Latin American Antiquity (2023), **34**, 723–741
doi:10.1017/laq.2022.79

ARTICLE

Economic Integration and Obsidian Consumption in the Late Postclassic Period K'iche' Region

Rachel A. Horowitz

Department of Anthropology, Washington State University, Pullman, WA, USA
Corresponding author: E-mail: Rachel.horowitz@wsu.edu

(Received 4 May 2022; revised 23 August 2022; accepted 20 September 2022)

Abstract
Although much research has been conducted on the Late Postclassic period Maya, there has been relatively less study of the role of economic activities in political management during this period. Many such studies focused on obsidian analysis and technology as proxies for trade and exchange. This article builds on that research, using a legacy collection of obsidian implements collected during archaeological surveys in the 1970s to examine Late Postclassic period (AD 1200–1524) economic networks in the K'iche' region. Obsidian collections from the site of Q'umarkaj and the surrounding region were examined through technological and geochemical analyses. I find that during the Late Postclassic period, K'iche' elites had more access to nonlocal obsidian sources than did non-elites, but that access to locally available sources was managed through independent and diverse acquisition networks. Thus, the K'iche' elite were not dependent on local economies as a main source of political power.

Resumen
Si bien se han realizado muchas investigaciones sobre el período posclásico tardío maya, se ha estudiado relativamente menos el papel de las actividades económicas en la gestión política durante este período. Muchos de estos estudios se han centrado en el análisis de la obsidiana y la tecnología como indicadores del comercio y el intercambio. Este trabajo se basa en dicha investigación, utilizando una colección de implementos de obsidiana recolectados durante estudios arqueológicos en la década de 1970 para examinar las redes económicas del período posclásico tardío (1200–1524 dC) en la región de K'iche'. Las colecciones de obsidiana del sitio de Q'umarkaj y de la región circundante fueron examinadas mediante análisis tecnológicos y geoquímicos. Este trabajo concluye que, durante el posclásico tardío, las élites K'iche' tenían más acceso a las fuentes de obsidiana no locales que las no élites, pero que el acceso a las fuentes disponibles localmente se gestionaba a través de redes de adquisición independientes y diversas. Así, la élite K'iche' no dependía de las economías locales como fuente principal de poder político.

Keywords: K'iche' Maya; Late Postclassic period; Mesoamerica; lithic technology; obsidian sourcing

Palabras clave: K'iche' Maya; periodo posclásico tardío; Mesoamérica; lítica; obsidiana

The Late Postclassic period (AD 1200–1524; Borgstede and Robinson 2012) in the Maya Highlands has been the source of much discussion about the role of elite actors in political organization, particularly as models of political organization for the Classic period Maya (Fox 1987; Fox and Cook 1996; but see Braswell 2001a, 2001b, 2003a). Much of the information for these models stems from ethnohistoric documents (Carmack and Weeks 1981; Fox 1978, 1989, 1996; Hill and Monaghan 1987; Wallace and Carmack 1977) because the Highlands, particularly the K'iche' region, are the source of many well-known ethnohistoric and precontact Indigenous documents (Akkeren 2000; Carmack and Weeks 1981; Matsumoto 2017; Wallace and Carmack 1977). Although ethnohistoric documents provide information on political organization, they are largely devoid of information

on economic organization. The role of political elites in economic organization provides a window into understanding political management, given that economies are sometimes used as sources of political power (see Mann 2005; Schroeder 2005; Yoffee 2005). This article addresses obsidian economies among the Late Postclassic period K'iche'; the management of obsidian exchange provides evidence about the role of K'iche' elites in economic activities and the degree of economic centralization among the K'iche'.

Examining the lithic economy, particularly obsidian production and distribution, enables an understanding of the role of elites in the distribution and consumption of utilitarian implements. Examinations of lithic production and exchange throughout the K'iche' region can also shed light on the territorial integration of areas that were conquered and ruled by the K'iche' elites. The independence or dependence of obsidian acquisition networks illustrates the level of elite involvement in obsidian exchange networks. Management of obsidian resources is often discussed as a source of power for Maya rulers (e.g., Aoyama 1999; Braswell 2010; Braswell and Glascock 2002), but the management of such trade must be evaluated.

This article examines obsidian from the K'iche' capital of Q'umarkaj[1] and the surrounding region using technological and sourcing studies to examine the organization of the Late Postclassic period K'iche' lithic economy (Figure 1). Although there is recent research on the Late Postclassic period in the Maya Highlands (e.g., Castillo Aguilar 2020; Cojti Ren 2012, 2020; Macario Calgua 2006, 2007, 2012), this article draws from a legacy collection obtained during the 1970s, highlighting the utility of revisiting data from earlier excavations (e.g., Babcock 2012; Nance et al. 2003). I find that, during the Late Postclassic period, access to nearby obsidian sources was managed through independent and diverse acquisition networks, indicating that the exchange of local obsidian was not a source of political power for K'iche' elites.

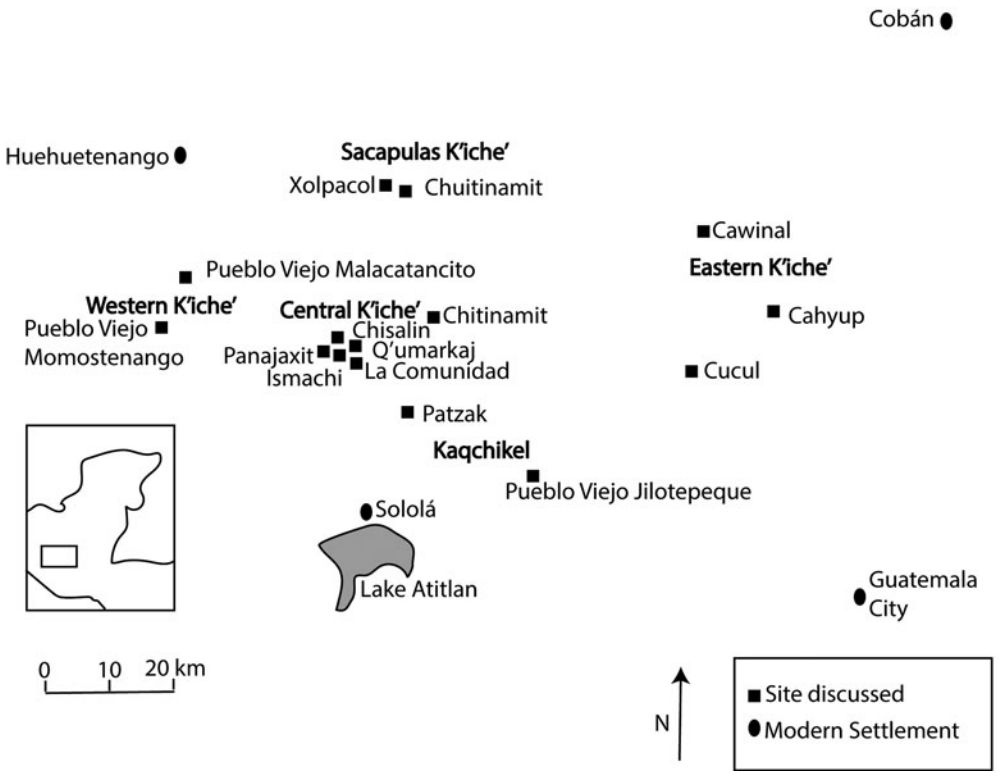

Figure 1. Map of sites discussed in text (map by Rachel Horowitz modified from Fox [1978:Map 1] and Carmack [1981:Figure 1.1]).

