMG_4205.jpg IMG_4206.jpg	Grp2	Complex of Eagles	Herndandez 2010:117	Network
MMM116	TAP-M-82-4	T6	Codex Laca	TAP-B-40-2	IMG_4207.jpg IMG_4208.jpg	Grp1	Complex of Tlillan	Hernández 2010:259	Network
MMM119	TAP-M-159-2	T6	Codex Laca	TAP-B-40-2	IMG_4213.jpg IMG_4214.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341	Network
MMM122	TAP-M-159-5	T6	Codex Laca	TAP-B-40-2	IMG_4219.jpg IMG_4220.jpg	Grp2	Machiyotl Glyph Complex	López 2019:348	Other
MMM123	TAP-M-159-6	T6	Codex Laca	TAP-B-40-2	IMG_4221.jpg IMG_4232.jpg	Grp2	Complejo Xochicuicatl-Xochilhuit	López 2019:341	Network

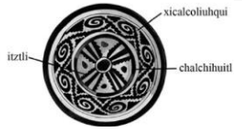
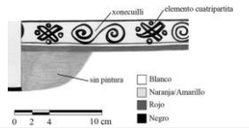
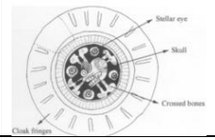
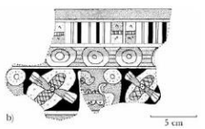
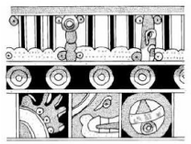
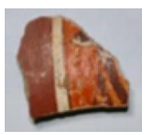
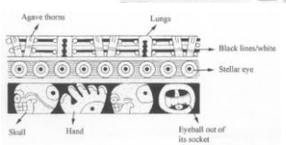
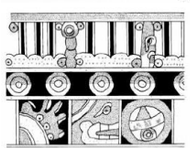
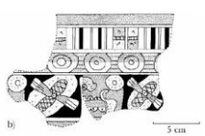
MMM124	TAP-M-159-7	T6	Codex Matte	TAP-B-40-2	IMG_4222.jpg IMG_4223.jpg	Grp2	Solar Band Complex	Hernández 2010:95, 98, 99	Network
MMM125	TAP-M-49-1	T6	Codex Laca	TAP-B-40-2	IMG_4224.jpg IMG_4225.jpg	Grp2	Complejo Xochicuicatl-Xochilhuit	López 2019:341	Network
MMM128	TAP-M-49-4	T6	Codex Laca	TAP-B-40-2	IMG_4230.jpg IMG_4231.jpg	Grp1	Stellar Eye (Complex of Death and Tezcalitpoca	Fargher et al. 2010	Other
MMM129	TAP-M-128-1	T6	Codex Laca	TAP-B-40-2	IMG_4233.jpg IMG_4234.jpg	Grp2	Vasijas de Textiles Finos	Hernández 2010:116	Network
MMM130	TAP-M-128-2	T6	Codex Laca	TAP-B-40-2	IMG_4235.jpg IMG_4236.jpg	Grp2	Machiyotl Glyph Complex	López 2019:347	Other
MMM131	TAP-M-128-3	T6	Codex Laca	TAP-B-40-2	IMG_4237.jpg IMG_4238.jpg	Grp2	Complex of Death and Tezcatlipoca	Fargher et al. 2010	Other
MMM132	TAP-M-128-4	T6	Codex Laca	TAP-B-40-2	IMG_4239.jpg IMG_4240.jpg	Grp2	Machiyotl Glyph Complex	López 2019:347	Other

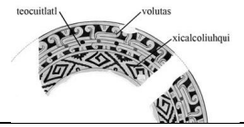
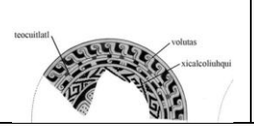
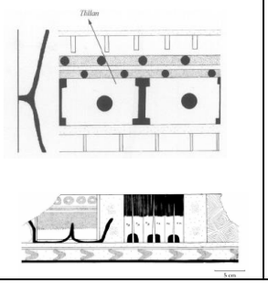
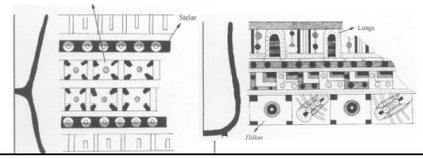
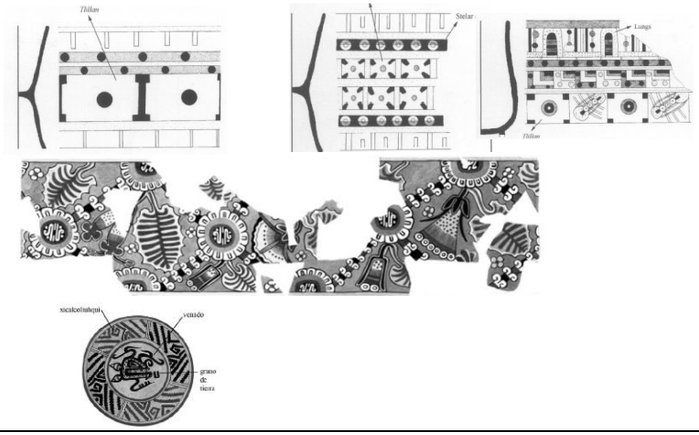
MMM155	TAP-I-52-2	T36	Codex Laca	TAP-B-40-2	IMG_4111.jpg IMG_4112.jpg	Grp1	Vasijas de Textiles Finos	Hernández 2010:116	Network
MMM156	TAP-I-52-3	T36	Codex Laca	TAP-B-40-2	IMG_4113.jpg IMG_4114.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl	López 2019:341	Network
MMM166	TAP-O-55-1	EFT4	Codex Laca	TAP-B-40-2	IMG_4026.jpg IMG_4027.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl	López 2019:341	Network
MMM168	TAP-O-168-1	EFT4	Codex Laca	TAP-B-40-2	IMG_4030.jpg IMG_4031.jpg	Grp1	Complex of Tlillan	Hernández 2010:259	Network
MMM170	TAP-O-59-1	EFT4	Codex Laca	TAP-B-40-2	0.690 IMG_4034.jpg IMG_4035.jpg	Grp2	Machiyotl Glyph Complex	López 2019:347-348	Other
MMM187	TAP-O-61-1	EFT4	Codex Laca	TAP-B-40-2	IMG_4068.jpg IMG_4069.jpg	Grp2	Complejo Xochicuicatl-Xochilhuitl	López 2019:341	Network
MMM197	TAP-X-210-6	EFT12	Codex Laca	TAP-B-40-2	IMG_4147.jpg IMG_4148.jpg	Grp2	Tlamatchli Glyph Complex	López 2019:347	Other

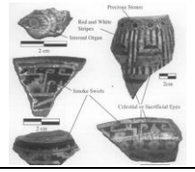
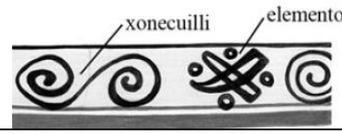
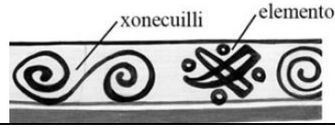
MMM199	TAP-X-210-4	EFT12	Codex Laca	TAP-B-40-2	IMG_4151.jpg IMG_4152.jpg	Grp1	Complex of War Sacrifice and Nobility	López 2019:342	Network
MMM201	TAP-X-210-1	EFT12	Codex Laca	TAP-B-40-2	IMG_4155.jpg IMG_4156.jpg	Grp1	Machiyotl Glyph Complex	López 2019:347-348	Other
MMM203	TAP-W-181-2	EFT12	Codex Laca	TAP-B-40-2	IMG_4159.jpg IMG_4160.jpg	Grp2	Machiyotl Glyph Complex	López 20169:347	Other
MMM208	TAP-X-244-3	EFT12	Codex Laca	TAP-B-40-2	IMG_4169.jpg IMG_4170.jpg	Grp1	Complex of Crossed Bones	Hernández 2010:265	Other
MMM209	TAP-X-244-4b	EFT12	Codex Laca	TAP-B-40-2	IMG_4171.jpg IMG_4172.jpg	Grp1	Complex of Tlillan	Hernández 2010:259	Network