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

K'iche' and Late Postclassic Period Economies

Although the origins of the K'iche' are still debated (e.g., Akkeren 2000; Babcock 2012; Borgstede and Robinson 2012; Braswell 2001b; Carmack 1981; Cojti Ren 2020; Fox 1987, 1989; Wauchope 1947), scholars generally agree that Q'umarkaj was founded as the Late Postclassic period K'iche' capital around AD 1200 (Borgstede and Robinson 2012; Macario Calgua 2012). K'iche' political organization is known from ethnohistoric documents that discuss elite lords as centralized political leaders based at Q'umarkaj. The leaders came from key family lineages and political power passed through these lineages (Carmack 1981; but see Braswell 2001b). Lineage power was both political and territorial (Hill and Monaghan 1987).

Q'umarkaj's layout reflects the importance of lineage groups. The site consists of 70–80 structures (Carmack 1981; Macario Calgua 2012; Wallace 1977), including pyramidal, range, and multichambered residential structures grouped around plazas (Carmack 1981; Wallace 1977). The similar architectural layouts suggest repetitive functions and the occupation of the plaza groups by different lineages; this pattern is also seen elsewhere in the K'iche' region (e.g., Annereau-Fulbert 2012).

Outside Q'umarkaj, the K'iche' elite managed a large multiethnic territory, much of which was acquired through conquest. The centralization of territorial management has long been a subject of debate, including identifying archaeological correlates for K'iche' influence, the degree of territorial control over the region, and the role of the K'iche' in settlement shifts from the Classic to the Postclassic periods (Arnauld 1993; Borgstede and Robinson 2012; Braswell 2003a; Carmack 1981; Ichon 1993). In other words, scholars disagree whether K'iche' elites directly managed outlying areas or had indirect control over the region (see Hill 1996). Obsidian distribution in these territories can shed light on how economies functioned in areas under K'iche' control.

Obsidian Sourcing

In Mesoamerica, many economic studies rely on obsidian sourcing. Such studies for the Late Postclassic period indicate an economic system based on competitive market exchange (Smith and Berdan 2003:7), suggesting that market exchange was the main mechanism for the distribution of goods in the K'iche' region (e.g., Berdan 2003; Berdan et al. 2003; Masson 2002; McKillop 2005; Smith 2003; Smith and Berdan 2003). This article defines market exchange following Garraty (2010:5–6) as transactions where supply and demand are important but are influenced by social mechanisms. Braswell's (2003b) analysis of obsidian exchange in Mesoamerica illustrated that in the Late Postclassic period the Maya Highlands acquired limited obsidian from long-distance trade and were reliant on local sources. Braswell proposed that there was not direct management of obsidian sources. A full discussion of temporal shifts in obsidian distribution is outside the scope of this article (for a summary, see Braswell 2003b), but the distribution of obsidian sources during the Late Postclassic period is discussed in a later section.

Previous studies of obsidian sourcing within the K'iche' and neighboring Kaqchikel regions indicate that sources from the Guatemalan Highlands were most common: they included San Martin Jilotepeque, the closest source to Q'umarkaj and the K'iche' region, located approximately 50 km away (to the east); El Chayal (90 km to the southwest); and Ixtepeque (130 km to the southeast). Other local sources include San Bartolome Milpas Altas. The most common nonlocal source in the K'iche' region is Pachuca, located in modern-day central Mexico (Figure 2).

Braswell (1996) and colleagues (Braswell and Robinson 1992; Robinson 1998) found that, in the Kaqchikel region, most obsidian was from San Martin Jilotepeque, but that there were several acquisition networks, with variable quantities of San Martin Jilotepeque and El Chayal and small amounts of Ixtepeque, San Bartolome Milpas Altas, and Pachuca at different sites (Figure 1). In the K'iche' region, Norris (2001) and Macario Calgua (2006, 2012) identified similar trends, with most obsidian coming from San Martin Jilotepeque and some from El Chayal and Ixtepeque.

In regions neighboring the K'iche area, including the Pacific Coast and Highland Chiapas, similar trends were identified, with most obsidian from San Martin Jilotepeque, followed by El Chayal (Blake 2010; Chinchilla Mazariegos 2020; Clark 2020; Clark and Lee 2007; Hayden 2020;

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

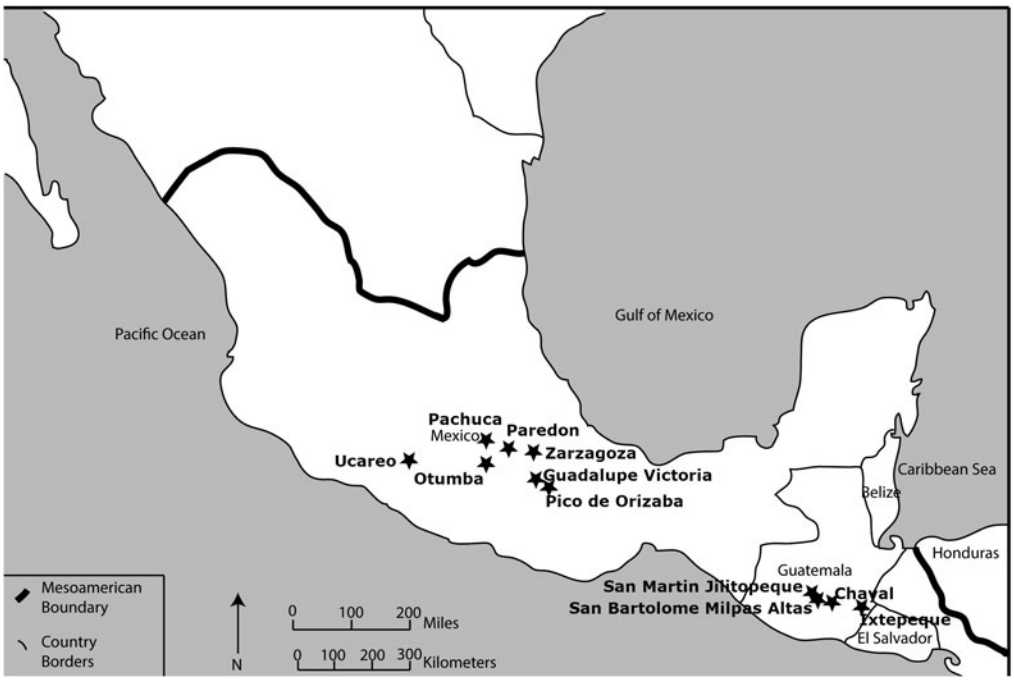

Figure 2. Map of obsidian sources discussed in text (map by Rachel Horowitz).

Johnston 2002; Popenoe de Hatch and Scheiber de Lavarreda 2001). The presence of San Martin Jilotepeque in these regions points to exchange networks integrating the K'iche' with the Pacific Coast and Highland Chiapas.

Although several previous studies have sourced materials from the K'iche' region, geochemical sourcing technology has advanced since the early 1990s and has been shown to be more accurate than visual sourcing. Thus, this study provides a comparison to the materials sourced previously to provide updated and additional data for Late Postclassic K'iche' obsidian consumption.

Technological Studies

Although the studies already discussed highlight the importance of obsidian in understanding the economic and political organization in the region, they draw mostly from resource acquisition, as discussed via sourcing. Technological analyses, in contrast, provide details about obsidian procurement, production, and distribution. To examine local obsidian exchange and consumption patterns, production techniques must also be analyzed (e.g., Braswell 1996), because sourcing alone does not provide data on production organization. Furthermore, previous studies of obsidian production point to the specialized production of obsidian blades (see Hirth 2008); thus, the distribution of materials indicative of different parts of the production process sheds light on production and distribution activities.

In overviews of the K'iche' region, obsidian is discussed when it is present, but mostly as the presence of specific tool types (e.g., Fox 1975; Guillemin 1977; Kidder 1975; Weeks 1983). There was some earlier discussion of potential production areas (Fox 1975, 1978) based on the quantities of obsidian observed, but no detailed analyses were performed. Additional information on the production stage and the regional distribution of items in different stages of production can shed light on obsidian access, which relates to differences in management and acquisition strategies. For example, at the San Martin Jilotepeque source, production included preforms, macrocores, and polyhedral cores, which Braswell (1996:647) interpreted as independent production, with some materials produced in the quarry, whereas others were removed for further reduction. Workshop areas located at a distance

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

from quarries also illustrated a combination of reduction activities, with evidence of blade and biface production (Braswell 1996:684–686), and they operated independently from elite centers.

Similar research in other areas of Mesoamerica demonstrated the exchange of cores and blades between sites, such as studies of the differences in production techniques at the Ucareo source and Tula (Healan 1997, 2002, 2003). Furthermore, some locations have variable blade production techniques; thus, study of the technological nature of the assemblage could provide information on exchange (e.g., De León et al. 2009; Healan 2002, 2003; Hirth 2002, 2003, 2008; Hirth and Flenniken 2002; Hirth et al. 2003; Pastrana 2002). The presence of different types of production debris and various parts of blades can shed light on the form in which obsidian was acquired (e.g., as cores or blades) and on whether it was acquired directly from the source or through trade (De León et al. 2009; Hirth 2008).

Obsidian Sample and Its Limitations

One of the most-studied parts of the K'iche' area is Q'umarkaj, the capital city, and the surrounding region (Figure 1). This article examines obsidian ($n = 2{,}286$) collected from settlement surveys and excavations at Q'umarkaj and the K'iche' region conducted between 1971 and 1974 as part of the University of Albany project (e.g., Babcock 2012; Fox 1975, 1978; Wallace and Carmack 1977; see Table 1 and Supplemental Table 1). The collections are housed at the Middle American Research Institute at Tulane University. The assemblages discussed are only from sites studied by the University of Albany Project, which represent a sample of K'iche' and Kaqchikel sites.

Before discussing the samples in more detail, some caveats must be made about the collection methods. Most of the materials were obtained through surface collections. The exact collection methods are unclear, and materials are only labeled to the site level. Because of the collection methods, larger objects, including formal tools, were more likely to be collected than smaller items, such as pressure

Table 1. Counts of Materials from Q'umarkaj.

Material	Count
Blade	1,427 (90.2%)
Whole	11
Proximal	468
Distal	150
Medial	798
Debitage	124 (7.8%)
Whole flake	49
Broken flake	2
Flake fragment	35
Shatter	37
Biface	6 (0.4%)
Core	12 (0.8%)
Retouched flake	2 (0.1%)
Drill	3 (0.2%)
Notched	2 (0.1%)
Eccentric	1 (0.1%)
Point tip	1 (0.1%)
Point base	4 (0.3%)
Total	1,582

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

flakes. Thus, later stages of production are probably underrepresented. Such limitations are common in heritage collections (see Nance et al. 2003). Because most of the materials in the assemblage are related to blade production, very small objects like pressure flakes were probably not that common. Thus, the assemblage provides an overview of the obsidian production that focused mostly on blade production.

Given that all materials were collected through similar means, we can assume that any limitations in the data for one site are shared among sites. For example, if only larger objects were collected, than we would assume this was the case at all sites. Thus, intra-assemblage comparisons are feasible. More consideration would be necessary if comparisons were made to other assemblages. Additionally, I combined sites into regions to alleviate issues of sample size and collection bias, thereby allowing interpretations that would not be possible on a site level. Regional comparisons help alleviate any variation within the collection process between individual sites.

The regional survey assemblage consists of obsidian ($n = 704$) from 50 sites (Figure 1; Supplemental Table 1). The survey material was divided into broad regional divisions following those used by Fox (1975, 1978). Fox explored these areas based on ethnohistoric evidence and the current people residing in these regions. Here the regions used by Fox are used as directional indicators. For instance, the Kaqchikel collections are from south of the central K'iche region, whereas the eastern K'iche' materials are from the east of that area. The materials include samples from the Central K'iche' region (around Q'umarkaj; $n = 277$), the eastern K'iche' ($n = 36$), the western K'iche' ($n = 251$), Sacapulas K'iche' ($n = 24$), and the Kaqchikel ($n = 116$) regions.

The regional assemblage dates to the Late Postclassic period based on chronological attributions performed in the 1970s through the dating of ceramics from surface collections (Babcock 2012; Fox 1978; Wauchope 1970). It is possible that some of these sites are multicomponent sites that were occupied during various time periods. However, given that the assemblages stem from surface collections, they were most likely from the latest occupation of these sites, the Late Postclassic period.

The Q'umarkaj assemblage ($n = 1{,}582$) resulted from excavations and surface survey (Carmack 1981) and represent only a fraction of the materials from the site (the location of the remaining excavated material is unknown). The contextual information identified some samples from residential and ritual spaces, whereas others could not be identified to specific areas of the site. Thus, these data are discussed at the site level, following the approach of Nance and colleagues (2003). All samples represent the Late Postclassic period because excavations at Q'umarkaj indicate the site was occupied only during this period (Babcock 2012; Macario Calgua 2006, 2007, 2012; Macario Calgua et al. 2007; Putzeys et al 2008; Wauchope 1970).

The mixture of contexts from the site core presents some issues for comparisons with the regional survey data because they may combine quotidian and ritual contexts. As is discussed later, from examinations of the technological aspects of the Q'umarkaj assemblage, such as ratios of blade segments, the materials from Q'umarkaj (Table 1) are comparable with quotidian assemblages from other contexts.

Although other types of analyses, such as normalization of lithic quantities by counts of ceramic sherds or other materials or use of the distributional approach (Hirth 1998), would be useful, the data to perform such analyses are not present. The ceramics that are present from these collections/excavations have not been reanalyzed since the 1970s. Despite the limitations in both the regional and site core data, the technological and sourcing analysis of the materials provides an opportunity to expand the analysis of obsidian economies among the Late Postclassic period K'iche'.