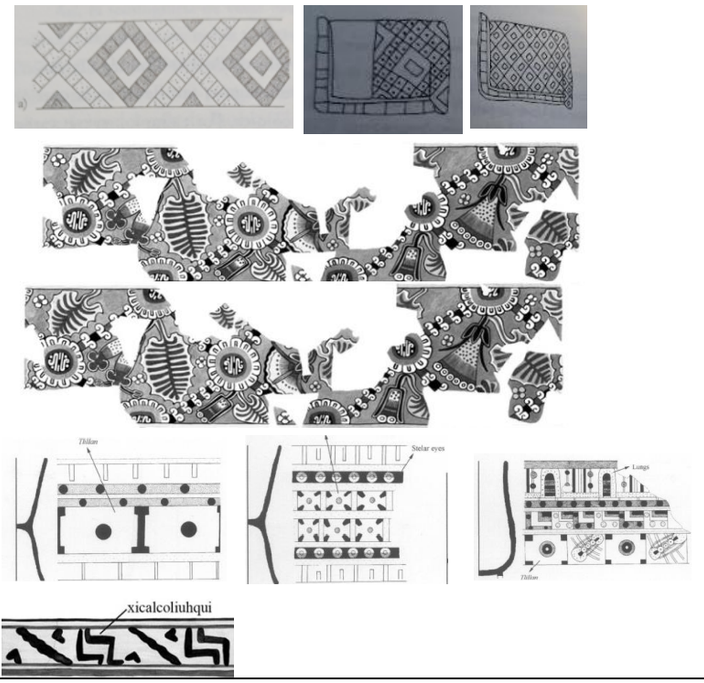
Appendix II Iconographic Images on NAA Sherds

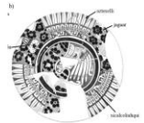
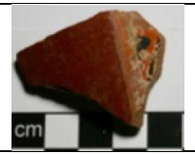
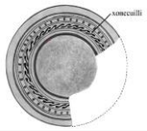
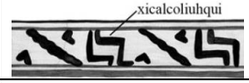
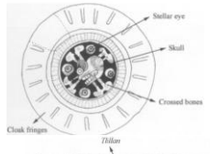
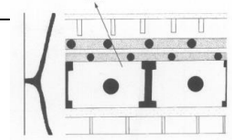
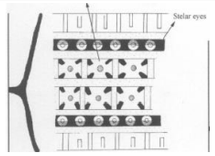
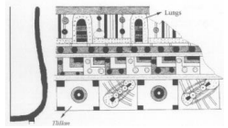
ANID	Picture	Complex	Citation	Sherd Image	Literature Image 1	Literature Image 2	Literature Image 3
MMM061	IMG_4263.jpg IMG_4264.jpg	Teocuitlatl Complex	López 2019:344				
MMM062	IMG_4265.jpg IMG_4266.jpg	Complex of Pulque and Fertility	Hernández 2005:147				
MMM066	IMG_4273.jpg IMG_4274.jpg	Complex of War Sacrifice and Nobility	López 2019:342				
MMM067	IMG_4275.jpg IMG_4276.jpg	Machiyotl Glyph Complex	López 2019:349			 	
MMM068	IMG_4277.jpg IMG_4278.jpg	Tlillan Complex	Hernández 2010:259			 	
MMM070	IMG_4281.jpg IMG_4282.jpg	Tlillan Complex	Hernández 2010:259				

MMM071	IMG_4283.jpg IMG_4284.jpg	Machiyotl Glyph Complex	López 2019:349				
MMM084	IMG_4309.jpg IMG_4310.jpg	Complex of Crossed Bones and Skulls	Hernández 2010:265				
MMM097	IMG_4335.jpg IMG_4336.jpg	Complex of Death and Tezcalitpoca (Mirror Backing)	Hernández 2004:20				
MMM098	IMG_4337.jpg IMG_4338.jpg	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341				
MMM099	IMG_4339.jpg IMG_4340.jpg	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341				
MMM101	IMG_4343.jpg IMG_4344.jpg	Complex of Death and Tezcatlipoca	Hernández 2010:264				
MMM103	IMG_4347.jpg IMG_4348.jpg	Complex of Death and Tezcalitpoca (Sectioned Skin)	Hernández 2010:119				

MMM104	IMG_4349.jpg IMG_4350.jpg	Teocuitlatl Complex	López 2019:344				
MMM107	IMG_4189.jpg IMG_4190.jpg	Complex of Tlillan	Hernández 2010:259				
MMM115	IMG_4205.jpg IMG_4206.jpg	Complex of Eagles	Herndandez 2010:117				
MMM116	IMG_4207.jpg IMG_4208.jpg	Complex of Tlillan	Hernández 2010:259				
MMM119	IMG_4213.jpg IMG_4214.jpg	Complejo Xochicuicatl-Xochilhuitl.	López 2019:341				
MMM122	IMG_4219.jpg IMG_4220.jpg	Machiyotl Glyph Complex	López 2019:348				
MMM123	IMG_4221.jpg IMG_4232.jpg	Complejo Xochicuicatl-Xochilhuit	López 2019:341				

MMM124	IMG_4222.jpg IMG_4223.jpg	Solar Band Complex	Hernández 2010: 95, 98, 99, 104		    	
MMM125	IMG_4224.jpg IMG_4225.jpg	Complejo Xochicuicatl-Xochilhuit	López 2019:341			
MMM128	IMG_4230.jpg IMG_4231.jpg	Stellar Eye (Complex of Death and Tezcalitpoca	Fargher et al. 2010			
MMM129	IMG_4233.jpg IMG_4234.jpg	Vasijas de Textiles Finos	Hernández 2010:116		 	
MMM130	IMG_4235.jpg IMG_4236.jpg	Machiyotl Glyph Complex	López 2019:347			
MMM131	IMG_4237.jpg IMG_4238.jpg	Complex of Death and Tezcatlipoca	Fargher et al. 2010			
MMM132	IMG_4239.jpg IMG_4240.jpg	Machiyotl Glyph Complex	López 2019:347			

MMM155	IMG_4111.jpg IMG_4112.jpg	Vasijas de Textiles Finos	Hernández 2010:116		
MMM156	IMG_4113.jpg IMG_4114.jpg	Complejo Xochicuicatl-Xochilhuitl	López 2019:341		
MMM166	IMG_4026.jpg IMG_4027.jpg	Complejo Xochicuicatl-Xochilhuitl	López 2019:341		
MMM168	IMG_4030.jpg IMG_4031.jpg	Complex of Tlillan	Hernández 2010:259		
MMM170	0.690 IMG_4034.jpg IMG_4035.jpg	Machiyotl Glyph Complex	López 2019:347-348		
MMM187	IMG_4068.jpg IMG_4069.jpg	Complejo Xochicuicatl-Xochilhuitl	López 2019:341		
MMM197	IMG_4147.jpg IMG_4148.jpg	Tlamatchli Glyph Complex	López 2019:347		

MMM199	IMG_4151.jpg IMG_4152.jpg	Complex of War Sacrifice and Nobility	López 2019:342				
MMM201	IMG_4155.jpg IMG_4156.jpg	Machiyotl Glyph Complex	López 2019:347-348				
MMM203	IMG_4159.jpg IMG_4160.jpg	Machiyotl Glyph Complex	López 20169:347				
MMM208	IMG_4169.jpg IMG_4170.jpg	Complex of Crossed Bones	Hernández 2010:265				
MMM209	IMG_4171.jpg IMG_4172.jpg	Complex of Tlillan	Hernández 2010:259				

Appendix III Iconography EFT-4

Photo	Site	Quad	Symbol1	Complex	Citation
20190814_144347	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_144400	EFT4	40X08Y (Structure 3)	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348
20190814_144444	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_144453	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_144522	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_144622	EFT4	40X06Y (Structure 3)	agave thorn or rays	Solar Band Complex	Hernández 2010:257
20190814_144639	EFT4	40X06Y (Structure 3)	agave thorn or rays	Solar Band Complex	Hernández 2010:257
20190814_144724	EFT4	36X08Y	eroded	Eroded	
20190814_144742	EFT4	36X08Y	eroded	Eroded	
20190814_144852	EFT4	44X03Y	flor	Complex Xochicuicatl-Xochilhuitl	López 2019:341
20190814_144915	EFT4	44X03Y	Piel de Jaguar con ojo	Complex of Death and Tezcatlipoca	see Hernández 2005:70
20190814_144939	EFT4	44X03Y	Xonecuilli	Teocuitlatl Complex	López 2019:344
20190814_145013	EFT4	44X03Y	crossed bones	Complex of Crossed Bones	Hernández 2010:265
20190814_145030	EFT4	44X03Y	quadripartite	Complex of Fine Textiles	Hernández 2005:116
20190814_145105	EFT4	44X03Y	Guirnalda de flores	Complex of Death and Tezcatlipoca	see Hernández 2005:58
20190814_145134	EFT4	44X03Y	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348
20190814_145157	EFT4	44X03Y	band	Unknown	
20190814_145217	EFT4	44X03Y	band	Unknown	
20190814_145242	EFT4	44X03Y	eroded	Eroded	
20190814_145318	EFT4	44X03Y	Eroded	Unknown	
20190814_145335	EFT4	44X03Y	Volute	Teocuitlatl Complex	López 2019:344
20190814_145400	EFT4	44X03Y	Piel de Jaguar	Complex of Smoke and Darkness	Hernández 2005:70; Fargher et al. 2010