Methods

The obsidian sample was analyzed using a detailed attribute analysis following standard conventions of lithic analysis (Andrefsky 2006; Whittaker 1994), as well as attributes of prismatic blade production, including size, form, production stage, and mechanism (see Hirth 2006; Hirth and Andrews 2002; Hirth and Flenniken 2002). The technological analysis allows a discussion of production processes and comparisons of the form and size among sites. Not all attribute data are presented here but will be presented in future publications.

One aspect of the attribute analysis included the identification of production stage and reduction mechanism following standard discussions of the blade-core reduction sequence (Clark and Bryant

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

1997; Hirth and Andrews 2002). Blade production focuses on the production of flakes, which are at least twice as long as they are wide with roughly parallel edges, otherwise known as blades. The products of blade production change from earlier to later in the manufacturing process, becoming more regular in shape and consistent in size from early- to final-series blades (see Hirth and Andrews 2002:Figure 1.2). The presence of different stages of blade manufacture is an indicator of the degree of core preparation and reduction completed before their manufacture, with final-series blades being the last products produced from the core. In addition to production stage, the quantity of different segments of final-series blades (medial, distal, proximal) can also be used to identify local blade production versus acquisition of blades produced elsewhere (De León et al. 2009). A discussion of the ratios of these blade segments provides evidence for the types of materials acquired throughout the K'iche' region.

Another aspect of the analysis was the use of the cutting edge to mass ratio (Sheets and Muto 1972), which is calculated by multiplying the length of blades by two and dividing by weight. Sheets and Muto (1972) developed the ratio from experimental blade reduction that they used to suggest the maximum possible cutting edge for the mass of different-sized cores. They suggest that the ratio should decrease the farther from the source, because of the difficulty in accessing raw material. This ratio will be compared between sites when possible. Not all sites/areas had blade assemblages large enough to make calculating the ratio a useful metric; therefore, I did not use any statistical comparisons. A few concerns about this metric should be noted. First, although the collection of these materials might be problematic for a metric that uses size, as noted earlier, larger objects are more likely to be collected. However, as noted later, the ratio is lower than would be expected for sites near source areas, suggesting that any size preferences in collecting did not skew the ratios; if larger materials were preferentially collected, that would suggest that the ratios should be lower than they are now. Finally, Braswell and Robinson (1992:274) suggest that the cutting edge to mass ratio is not as sensitive when raw material sources are relatively close to a site. Although this may be the case, we can use the ratio to examine its potential use in this region and discuss whether conservative uses of raw material did occur near source areas.

pXRF sourcing was conducted with a Bruker Tracer 5 g using the Missouri Research Reactor/Bruker calibration (Glascock 2020; Glascock and Ferguson 2012). The calibration used the values from Glascock (2020; see also Martindale Johnson et al. [2021] for a discussion of the validity of these calibration samples). Each sample was run for 120 s. Source samples from known Mesoamerican samples were processed using the same instrument, under the same conditions. These samples were borrowed from the Missouri Research Reactor, which maintains a collection of known obsidian sources from the region. Sources compared to the archaeological collection included El Chayal, Ixtepeque, San Martin Jilotepeque, and San Bartolome Milpas Altas, from the Maya Highlands, and Guadalupe Victoria, Laguna Ayarza, Otumba, Pachuca, Paredon, Pico de Orizaba, Ucareo, Zinapecuaro, and Zaragoza from central Mexico (Figure 2). Elemental analysis was compared between the archaeological and source samples to determine source attributions.

Results

Here I discuss the materials divided into those regions used by Fox (1975, 1978). This allows comparisons between the areas closer to Q'umarkaj and those that are farther away.

Q'umarkaj

The lithic assemblage consists of obsidian materials from across the site ($n = 1{,}582$), the majority of which resulted from blade production (Table 1; Figure 3). In terms of tool debris, the presence of bifaces and projectile points made on blades points to the use of these tools as projectiles for hunting or warfare. Other tools represent a variety of activities, as seen from the presence of drills and a notch (Table 1).

In terms of production activities, there is relatively little evidence of flake production, with the majority representing blade production. The flakes that were present show evidence of predominantly hard hammer percussion ($n = 76$; 61.3%), with little evidence of thinning ($n = 1$; 0.8%) or pressure flaking ($n = 6$; 4.8%).

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Figure 3. Representative lithics from Q'umarkaj; A. blade segments; B. blade cores; and C. bifaces (photographs by Rachel Horowitz). (Color online)

Blades and blade-related production debris make up most of the assemblage. All cores were blade cores in various stages of reduction (see Table 1; Figure 3). These included broken core segments that were exhausted or suffered from production errors. Rejuvenation flakes ($n = 38$) and blades ($n = 6$) illustrate that blade production occurred. The rejuvenation blades are overshot blades to rejuvenate small cores, whereas the flakes are mostly for error correction to remove hinge or step fractures. Lastly, most of the blades recovered were final-series blades ($n = 1{,}362$; 95%), but there were some early-stage blades ($n = 59$; 4%), illustrating that although all blade cores recovered were exhausted, some cores were brought into the site partially prepared.

The final-series blades show evidence of use. Most blades were medial segments ($n = 798$; 55.9%), typical of materials used in component tools. Furthermore, some blades show evidence of retouch ($n = 309$; 26%).[2] The cutting edge to weight ratio (Sheets and Muto 1972) of the blades was calculated as 35.2 mm/g or 3.52 cm/g ($[33{,}088 \times 2]/1{,}877.5$). This ratio suggests a conservative use of obsidian, the potential reasons for which are discussed later.

The production of blades from prepared cores indicates that Q'umarkaj residents obtained obsidian mainly in core form that was reduced at the site. This conclusion is supported by the ratio of proximal to distal (3.1:1) and medial to distal (5.3:1) blade segments. Although these ratios are higher than those De León and colleagues (2009) suggest for local production (1:1, 2:3:1, respectively), they are much lower than those suggested for segmented production (6:1, 6:1). The presence of production debris, such as early-stage blades, supports local blade production.

Some non-blade core production also occurred, and residents used a variety of tools produced on flakes and blades. The assemblage indicates that residents had ample access to obsidian. Analyses of the geochemical sourcing of these materials and comparisons with the region around Q'umarkaj can provide further insight into obsidian acquisition networks.

Sourcing Analysis. A 10% sample of the assemblage was sourced using the pXRF ($n = 174$). The geochemical analysis finds that most of the materials were from San Martin Jilotepeque, with others from El Chayal, San Bartolome Milpas Altas, and Ixtepeque (see Table 3 and Supplemental Table 2). The sourcing also identified a single blade fragment from Pachuca, indicating that some obsidian was obtained through long-distance trade. The presence of Pachuca obsidian

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

confirms Braswell's (2003b) discussion of it as the most common nonlocal obsidian in the Highlands during this period.

In terms of the types of implements produced from different sources, there is some variety between sources, but each were used for similar types of materials. Braswell and Robinson (1992) found that El Chayal was overrepresented in blades. In this sample, about 23% of the blades were El Chayal, very close to the overall percentage of materials assigned to El Chayal (24%). Interestingly, both Ixtepeque and San Bartolome Milpas Altas are found only as blades, indicating these obsidians were probably brought into the region in this form.

Both El Chayal and San Martin Jilotepeque are represented by a variety of technologies. Whereas the El Chayal assemblage is related mostly to blade production, including cores, early-stage blades, and blade-core rejuvenation flakes, there were also a few flakes. Similarly, the San Martin Jilotepeque assemblage was mostly made up of blades and blade-related materials but showed some evidence of flake production, as well as a single biface. Thus, both San Martin Jilotepeque and El Chayal entered the site mostly in the form of early-stage blade cores. However, in both cases, other types of reduction occurred, suggesting residents of the site had access to non-blade cores.

In comparisons with previous geochemical studies, the Q'umarkaj assemblage is consistent in terms of the sources identified, with San Martin Jilotepeque as the most prominent, followed by El Chayal, and a small number of materials from other sources. Comparisons across the K'iche' region can begin to look for regional patterns in obsidian distribution.

Central K'iche'

The central K'iche' assemblage ($n = 267$; Table 2; Figure 4) includes larger collections from La Comunidad ($n = 76$) and Chitinamit ($n = 57$), as well as smaller collections from nine additional sites ($n = 134$; Supplemental Table 1). The larger assemblages are discussed separately and then combined for a regional discussion.

Table 2. Counts of Materials from the K'iche' Region.

Material	Central K'iche' Count (percent)	Western K'iche' Count (percent)	Eastern K'iche' Count (percent)	Sacapulas K'iche' Count (percent)	Kaqchikel Count (percent)
Debitage	89 (33.3)	21 (8.4)	16 (44.4)	9 (37.5)	27 (23.3)
Whole	67	12	12	3	15
Broken	2	0	1	0	0
Fragment	25	3	2	5	11
Shatter	7	6	1	1	1
Core	18 (6.7)	3 (1.2)	2 (5.6)	2 (8.3)	12 (10.3)
Blade	149 (55.6)	223 (88.8)	16 (44.4)	9 (37.5)	73 (62.9)
Whole	2	2	3	0	6
Proximal	56	57	4	3	25
Distal	30	41	4	1	16
Medial	61	126	5	5	26
Biface	4 (1.5)	0	0	3 (12.5)	0
Point	2 (0.7)	0	0	0	1 (0.9)
Drill	4 (1.5)	0	2 (5.6)	0	1 (0.9)
Notch	1 (0.4)	1 (0.4)	0	0	0
Scraper	0	0	0	1 (4.2)	2 (1.7)
Total	267	251	36	24	116

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Figure 4. Obsidian from the central K'iche' region: A. biface; B. blades, and C. core (photographs by Rachel Horowitz). (Color online)

Materials from La Comunidad indicate that some reduction activities occurred at the site while other materials were brought into the site as finished products. The high proportion of flakes ($n = 46$; 60.5%), including the presence of cortex on some flakes ($n = 14$, 29.2%), suggests importation of materials in core form. The flakes also consisted of a mix of types of reduction including hard hammer ($n = 8$), thinning flakes ($n = 22$), and rejuvenation flakes ($n = 6$). While few blades ($n = 15$; 19.7%) were present, most ($n = 11$) are final-series blades. Blade-based tools, including drills, were also present. Most interesting is the large number of cores ($n = 12$), the majority of which were polyhedral blade cores. The presence of blade cores indicates that blade production occurred within the site but that residents of La Comunidad also had access to non-blade obsidian cores.

Although Chitinamit contains a large assemblage ($n = 57$), there is little evidence of production. Most of the materials are final-stage blades ($n = 55$; 96.5%). The presence of a single core indicates that some blade core reduction may have occurred. Ratios of proximal to distal (2.3:1) and medial to distal blade fragments (3.6:1) are within the ranges suggested by De León and colleagues (2009) for local production, indicating that blades were probably locally produced. The cutting edge to weight ratio was calculated as 42.3 mm/g or 4.2 cm/g ($[1{,}493 \times 2]/70.6$), indicating a conservative use of lithic raw materials, the implications of which are discussed later.

Much like La Comunidad and Chitinamit, the remaining sites in the Central K'iche region show evidence for production (Table 2). Most of the assemblage were blades ($n = 79$; 54.9%), and there were some early-stage blades ($n = 8$), which indicates some blade cores were not fully prepared when they arrived. All blade cores present were exhausted, suggesting extensive reduction activities.

Non-blade production also occurred, as evidenced by the presence of bifacial cores ($n = 2$) and non-blade core fragments ($n = 2$), as well as flakes ($n = 42$; 29.2%) showing a variety of manufacturing methods (hard hammer, $n = 10$, soft hammer $n = 17$) and rejuvenation flakes ($n = 9$). Some of this reduction may be related to the production of tools on blade blanks because both projectile points were bifacially retouched on blades.

These data indicate that obsidian was imported into the central K'iche' region as final-stage prismatic blade cores, which were local reduced into blades and retouched into blade tools. These data are supported by the ratios of proximal to distal blade fragments (1.9:1) and medial to distal blade fragments (2.1:1), which fall within De León and colleagues' (2009) ratio for local production. However, some sites seem to have produced more blades than others, suggesting independent obsidian acquisition networks. Independent acquisition networks are supported by the variable presence of non-blade core debitage and tools between sites, especially La Communidad and Chitinamit.

Western K'iche'

The western K'iche' sample is large ($n = 251$; Table 2; Figure 5) and stems predominantly from Pueblo Viejo Malacatancito ($n = 195$) and Pueblo Viejo Momostenango ($n = 42$), with a small number of lithics from four additional sites ($n = 14$; Supplemental Table 1). The Pueblo Viejo Malacatancito assemblage

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Figure 5. A. Core; and B. blades from western K'iche' sites (photographs by Rachel Horowitz). (Color online)

consists almost entirely of blades ($n = 193$), with two flakes. The vast majority ($n = 112$) are medial blade segments. Despite this large number, the ratios of proximal to distal segments (1.6:1) and medial to distal segments (3.6:1) are still within the range for the importation of whole blades into the site (De León et al. 2009). The cutting edge to mass ratio is 47 mm/g (4.7 cm/g; total length of [3,395 × 2]/144.2), indicating a conservative use of raw materials, the implications of which are discussed later.

The smaller sample of materials from Pueblo Viejo Momostenango ($n = 42$) is indicative of blade production activities. The assemblage includes cores ($n = 2$; 4.8%) and flakes ($n = 15$; 35.7%), as well as final-stage blades.

The remaining materials ($n = 14$) from the western K'iche' region come from four sites. The majority ($n = 9$) are blades; there are also flakes ($n = 4$) and a blade core ($n = 1$). Like the materials from Pueblo Viejo Malacatancito, this indicates the importation of blades or final-stage blade cores, which is also supported by the ratios of proximal to distal segments (1.4:1) and medial to distal segments (3:1). The presence of production debris suggests importation and reduction of blade cores in the region.