20190814_145429	EFT4	44X03Y	crossed bones	Complex of Crossed Bones	Hernández 2010:265
20190814_145449	EFT4	44X03Y	celestial eyes	Complex of Smoke and Darkness	Fargher et al. 2010
20190814_145506	EFT4	44X03Y	banda de puntos	Teocuitlatl Complex	López 2019:344
20190814_145603	EFT4	44X03Y	sphere	Unknown	
20190814_145625	EFT4	44X03Y	band	Unknown	
20190814_145645	EFT4	44X03Y	volute	Complex Xochicuicatl-Xochilhuitl	López 2019:341
20190814_145704	EFT4	44X03Y	Eroded	Unknown	
20190814_145729	EFT4	44X03Y	band	Unknown	
20190814_145750	EFT4	44X03Y	teocuitlatl	Teocuitlatl Complex	López 2019:344
20190814_145827	EFT4	44X03Y	band	Unknown	
20190814_145852	EFT4	44X03Y	band	Unknown	
20190814_145932	EFT4	44X03Y	Volute Xonecuilli or Sphere	Teocuitlatl Complex	López 2019:344
20190814_150131	EFT4	40X08Y (Structure 3)	Eroded	Unknown	
20190814_150305	EFT4	40X12Y (Structure 3)	Piel de Jaguar	Complex of Smoke and Darkness	Hernández 2005:70; Fargher et al. 2010
20190814_150333	EFT4	40X12Y (Structure 3)	snake (xicaliuhqui)	Machiyotl Glifo Geometrico	López 2019
20190814_150357	EFT4	40X12Y (Structure 3)	Tlillan	Tlillan Complex	López 2019:259
20190814_150409	EFT4	40X12Y (Structure 3)	Xicalcoliuhqui	Machiyotl Glifo Geometrico	López 2019:348; Hernández 2005:74
20190814_150425	EFT4	40X12Y (Structure 3)	Tlillan	Tlillan Complex	López 2019:259
20190814_150438	EFT4	40X12Y (Structure 3)	snake (xicaliuhqui)	Machiyotl Glifo Geometrico	López 2019
20190814_150452	EFT4	40X12Y (Structure 3)	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348; Hernández 2005:74
20190814_150515	EFT4	40X12Y (Structure 3)	snake (xicaliuhqui)	Complex of Smoke and Darkness	Fargher et al. 2010
20190814_150537	EFT4	40X12Y (Structure 3)	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348; Hernández 2005:74
20190814_150602	EFT4	40X12Y (Structure	band	Unknown	

		3)			
20190814_150720	EFT4	40X08Y (Structure 3)	eroded	Unknown	
20190814_150742	EFT4	40X08Y (Structure 3)	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348; Hernández 2005:74
20190814_150803	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_150811	EFT4	40X08Y (Structure 3)	Flor - "J"	Complex Xochicuicatl-Xochilhuitl	Hernández 2005:77; López 2019:341
20190814_150822	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_150904	EFT4	40X12Y (Structure 3)	Xonecuilli	Machiyotl Glifo Geometrico	López 2019:348; Hernández 2005:74
20190814_150925	EFT4	40X12Y (Structure 3)	tlillan	Tlillan Complex	Hernández 2010:259
20190814_150944	EFT4	40X12Y (Structure 3)	greca	Machiyotl Glifo Geometrico	López 2019:348
20190814_151134	EFT4	44X04Y	lung	Complex of Death and Tezcatlipoca	López 2019:347; Hernández 2010:264
20190814_151151	EFT4	44X04Y	snake (xicaliuhqui)	Machiyotl Glifo Geometrico	López 2019
20190814_151208	EFT4	44X04Y	eroded	Eroded	
20190814_151310	EFT4	40X08Y (Structure 3)	Xonecuilli	Solar Band Complex	Hernández 2010:257
20190814_151330	EFT4	40X08Y (Structure 3)	band	Unknown	
20190814_151349	EFT4	40X08Y (Structure 3)	gurerros	Machiyotl Glifo Geometrico	López 2019:347
20190817_164943	EFT4	44X06Y	Xonecuilli	Solar Band Complex	Hernández 2010:257
20190817_162123	EFT4	40X12Y (Structure 3)	Celestial Eyes	Complex of Propitiation of Agricultural Fertility	López 2019:263

Appendix IV Iconography in EFT-12

Photo	Site	Quad	Symbol1	Complex	Citation
20190815_132359	T12	Elemento 3	Ik symbol	Complex of Death and Tezcalitpoca	Heath 2013:40; Hernández 2010:264
20190815_132440	T12	Elemento 3	band	Plain/Fragment	
20190815_132516	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_132600	T12	Elemento 3	agave thorn	Complex of Death and Tezcalitpoca	Hernández Sanchez 2010:264
20190815_132805	T12	Elemento 3	band	Unknown	
20190815_132805	T12	Elemento 3	Xonecuilli	Unknown	
20190815_132850	T12	Elemento 3	band	Plain/Fragment	
20190815_132913	T12	Elemento 3	band	Plain/Fragment	
20190815_133042	T12	Elemento 3	band	Plain/Fragment	
20190815_133315	T12	Elemento 3	Tlillan	Tlillan Complex	Hernández 2010:259
20190815_165506	T12	Elemento 3	band	Eroded	
20190815_165831	T12	Elemento 3	piel de jaguar	Xochicuicatl-Xochilhuitl Complex	Hernández Sanchez 2005:70
20190815_165917	T12	Elemento 3	solar ray	Solar Band Complex	Hernández 2010:257
20190815_170154	T12	Elemento 3	Jaguar Skin With Eye	Complex of Smoke and Darkness	Hernández 2005:70; Fargehr et al. 2010
20190815_170243	T12	Elemento 3	Solar Band	Solar Band Complex	Hernández Sanchez 2005:102
20190815_170325	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_170357	T12	Elemento	snake	Machiyotl Glypho Geometrico	López 2019:348

		3	(xicaliuhqui)		
20190815_171217	T12	Elemento 3	Xonecuilli	Teocuitlatl Complex	López et al. 2019:348
20190815_171258	T12	Elemento 3	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:348
20190815_171506	T12	Elemento 3	Flor - cuicailhuia	Xochicuicatl-Xochilhuitl Complex	López 2019:341
20190815_171552	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_171712	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_172214	T12	Elemento 3	Dia de Fiesta	Solar Complex	Hernández Sanchez 2005:56
20190815_172342	T12	Elemento 3	Tlillan	Tlillan Complex	Hernández 2010:259
20190815_172559	T12	Elemento 3	piel de jaguar	Complex of Smoke and Darkness	Hernández Sanchez 2005:70
20190815_172626	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_172848	T12	Elemento 3	band	Eroded	
20190815_182432	T12	Elemento 3	band	Plain/Fragment	
20190815_182605	T12	Elemento 3	band	Eroded	
20190815_182719	T12	Elemento 3	quadripartite	Complex of Fine Textiles	Hernández 2005:116
20190815_182806	T12	Elemento 3	Tlillan	Tlillan Complex	Hernández 2010:259
20190815_182846	T12	Elemento 3	agave thorn	Solar Complex	Hernández 2004:14
20190816_110450	T12	Elemento 3	band	Plain/Fragment	
20190815_110604	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348

20190815_110701	T12	Elemento 3	celestial eye	Complex of Smoke and Darkness	Fargher et al. 2010
20190815_110856	T12	Elemento 3	xicalcoliuhqui	Unknown	
20190815_114014	T12	Elemento 3	xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:344
20190816_114228	T12	Elemento 3	band	Plain/Fragment	
20190815_114427	T12	Elemento 3	xicalcoliuhqui	Teocuitlatl Complex	López 2019:344
20190816_114626	T12	Elemento 3	band	Eroded	
20190815_114918	T12	Elemento 3	Eroded	Plain/Fragment	
20190815_115029	T12	Elemento 3	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:348
20190815_115131	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190815_115422	T12	Elemento 3	Teocuitlatl	Teocuitlatl Complex	López 2019:344
20190815_115543	T12	Elemento 3	band	Plain/Fragment	
20190815_115650	T12	Elemento 3	Xonecuilli	Teocuitlatl Complex	López et al. 2019:348
20190815_120125	T12	Elemento 3	precious stone	Complex of Luxury Vases	Hernández 2005:117; Hernández 2005:77 for J
20190815_120255	T12	Elemento 3	Tlillan	Tlillan Complex	Hernández 2010:259
20190815_120431	T12	Elemento 3	band	Eroded	
20190815_121354	T12	Elemento 3	Xonecuilli	Teocuitlatl Complex	López et al. 2019:348
20190816_121828	T12	Elemento 3	eroded	Plain/Fragment	
20190816_122155	T12	Elemento 3	band	Plain/Fragment	

20190816_122300	T12	Elemento 3	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348
20190816_122344	T12	Elemento 3	eroded	Eroded	
20190816_122521	T12	Elemento 3	celestial eye	Complex of Smoke and Darkness	Fargher et al. 2010
20190816_124259	T12	Elemento 3	xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:344
20190816_124352	T12	Elemento 3	Teocuitlatl	Teocuitlatl Complex	López 2019:344
20190816_124434	T12	Elemento 3	Spheres	Complex of War, Sacrifice, and Nobility	López 2019:342
20190816_132823	T12	Elemento 3	sangre line	Complex of Death and Tezcalitpoca	Fargher et al. 2010
20190816_133112	T12	Elemento 3	crossed bones	Complex of Crossed Bones	Hernández 2010:265
20190815_213755	T12	Elemento 3	crossed bones	Complex of Crossed Bones	Hernández 2010:265
20190815_162825	T12	Elemento 3	precious symbol	Xochicuicatl-Xochilhuitl Complex	Hernández 2005:77

Appendix V Iconography in EFT-30

Photo	Site	Quad	Symbol1	Complex	Citation
20190821_095712	EFT30a	44X54Y	xicalcoliuhqui	Machiyotl Glifo Geométrico	López et al. 2019:348
20190821_095831	EFT30a	44X54Y	Flor	Xochicuicatl-Xochilhuitl Complex	López 2019:341
20190821_095917	EFT30a	44X54Y	eagle feathers	Complex of Propitiation of Agricultural Fertility	Hernández Sanchez 2010:260, 262
20190821_100011	EFT30a	44X54Y	Agave thorn	Complex of Death and Tezcalitpoca	Hernández Sanchez 2010:264
20190821_100025	EFT30a	44X54Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_100108	EFT30a	44X54Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_100121	EFT30a	44X54Y	Viscera	Complex of Death and Tezcatlitpoca	López 2019: 345
20190821_100152	EFT30a	44X54Y	Stellar Eyes	Complex of Smoke and Darkness	Fargher et. al. 2010:243
20190821_100211	EFT30a	44X54Y	Sphere	unknown	Fargher et. al. 2010:243
20190821_100233	EFT30a	44X54Y	volutes	Complex of Smoke and Darkness	Hernández Sanchez 2004:26
20190821_100258	EFT30a	44X54Y	Band	unknown	
20190821_100319	EFT30a	44X54Y	Aztacelli	Complex of War, Sacrifice, and Nobility	López et al. 2019:342
20190821_100347	EFT30a	44X54Y	xonecuilli	Complex of War, Sacrifice, and Nobility	López et al. 2019:342
20190821_100418	EFT30a	44X54Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265
20190821_100503	EFT30a	44X54Y	Tlillan	Tlillan Complex	
20190821_100532	EFT30a	44X54Y	Lungs	Complex of Death and Tezcalitpoca	Hernández 2010:264
20190821_100604	EFT30a	44X54Y	band	Plain/Fragment	
20190821_100632	EFT30a	44X54Y	xonecuilli	Complex of War, Sacrifice, and Nobility	López et al. 2019:342
20190821_100655	EFT30a	44X54Y	eroded	Eroded	
20190821_100719	EFT30a	44X54Y	tlipatli	Xochicuicatl-Xochilhuitl Complex	
20190821_100746	EFT30a	44X54Y	"J" - xicalcoliuhqui	Complex of War, Sacrifice, and Nobility	Hernández 2010:342
20190821_100807	EFT30a	44X54Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_100825	EFT30a	44X54Y	Band	Plain/Fragment	
20190821_100839	EFT30a	44X54Y	Band	Plain/Fragment	
20190821_102845	EFT30a	44X60Y	Band	Plain/Fragment	
20190821_102901	EFT30a	44X60Y	Band	Plain/Fragment	
20190821_102921	EFT30a	44X60Y	lungs	Complex of Death and Tezcalitpoca	López 2019:347; Hernández 2010:264

20190821_102936	EFT30a	44X60Y	Band	Unknown	
20190821_102950	EFT30a	44X60Y	Tlillan	Tlillan Complex	López 2019:259
20190821_103005	EFT30a	44X60Y	xonecuilli	Tlillan Complex	
20190821_103016	EFT30a	44X60Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_103029	EFT30a	44X60Y	Celestial Eyes	Complex of Smoke and Darkness	Fargher et al. 2010:243
20190821_103045	EFT30a	44X60Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_103059	EFT30a	44X60Y	Lungs	Complex of Death and Tezcalitpoca	López 2019:347; Hernández 2010:264
20190821_103114	EFT30a	44X60Y	xonecuilli	Machiyotl Glifo Geométrico	López 2019:348
20190821_103129	EFT30a	44X60Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_103848	EFT30a	44X52Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_103904	EFT30a	44X52Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_105550	EFT30a	44X58Y	Celestial Eyes	Complex of Smoke and Darkness	Fargher et al. 2010:243
20190821_105606	EFT30a	44X58Y	step fret	Teocuitlatl complex	López 2019:344
20190821_105638	EFT30a	44X58Y	Agave thorn	Solar Band Complex with Spine and Bone	Hernández 2010:99
20190821_105656	EFT30a	44X58Y	Band	Plain/Fragment	
20190821_105711	EFT30a	44X58Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_105725	EFT30a	44X58Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_105742	EFT30a	44X58Y	Jaguar	Complex of War, Sacrifice, and Nobility	
20190821_105816	EFT30a	44X58Y	step fret	Machiyotl Glifo Geométrico	López 2019:348
20190821_105838	EFT30a	44X58Y	eroded	Plain/Fragment	
20190821_105908	EFT30a	44X58Y	Agave thorn	Complex of Death and Tezcalitpoca	Hernández Sanchez 2010:264
20190821_105917	EFT30a	44X58Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_105941	EFT30a	44X58Y	xicalcoliuhqui	Probable solar band complex	Hernández 2010:257
20190821_105956	EFT30a	44X58Y	Greca	Tlamachli Glyph Complex	López 2019: 347
20190821_110018	EFT30a	44X58Y	Teeth	Plain/Fragment	Hernández 2005
20190821_110036	EFT30a	44X58Y	xicalcoliuhqui	Teocuitlatl complex	López 2019:344
20190821_110058	EFT30a	44X58Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_110119	EFT30a	44X58Y	eroded	eroded	
20190821_110132	EFT30a	44X58Y	xicalcoliuhqui	Teocuitlatl complex	López 2019:344