The sample from the western K'iche' region shows little evidence of production. Materials were imported into the site as blades and in a few cases as final-stage blade cores, which were reduced.

Eastern K'iche'

The eastern K'iche' assemblage is small ($n = 36$; Table 2) and comes from four sites (Supplemental Table 1). The collection provides evidence of limited blade production activities through the presence of exhausted blade cores ($n = 2$; 5.6%) and blade-core rejuvenation flakes ($n = 2$). Production of blade-based tools also may have occurred, given the presence of drills produced on blades.

The collection suggests limited reduction at these sites—all of which occurred on blade cores. This does not differ greatly from the Central K'iche' region, but the sample size limits the discussion.

Sacapulas K'iche'

The Sacapulas K'iche' sample is small ($n = 24$; Table 2) and comes from three sites (Supplemental Table 1). The sample indicates some reduction, based on the presence of exhausted blade cores and flakes. The blades, which were all produced from blade cores in their final reduction stage, and the presence of exhausted blade cores indicate that blade cores were imported. Other types of formal tools may also have been imported, based on the presence of bifaces and a scraper.

Kaqchikel

The Kaqchikel materials came from eight sites ($n = 116$; Supplemental Table 1), with nearly all from Patzak ($n = 46$), Cucul ($n = 30$), and Pueblo Viejo Jilotepeque ($n = 31$). Pueblo Viejo Jilotepeque is

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

located near the San Martin Jilotepeque source and had comparatively large numbers of blade cores ($n = 12$; 38.7%; Figure 6). Patzak and Cucul showed some evidence of production as flakes, and final-series blades were present (Table 2).

The Kaqchikel materials indicate blade-core reduction, particularly of early-stage blades at Pueblo Viejo Jilotepeque. Patzak and Cucul also indicate blade-core reduction, mostly of final-stage blades. The ratios of proximal–distal blades (1.6:1) and medial–distal segments (1:1) also support local blade production (De León et al. 2009). Thus, even near the source of raw materials, early-stage reduction and core preparation occurred at a few sites while later stages of reduction occurred more widely.

Regional Sourcing Analysis

Obsidian samples from the regional survey were also sourced using the pXRF. A total of 90 lithics from 30 Late Postclassic sites were sourced (Table 3). These data provide information about regional differences in obsidian access and variability in obsidian acquisition among sites.

The data from the Central K'iche' region broadly reflect the patterns at Q'umarkaj, with slightly more Ixtepeque in comparison to El Chayal (Table 3). This is in many ways unsurprising, given that these satellite sites are thought to have been allies of the political leaders of Q'umarkaj and would be expected to participate in economic exchange networks similar to those used by the residents of Q'umarkaj.

In the outlying areas, several interesting patterns emerge. In the eastern region, the assemblage is predominately El Chayal, with no San Martin Jilotepeque, a distinction from the other regions. The western region, however, shows high amounts of San Martin Jilotepeque, some El Chayal, and a few other sources, suggesting similar distribution networks to Q'umarkaj. Within the Kaqchikel region, most materials were San Martin Jilotepeque, the closest source to this area, and there was an absence of El Chayal. This analysis supports previous sourcing projects from the K'iche' region (Macario Calgua 2006; Norris 2001).

Discussion

Obsidian procurement has often been used as a proxy for centralized economic and political organization. The locations closer to Q'umarkaj did not have greater access to obsidian than outlying areas, based on the types of obsidian materials identified, specifically the presence of blade cores. The greatest core frequencies were from areas closest to the San Martin Jilotepeque source, supporting Braswell's (1996) findings of the decentralized management of obsidian sources. No evidence of source area management was found at San Martin Jilotepeque (Braswell 1996) or El Chayal (Suyuc Ley 2011), suggesting that independent acquisition networks may have operated around source areas, which would support independent distribution networks within the K'iche' region. Such patterns also suggest down-the-line trade or direct acquisition as a main distribution mechanism.

Figure 6. Blade cores from Pueblo Viejo Jilotepeque (photographs by Rachel Horowitz). (Color online)

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Table 3. Obsidian Source Designations.

Location	Sourced	SMJ	El Chayal	Ixtepeque	SBMA	Pachuca	Laguna Ayala	Unknown
Site Core (Q'umarkaj)	174	107 (61.5%)	42 (24%)	5 (2.9%)	3 (1.7%)	1 (0.6%)	1 (0.6%)	15 (8.6%)
Central K'iche'	35	23 (65.7%)	5 (14.3%)	3 (8.6%)	1 (2.9%)	0	0	3 (8.6%)
Eastern K'iche'	7	0	6 (85.7%)	1 (14.3%)	0	0	0	0
Western K'iche'	30	22 (73.3%)	7 (23.3%)	1 (3.3%)	0	0	0	0
Sacapulas K'iche'	4	2 (50%)	2 (50%)	0	0	0	0	0
Kaqchikel	14	11 (78.6%)	0	1 (7%)	1 (7%)	0	0	1 (7%)
Total	264	176 (66.6%)	62 (23.5%)	11 (4.2%)	5 (1.9%)	1 (0.4%)	1 (0.4%)	19 (7.2%)

Note: SMJ = San Martin Jilotepeque; SBMA = San Bartolome Milpas Altas

In terms of types of production, however, these data indicate that prismatic blade production was practiced by specialized individuals. The limited locations in which cores were identified suggest that specialized producers reduced cores, a pattern identified throughout other areas of Mesoamerica (De León et al. 2009; Healan 2002, 2003; Hirth 2002, 2003, 2008; Hirth and Flenniken 2002; Hirth et al. 2003; Pastrana 2002).

Related to the production of these materials by specialized individuals is the degree of access to different types of obsidian products. Some areas did not have access to prismatic blade cores, instead obtaining blades and other materials from craft producers, whereas other areas produced blades. This difference in the distribution of blade cores and the lack of reduction debris at some sites support different acquisition networks. That is, some sites obtained materials as blades, whereas others obtained blade cores and reduced them. For example, within the western K'iche' assemblage, Pueblo Viejo Malacatancito had 99.9% blades, whereas Pueblo Viejo Momostenango had only 57% blades with more blade cores and flakes. Within regions there is variation in how and in what form obsidian was acquired, as supported by ratios of types of blade fragments (De León et al. 2009). These differences in the obsidian assemblage makeup indicate intra- and interregional differences in obsidian acquisition networks.

The sites that contained large numbers of blades can also be examined in terms of their conservative or unconservative use of blades, as compared to the experimental data from Sheets and Muto (1972). Both Chitinamit (4.2 cm/g) and Pueblo Viejo Malacatancito (4.7 cm/g), the two sites with the largest numbers of blade fragments, showed relatively conservative blade use (as compared to 2.1 cm/g in Sheets and Muto [1972:633]). Even Q'umarkaj (3.5 cm/g) shows a more conservative use of blades than the experimental data, although it is lower than the more outlying sites. In this case, despite being relatively close to sources, the ratios are higher, which may indicate other restrictions in access. For instance, the ratios from sites in this study are more similar to those from Late Postclassic period sites in coastal Belize (Stemp et al. 2011:Table 3) than to the original experimental data. The lower average at Q'umarkaj suggests differences in obsidian access, with Q'umarkaj having greater access to blade resources.