20190821_110147	EFT30a	44X58Y	eroded	Plain/Fragment	
20190821_110207	EFT30a	44X58Y	sphere	Plain/Fragment	Hernández 2010:257
20190821_110224	EFT30a	44X58Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_124755	EFT30a	44X54Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265
20190821_130618	EFT30a	38X48Y	Animated Flint	Complex of Death and Tezcalitpoca	Hernández 2010:264
20190821_141047	EFT30a	65X55Y	Band	Plain/Fragment	
20190821_132644	EFT30a	67X57Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_132706	EFT30a	67X57Y	xonecuilli	Machiyotl Glifo Geométrico	López 2019:348
20190821_132725	EFT30a	67X57Y	step fret	Teocuitlatl complex	López 2019:344
20190821_132745	EFT30a	67X57Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_132800	EFT30a	67X57Y	Celestial Eyes	Complex of Death and Tezcalitpoca	Hernández 2010:264
20190821_132814	EFT30a	67X57Y	xonecuilli	Machiyotl Glifo Geométrico	López 2019:348
20190821_132848	EFT30a	67X57Y	band	Plain/Fragment	
20190821_132848	EFT30a	67X57Y	band	Plain/Fragment	
20190821_132924	EFT30a	67X57Y	Celestial Eyes	Complex of Smoke and Darkness	Hernández Sanchez 2008:120
20190821_132945	EFT30a	67X57Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_133018	EFT30a	67X57Y	band	Eroded	
20190821_133037	EFT30a	67X57Y	Jaguar	Complex of War, Sacrifice, and Nobility	
20190821_133058	EFT30a	67X57Y	eroded	Eroded	
20190821_133122	EFT30a	67X57Y	celestial eyes	Complex of Smoke and Darkness	Fargher et al. 2010:243
20190821_133144	EFT30a	67X57Y	xonecuilli	Machiyotl Glifo Geométrico	López 2019:348
20190821_133224	EFT30a	67X57Y	Volutes	Complex of Smoke and Darkness	Hernández Sanchez 2004:26
20190821_133244	EFT30a	67X57Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344
20190821_133310	EFT30a	67X57Y	band	Eroded	
20190821_133340	EFT30a	67X57Y	Celestial Eyes	Complex of Smoke and Darkness	Hernández Sanchez 2008:120
20190821_133407	EFT30a	67X57Y	eroded	Eroded	
20190821_133427	EFT30a	67X57Y	banda de puntos	Complex of War, Sacrifice, and Nobility	
20190821_133449	EFT30a	67X57Y	celestial eyes and teeth	Complex of Death and Tezcalitpoca	Hernández Sanchez 2004:21
20190821_133557	EFT30a	67X57Y	crossed bones	Complex of Crossed Bones	Hernández 2010:265

Appendix VI Iconography in OCOT6

Photo	Site	Quad	Symbol1	Complex	Citation
20190820_104428	T6	84X17Y	Celestial eye	Complex of Smoke and Darkness	Hernández 2008:120; Fargher et al. 2010:243
20190820_104450	T6	84X17Y	band	Plain/Fragmented	
20190820_104512	T6	84X17Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_104527	T6	84X17Y	band	Plain/Fragmented	
20190820_104557	T6	84X17Y	band	Plain/Fragmented	López 2019:348
20190820_104642	T6	84X17Y	agave thorn	complex of death and tlillan	Hernández Sanchez 2010:259
20190820_104709	T6	84X17Y	band	Machiyotl Glypho Geometrico	López 2019:347
20190820_104730	T6	84X17Y	band	Plain/Fragmented	
20190820_111131	T6	88X15Y	Tlillan	Tlillan Complex	Hernández 2010:259
20190820_111209	T6	88X15Y	sphere	Plain/Fragmented	
20190820_111224	T6	88X15Y	sphere	Plain/Fragmented	
20190820_111238	T6	88X15Y	Xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:348; Hernández 2005:85
20190820_111251	T6	88X15Y	agave thorn	Solar Ray Complex	Hernández Sanchez 2005:102
20190820_111307	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_114400	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_114429	T6	88X15Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:347
20190820_114446	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_114503	T6	88X15Y	band	Plain/Fragmented	
20190820_114525	T6	88X15Y	eagle feather	Complex of Eagles	López 2019:347
20190820_114550	T6	88X15Y	eagle feather	Complex of Eagles	Hernández 2005:87
20190820_114622	T6	88X15Y	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:347
20190820_114637	T6	88X15Y	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:347
20190820_114652	T6	88X15Y	greca	Tlamatchli Glyph Complex	López 2019: 347; Heath 2013
20190820_114705	T6	88X15Y	Xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:348

20190820_114723	T6	88X15Y	Eroded	Eroded	
20190820_114742	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_114829	T6	88X15Y	eagle feather	Complex of Eagles	Hernández 2005:87
20190820_114901	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_114919	T6	88X15Y	band	Eroded	
20190820_114934	T6	88X15Y	fine textile	Complex of Fine Textiles	Hernández 2005:116; Hernández 2010:262
20190820_114954	T6	88X15Y	Disorbited Eye	Complex of Death and Tezcalitpoca	Hernández 2005:54
20190820_115015	T6	88X15Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:347
20190820_115044	T6	88X15Y	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:347
20190820_115111	T6	88X15Y	Flor - cuicailhuia	Complex Xochicuicatl-Xochilhuitl	López 2019:341
20190820_115134	T6	88X15Y	band	Plain/Fragmented	
20190820_115242	T6	88X15Y	Eroded	Eroded	
20190820_115305	T6	88X15Y	Celestial eye	Complex of Smoke and Darkness	Hernández 2008:120; Fargher et al. 2010:243
20190820_115627	T6	88X15Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_115708	T6	88X15Y	divine secretions	Teuciutlatl Complex	López 2019:349
20190820_130446	T6	80X13Y	celestial eye	Complex of Death and Tezcalitpoca	Hernández 2008:120; Fargher et al. 2010:243
20190820_130506	T6	80X13Y	band	Eroded	
20190820_130528	T6	80X13Y	teucuitlatl	Teuciutlatl Complex	López 2019:344
20190820_130548	T6	80X13Y	band	Plain/Fragmented	
20190820_130605	T6	80X13Y	precious stones	Complex Xochicuicatl-Xochilhuitl	López 2019:341
20190820_130622	T6	80X13Y	Eroded	Eroded	
20190820_130649	T6	80X13Y	Band	Unknown	
20190820_130718	T6	80X13Y	band	Plain/Fragmented	
20190820_130752	T6	80X13Y	Xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:348; Hernández 2005:85
20190820_130818	T6	80X13Y	teucuitlatl	Teuciutlatl Complex	López 2019:344
20190820_130926	T6	80X13Y	flor	Complex Xochicuicatl-Xochilhuitl	López 2019:341
20190820_131104	T6	80X13Y	band of spheres	Unknown	
20190820_131134	T6	80X13Y	band of spheres	Unknown	

20190820_131155	T6	80X13Y	sacrificial lines	Complex of Death and Tezcalitpoca	Fargher et al. 2010
20190820_131220	T6	80X13Y	flor	Complex Xochicuicatl-Xochilhuitl	López 2019:342; Hernández Sanchez 2004:77
20190820_131244	T6	80X13Y	band	Machiyotl Glypho Geometrico	López 2019:347
20190820_131314	T6	80X13Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_131335	T6	80X13Y	eagle feathers or aztaxelli	Complex of Eagles	Hernadez Sanchez 2010:263
20190820_131401	T6	80X13Y	volute	Teuciutlatl Complex	López 2019:347
20190820_131503	T6	80X13Y	sphere	Unknown	
20190820_131524	T6	80X13Y	band	Unknown	
20190820_131550	T6	80X13Y	snake (xicaliuhqui)	Teuciutlatl Complex	López 2019:344
20190820_131622	T6	80X13Y	Xonecuilli	Unknown	
20190820_131642	T6	80X13Y	greca	Tlamatchli Glyph Complex	López 2019: 347; Heath 2013
20190820_131702	T6	80X13Y	band	Unknown	
20190820_131725	T6	80X13Y	sphere with band and points	Complex of Smoke and Darkness	Hernández Sanchez 2008:121
20190820_134255	T6	89X15Y	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:348
20190820_134328	T6	89X15Y	Tlillan	Tlillan Complex	Hernández Sanchez 2010:259
20190820_134400	T6	89X15Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265
20190820_134420	T6	89X15Y	band	Machiyotl Glypho Geometrico	López 2019:347
20190820_134437	T6	89X15Y	snake (xicaliuhqui)	Machiyotl Glypho Geometrico	López 2019:348
20190820_134453	T6	89X15Y	sphere	unknown	
20190820_134510	T6	89X15Y	Celestial eye	Complex of Smoke and Darkness	Hernández 2008:120; Fargher et al. 2010:243
20190820_134544	T6	89X15Y	Tlillan	Tlillan Complex	López 2019:259
20190820_134609	T6	89X15Y	flor	Complex of White Flowers	Hernández Sanchez 2005:77
20190820_134625	T6	89X15Y	flor	Complex of White Flowers	Hernández Sanchez 2005:77
20190820_134642	T6	89X15Y	band	Unknown	
20190820_134729	T6	89X15Y	snake (xicaliuhqui)	Tlillan Complex	López 2019:259
20190820_134751	T6	89X15Y	Sphere	Unknown	
20190820_134811	T6	89X15Y	band	Unknown	

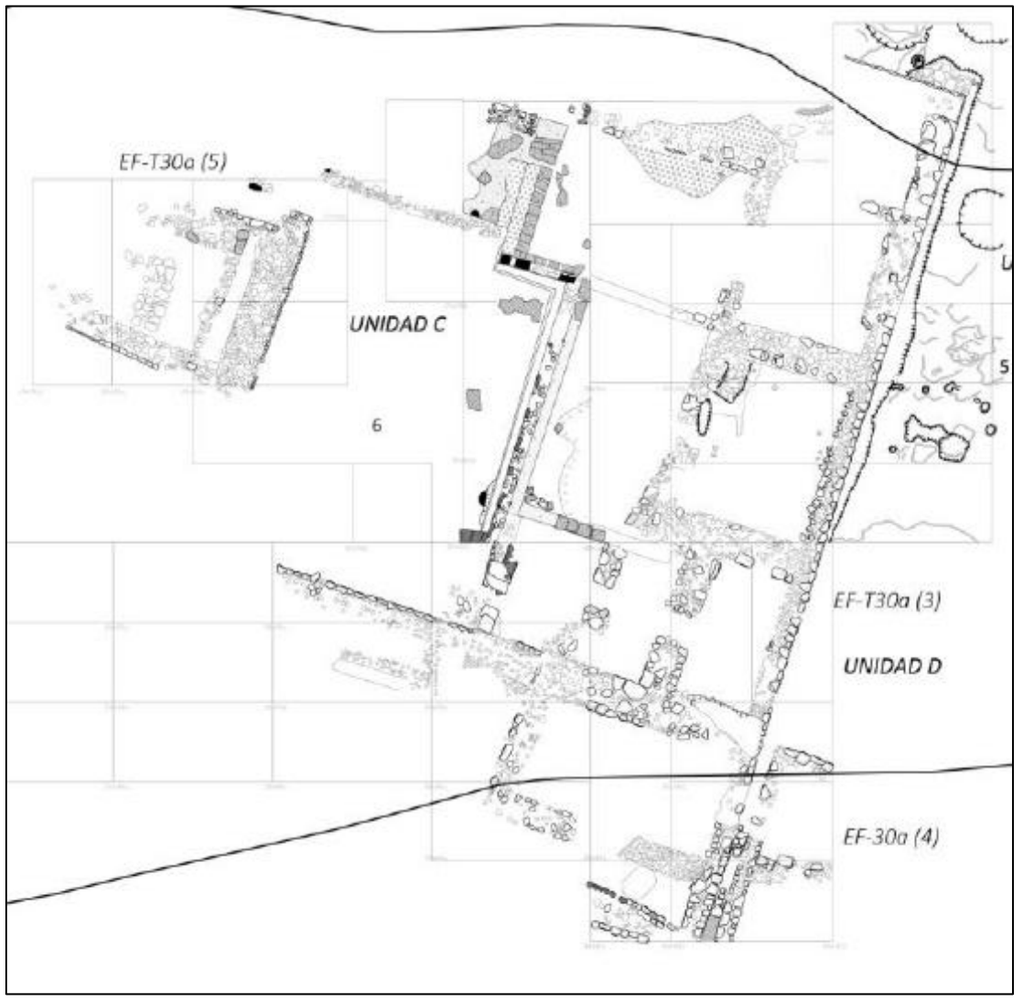
20190820_134827	T6	89X15Y	volute	Teuciutlatl Complex	López 2019:344
20190820_134846	T6	89X15Y	Dried Earth	Complex of Propitiation of Agricultural Fertility	Hernández Sanchez:263
20190820_134905	T6	89X15Y	Quadripartite Element	Complex of Fine Textiles	Hernández 2005:116
20190820_134944	T6	89X15Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265
20190820_134958	T6	89X15Y	Viento	Tlamatchli Glyph Complex	López 2019:347

Appendix VII Iconography in QUIT36

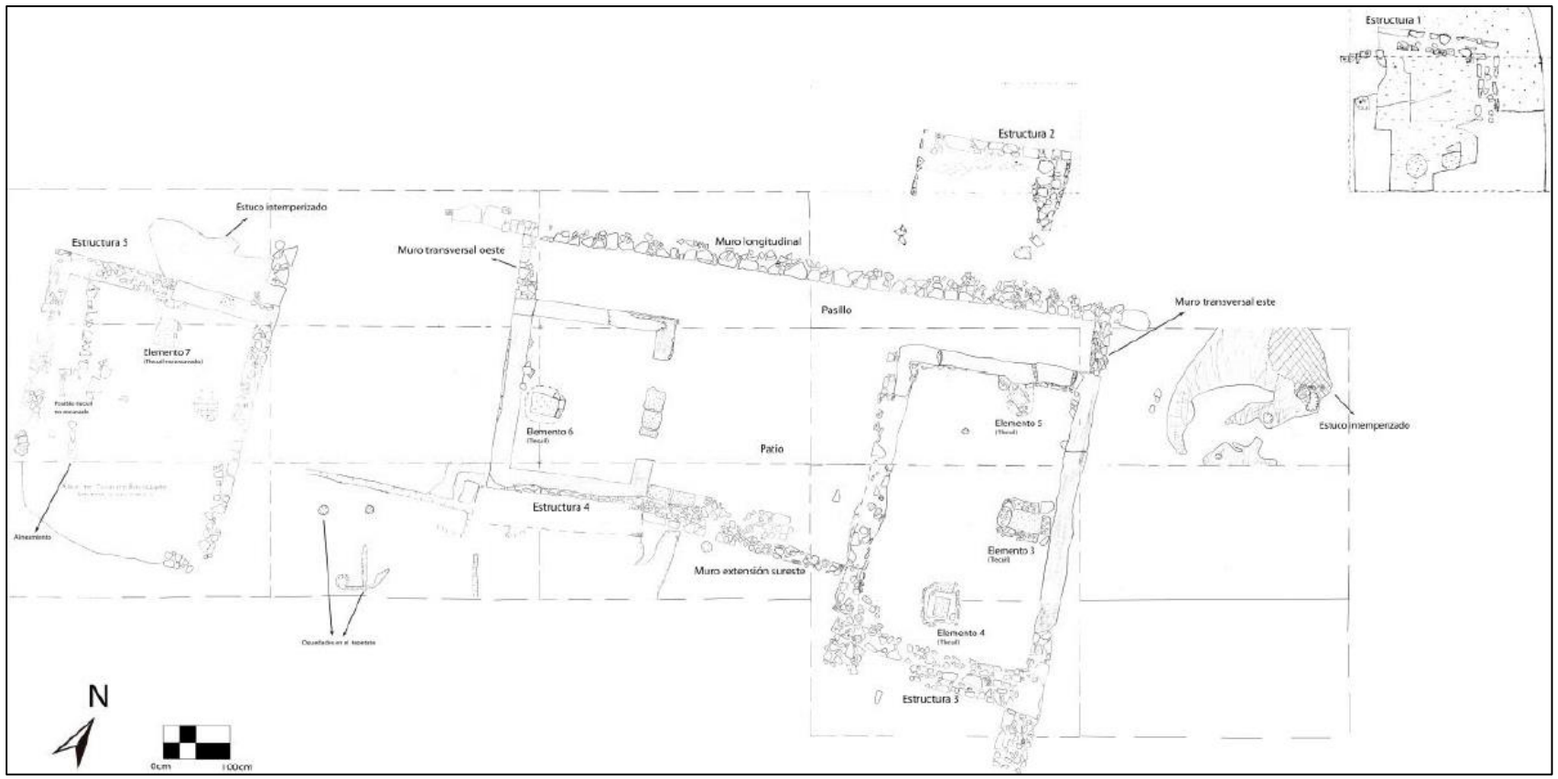
Photo	Site	Quad	Symbol1	Complex	Citation	Date
20190819_132327	T36	6X12Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_132354	T36	6X12Y	xicalcoliuhqui	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_133207	T36	6X12Y	xicalcoliuhqui	Teocuitlatl Complex	López 2019:342; Heath 2013:41	03/24/2023
20190819_133225	T36	6X12Y	agave thorn	Solar Band, probable elite personalization	Hernández 2010:257	03/24/2023
20190819_133307	T36	6X12Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_133329	T36	6X12Y	band	Plain/Fragment		03/24/2023
20190819_133413	T36	6X12Y	band	Plain/Fragment		03/24/2023
20190819_134156	T36	6X20Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344	03/24/2023
20190819_134225	T36	6X20Y	band	Plain/Fragment		03/24/2023
20190819_134245	T36	6X20Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265	03/24/2023
20190819_134301	T36	6X20Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_134317	T36	6X20Y	unknown	Eroded		03/24/2023
20190819_134335	T36	6X12Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_134357	T36	6X20Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265	03/24/2023
20190819_134420	T36	6X20Y	band	Plain/Fragment		03/24/2023
20190819_134436	T36	6X20Y	band	Plain/Fragment		03/24/2023
20190819_134454	T36	6X20Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_134509	T36	6X20Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344	03/24/2023
20190819_134524	T36	6X20Y	Celestial Eye	Complex of Smoke and Darkness	Fargher et al. 2010:243	03/24/2023
20190819_134651	T36	6X20Y	Celestial Eye	Complex of Smoke and Darkness	Fargher et al. 2010:243	03/24/2023
20190819_134721	T36	6X20Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_134801	T36	6X20Y	Aztacelli	Complex of War, Sacrifice, and Nobility	López et al. 2019:342	03/24/2023
20190819_134834	T36	6X20Y	Greca	Tlamachli Glyph Complex	López 2019: 347; Heath 2013	03/24/2023
20190819_110505	T36	6X8Y	agave thorn	Solar Band, probable elite personalization	Hernández 2010:257	03/24/2023
20190819_110553	T36	6X8Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_110620	T36	6X8Y	band	Plain/Fragment		03/24/2023