The sourcing data highlight similarities between the Central K'iche' region and Q'umarkaj. The similarities in source distributions (Table 3) indicate that these areas acquired goods using the same or similar acquisition networks. Farther afield, however, wealth seems to have influenced acquisition. That is, the K'iche' elite did not manage obsidian distribution outside the Central K'iche' region. This is not to suggest that political activities did not influence obsidian acquisition, because long-distance trade activities might have operated differently. A full discussion of this possibility is outside the scope of this article.

No clear data support the management of obsidian distribution outside the central K'iche' region by the political leaders at Q'umarkaj. Instead, differences in economic wealth and status and local acquisition networks resulted in the variations in obsidian concentrations and sources observed within and between regions.

One caveat should be made about elite management, and that relates to nonlocal obsidians, which were found only within the site core, suggesting that these long-distance trade routes might have been managed by elite political networks or at least that they had preferential access to such goods.

The data from Q'umarkaj and the surrounding region support previous studies of Late Postclassic period obsidian circulation. Braswell's (2003b) study of obsidian circulation proposed that there was no direct control over local obsidian sources in the highlands and that there were also limited nonlocal obsidian; the data support both arguments.

Conclusions

The K'iche' region obsidian analysis provides an opportunity to evaluate the relationship between political and economic centrality among the Late Postclassic K'iche'. In general, this research supports previous studies on Postclassic period Maya economies, which suggest a market-based economy with limited elite management of obsidian distribution. The exception to this is the acquisition of nonlocal obsidians, particularly Pachuca obsidian, which was limited to the site core and was related to elite management of long-distance trade. This conclusion follows Braswell's (1996, 2003b) discussions of management of Late

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Postclassic period obsidian exchange networks in the Maya highlands and studies of Late Postclassic period distribution networks elsewhere in Mesoamerica (e.g., Golitko and Feinman 2015).

Furthermore, the technological and sourcing analyses indicate variable economic networks both within and between regions under K'iche' control. Q'umarkaj and the central K'iche' region seem to have had similar economic networks, given the similarities in obsidian sources and access to blades and core technologies. Outside the core K'iche' region, in those areas conquered by the K'iche', there was less similarity in obsidian economic networks. Within and between regions, both the sourcing and the technological analyses suggest that these sites had their own acquisition networks. This is suggestive of a market-based economy with independent acquisition networks as the main obsidian distribution mechanism. The conservative use of blades in some sites indicates that purchaser wealth may have contributed to these differences.

The lack of centralized economic management by the K'iche' elite of regional economic networks has implications for the role of economies as sources of political power (e.g., Mann 2005). Although the K'iche' elite could have used other sources of power to support their political power, obsidian exchange networks do not support the centralized management of economic resources within the K'iche' region. Instead, it seems more likely that the obsidian exchange networks in these regions existed before the K'iche' conquest and continued despite the political rulership of the K'iche'. However, K'iche' elites could have gained political power through management of trade routes of obsidian to the coast and neighboring highland regions.

Although K'iche' political expansion and organization have been the focus of much debate and discussion among archaeologists and other scholars (e.g., Braswell 2001a, 2003a; Carmack 1981; Fox 1987; Norris 2001), the role of economic power has not been fully addressed. The obsidian analyses discussed here indicate decentralized economic networks outside the central K'iche' region, suggesting that the economic management of locally available resources was not a main source of political power for the K'iche' elite in the Late Postclassic period. This does not imply that political centralization of these outlying areas did not exist, just that it was not propped up by the management of local economic resources.

Acknowledgments. Thanks to the Middle American Research Institute for access to the material, particularly Caroline Parris, Erin Patterson, Jocelyne Ponce, and Marcello Canuto. Thanks to Genie Robinson and Tom Babcock for providing information about the Q'umarkaj investigations. Jeff Ferguson and Michael Glascock of the Missouri Research Reactor provided obsidian source samples. Thanks to Jeff Ferguson, Matt Bolanger, and Nigel Kelly for their assistance with the pXRF. Thanks to the members of the spring 2018 lithic analysis class at Tulane University who conducted a preliminary analysis of the regional survey material, which led to my reanalysis of the collection and my analysis of the Q'umarkaj assemblage. Thanks to Genie Robinson, Jason Nesbitt, Erin Thornton, Lori Phillips, Kim Sheets, Garrett Toombs, Emily Kenney, and three anonymous reviewers for their comments on a previous draft of this article. No permits were required.

Funding. None

Data Availability Statement. All artifacts discussed are housed at the Middle American Research Institute at Tulane University. Raw sourcing data can be requested from the author. All other data are contained within the text.

Competing Interests. The author declares none.

Supplemental Material. For supplemental material accompanying this article, visit https://doi.org/10.1017/laq.2022.79.
Supplemental Table 1. Full List of Sites from the Regional Survey and Count of Lithics Analyzed.
Supplemental Table 2. Source Attributions from the Q'umarkaj Site Core.

Notes

1. Q'umarkaj is the K'iche' name for the site. It was long referred to as Utatlan, its Nahua name (see Babcock 2012).
2. The number of blades used to calculate the retouch percentage is 1,176. A total of 251 blades were not analyzed for retouch, because they were accompanied by a note indicating their previous storage arrangement resulted in visible edge damage that might be confused for retouch.

References Cited

Akkeren, Ruud van. 2000. *Place of the Lord's Daughter: Rab'inal, Its History, Its Dance-Drama*. Research School CNWS, Leiden, Netherlands.

Andrefsky, William, Jr. 2006. *Lithics Macroscopic Approaches to Analysis*. 2nd ed. Cambridge University Press, Cambridge.

Annereau-Fulbert, Marie. 2012. Intermediate Settlement Units in Late Postclassic Maya Sites in the Highlands: An Assessment from Archaeology and Ethnohistory. In *The Neighborhood as a Social and Spatial Unit in Mesoamerican Cities*, edited by Charlotte M. Arnauld, Linda R. Manzanilla, and Michael E. Smith, pp. 261–285. University of Arizona Press, Tucson.

Aoyama, Kazuo. 1999. *Ancient Maya State, Urbanism, Exchange, and Craft Specialization: Chipped Stone Evidence from Copan Valley and the La Entrada Region, Honduras*. University of Pittsburgh Memoirs in Latin American Archaeology No. 12. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Arnauld, Marie-Charlotte. 1993. Los territorios políticos de las cuencas de Salamá, Rabinal y Cubulco en el Postclásico (Baja Verapaz, Guatemala). In *Representaciones del espacio político en las tierras altas de Guatemala*, edited by Alain Breton, pp. 43–109. Centro de Estudios Mexicanos y Centroamericanos, Mexico City.

Babcock, Thomas F. 2012. *Utatlan: The Constituted Community of the K'iche' Maya of Q'umarkaj*. University Press of Colorado, Boulder.

Berdan, Frances F. 2003. The Economy of Postclassic Mesoamerica. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 93–95. University of Utah Press, Salt Lake City.

Berdan, Frances F., Marilyn Masson, Janine Gasco, and Michael E. Smith. 2003. An International Economy. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 96–108. University of Utah Press, Salt Lake City.