20190819_110652	T36	6X8Y	Jaguar	Complex of War, Sacrifice, and Nobility	López 2019:342	03/24/2023
20190819_111829	T36	6X8Y	band	Plain/Fragment		03/24/2023
20190819_112925	T36	6X8Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_113002	T36	6X8Y	band	Plain/Fragment		03/24/2023
20190819_113339	T36	6X8Y	Eroded	Eroded		03/24/2023
20190819_114221	T36	6X20Y	xicalcoliuhqui	Solar Band, probable elite personalization	Hernández 2005:99; Hernández 2005:124; Hernández 2005:85	03/24/2023
20190819_114136	T36	6X8Y	Xonecuilli	Machiyotl Glypho Geometrico	López 2019:348	03/24/2023
20190819_114159	T36	6X20Y	Shield and Banner	Complex of Propitation of Agricultural Fertility	Hernández Sanchet 2010:260, 262	03/24/2023
20190819_114121	T36	6X20Y	agave thorn	Solar Band, probable elite personalization	Hernández 2010:257	03/24/2023
20190819_114246	T36	6X20Y	snake (xicaliuhqui)	Teocuitlatl complex	López 2019:344	03/24/2023
20190819_114302	T36	6X20Y	Eroded	Plain/Fragment		03/24/2023
20190819_124808	T36	6X20Y	Eroded	Eroded		03/24/2023
20190819_124830	T36	6X20Y	Greca	Eroded	López 2019: 347	03/24/2023
20190819_124914	T36	6X20Y	Aztacelli	Complex of War, Sacrifice, and Nobility	López et al. 2019:342	03/24/2023
20190819_124937	T36	6X20Y	Crossed Bones	Complex of Crossed Bones	Hernández 2010:265	03/24/2023

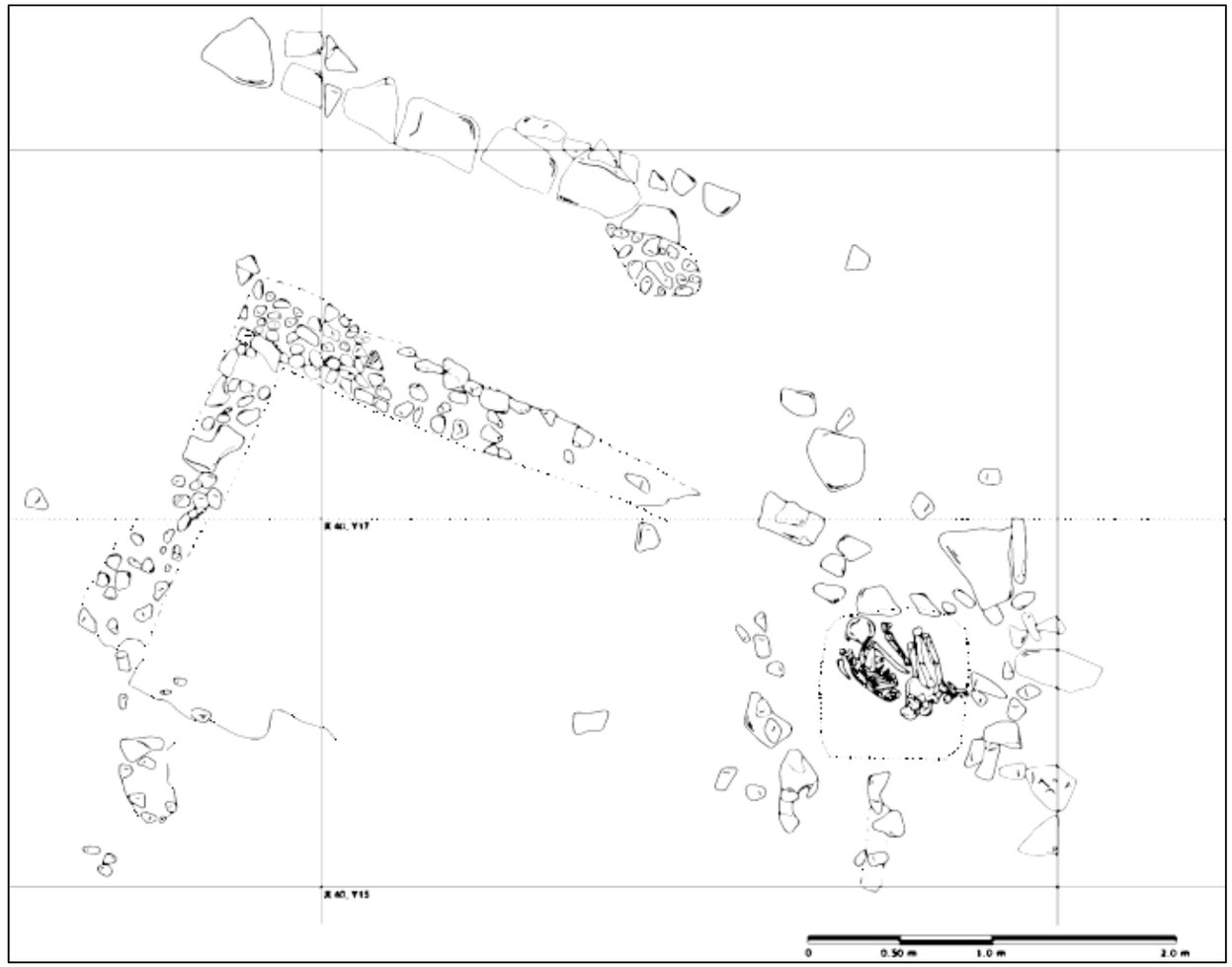
Appendix VIII Plan Drawings of Structures Discussed



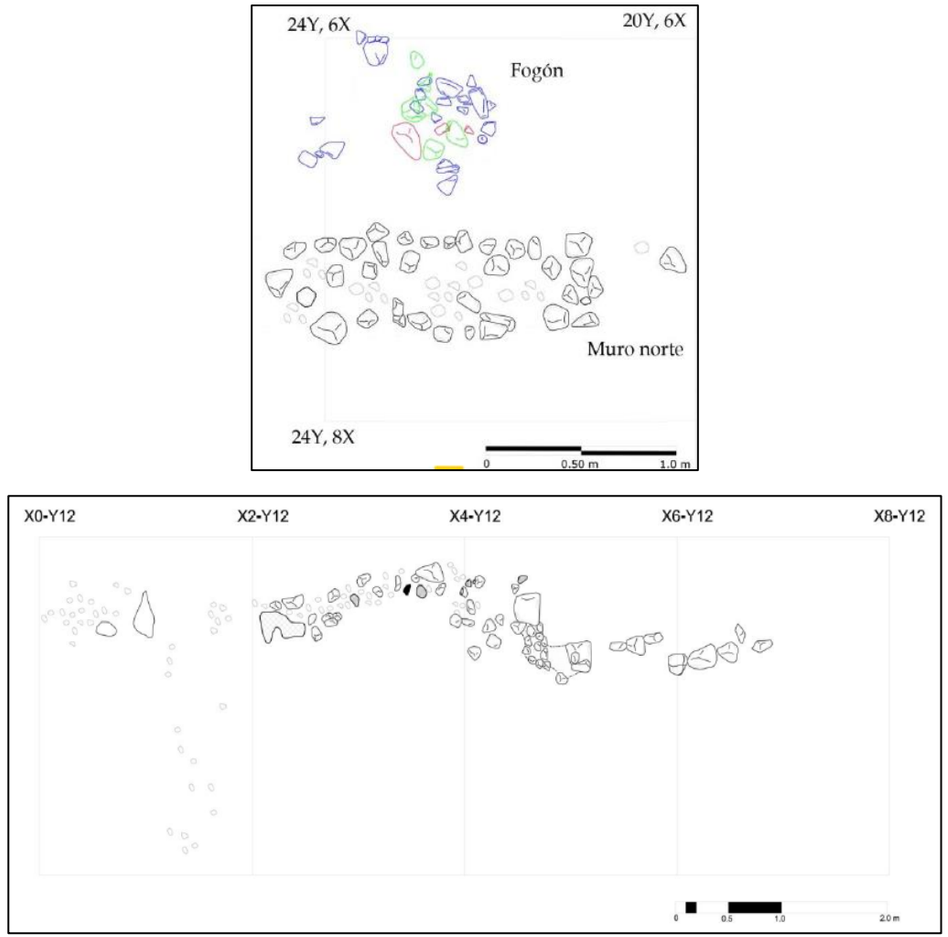
Tepeticpac-El Fuerte Structure T30. Fargher 2015:85, Appendix 2. Note each Quadrangle is 5m by 2m.



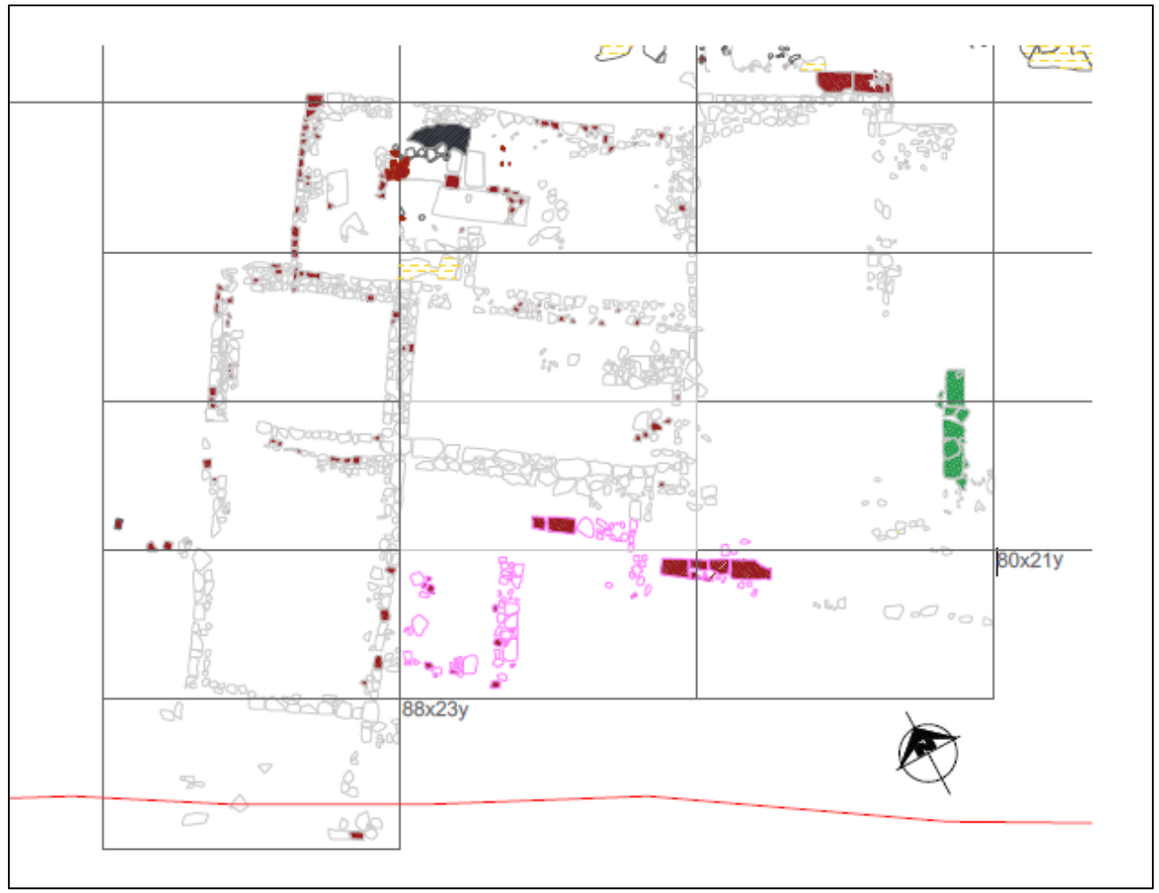
Tepeticpac-El Fuerte Structure T4. Fargher 2017:64, Figure 11. Note each Quadrangle is 5m by 2m.



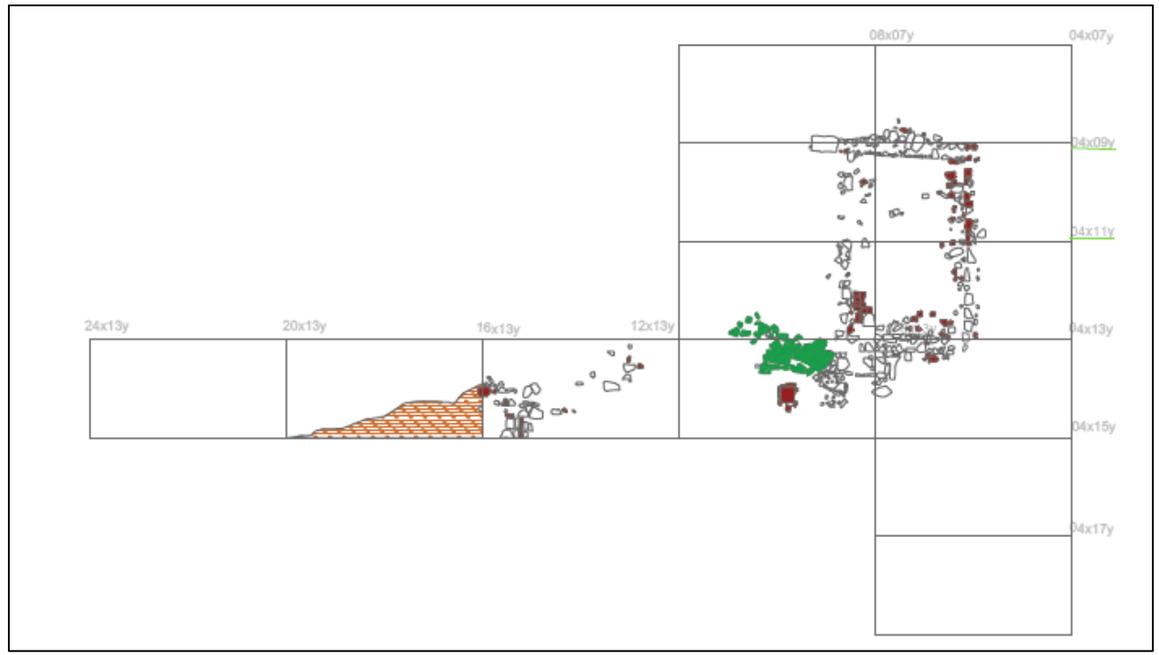
Tepeticpac-El Fuerte Structure T12. Fargher 2018:69. Note each Quadrangle is 5m by 2m.



Quiahuixtlan Public Structure North Wall (Top) and East Wall (Bottom). Fargher 2016



Ocotelulco Acxotla Structure T6-1: Fargher 2016:63, Figure 25. Note each Quadrangle is 5m by 2m.



Ocotelulco-Acxotla Structure T6-2. Fargher 2016:67, Figure 26. Note each Quadrangle is 5m by 2m.

Ocotelulco-Acxotla Structure T6-3. Fargher 2016:70, Figure 27. Note each Quadrangle is 5m by 2m.