Blake, Michael. 2010. *Colonization, Warfare, and Exchange at the Postclassic Maya Site of Canajasté, Chiapas, Mexico*. Papers of the New World Archaeological Foundation No. 70. Brigham Young University, Provo, Utah.

Borgstede, Gregory, and Eugenia Robinson. 2012. The Archaeology of the Late Postclassic Maya Highlands. In *Oxford Handbook of Mesoamerican Archaeology*, Online ed., edited by Deborah Nichols. Oxford Academic, Oxford. https://doi.org/10.1093/oxfordhb/9780195390933.013.0028.

Braswell, Geoffrey E. 1996. A Maya Obsidian Source: The Geoarchaeology, Settlement History, and Ancient Economy of San Martin Jilotepeque, Guatemala. PhD dissertation, Department of Anthropology, Tulane University, New Orleans, Louisiana.

Braswell, Geoffrey E. 2001a. Postclassic Maya Courts of the Guatemalan Highlands: Archaeological and Ethnohistorical Approach. In *Royal Courts of the Ancient Maya: 2, Data and Case Studies*, edited by Takeshi Inomata and Stephen D. Houston, pp. 308–334. Westview Press, Boulder, Colorado.

Braswell, Geoffrey E. 2001b. Ethnogenesis, Social Structure, and Survival: The Nahuaization of K'iche'an Culture, 1450–1550. In *Maya Survivalism*, edited by Ueli Hostettler and Matthew Restall, pp. 51–58. Verlag Anton Saurwein, Markt Schwaben, Germany.

Braswell, Geoffrey E. 2003a. The Highland Maya Polities. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 45–49. University of Utah Press, Salt Lake City.

Braswell, Geoffrey E. 2003b. Obsidian Exchange Spheres. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 131–158. University of Utah Press, Salt Lake City.

Braswell, Geoffrey E. 2010. The Rise and Fall of Market Exchange: A Dynamic Approach to Ancient Maya Economy. In *Archaeological Approaches to Market Exchange in Ancient Societies*, edited by Christopher P. Garraty and Barbara L. Stark, pp. 127–140. University Press of Colorado, Boulder.

Braswell, Geoffrey E., and Michael D. Glascock. 2002. The Emergence of Market Economies in the Ancient Maya World: Obsidian Exchange in Terminal Classic Yucatan, Mexico. In *Geochemical Evidence for Long Distance Exchange*, edited by Michael D. Glascock, pp. 33–52. Bergin and Garvey Press, Westport, Connecticut.

Braswell, Geoffrey E., and Eugenia J. Robinson. 1992. Obsidiana en las tierras altas Mayas Kaqchikel. In *IV Simposio de Investigaciones Arqueológicas en Guatemala, 1990*, edited by Juan Pedro Laporte, Hector Escobedo, and Sandra Villagrán de Brady, pp. 269–275. Museo Nacional de Arqueología y Etnología, Guatemala City.

Carmack, Robert M. 1981. *The Quiche Mayas of Utatlan: The Evolution of a Highland Guatemala Kingdom*. University of Oklahoma Press, Norman.

Carmack, Robert M., and John M. Weeks. 1981. The Archaeology and Ethnohistory of Utatlan: A Conjunctive Approach. *American Antiquity* 46:323–341.

Castillo Aguilar, Victor Jesus. 2020. Conquest and Religious Change at Chiantla Viejo, Guatemala: The Transition of a Highland Maya Community to Spanish Colonial Rule. PhD dissertation, Department of Anthropology, University of Arizona, Tucson.

Chinchilla Mazariegos, Oswaldo. 2020. Classic and Postclassic Peoples of the Pacific Coast. In *The Maya World*, edited by Scott R. Hutson and Traci Ardren, pp. 731–751. Routledge, New York.

Clark, John E. 2020. Los Encuentros Stone Artifacts. In *Postclassic and Colonial Sites of the Upper Grijalva River Basin in Chiapas Mexico: Los Encuentros, Coapa, and Coneta*, edited by Douglas D. Bryant and Thomas A. Lee Jr., pp. 279–288. Papers of the New World Archaeological Foundation No. 86. Brigham Young University Press, Provo, Utah.

Clark, John E., and Douglas D. Bryant. 1997. A Technological Typology of Prismatic Blades and Debitage from Ojo de Agua, Chiapas, Mexico. *Ancient Mesoamerica* 8:111–136.

Clark, John E., and Thomas A. Lee Jr. 2007. The Changing Role of Obsidian Exchange in Central Chiapas. In *Archaeology, Art, and Ethnogenesis in Mesoamerican Prehistory: Papers in Honor of Gareth W. Lowe*, edited by Lynneth S. Lowe and Mary E. Pye, pp. 109–159. Papers of the New World Archaeological Foundation. Brigham Young University Press, Provo, Utah.

Cojti Ren, Iyaxel. 2012. El saqarik o amanecer como ritual de fundación descrito en los documentos históricos K'iche's y Kaqchikeles. *Contributions in New World Archaeology* 4:279–288.

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Cojti Ren, Iyaxel. 2020. The Emergence of the Ancient Maya Kaqchikel Polity as Explained through the Dawn Tradition in the Guatemalan Highlands. *Mayanist* 2:21–37.

De León, Jason P., Kenneth G. Hirth, and David M. Carballo. 2009. Exploring Formative Period Obsidian Blade Trade: Three Distribution Models. *Ancient Mesoamerica* 20:113–128.

Fox, John W. 1975. Centralism and Regionalism: Quiche Acculturation Processes in Settlement Patterning: An Archaeological and Ethnohistoric Study of the Late Postclassic Highland Maya Ethnic Groups. PhD dissertation, Department of Anthropology, University of Albany, Albany, New York.

Fox, John W. 1978. *Quiche Conquest: Centralism and Regionalism in Highland Guatemalan State Development*. University of New Mexico Press, Albuquerque.

Fox, John W. 1987. *Maya Postclassic State Formation: Segmentary Lineage Migration in Advancing Frontiers*. Cambridge University Press, Cambridge.

Fox, John W. 1989. On the Rise and Fall of Tulans and Maya Segmentary States. *American Anthropologist* 9:656–681.

Fox, John W. 1996. Questions of Political and Economic Integration: Segmentary versus Centralized States among the Ancient Maya. *Current Anthropology* 37:795–801.

Fox, John W., and Garrett W. Cook. 1996. Constructing Maya Communities: Ethnography for Archaeology. *Current Anthropology* 37:811–830.

Garraty, Christopher P. 2010. Investigating Market Exchange in Ancient Societies. In *Archaeological Approaches to Market Exchange in Ancient Societies*, edited by Christopher P. Garraty and Barbara L. Stark, pp. 3–32. University Press of Colorado, Boulder.

Glascock, Michael D. 2020. A Systematic Approach to Geochemical Sourcing of Obsidian Artifacts. *Scientific Culture* 6: 35–47.

Glascock, Michael D., and Jeffrey R. Ferguson. 2012. Report on the Analysis of Obsidian Source Samples by Multiple Analytical Methods. Submitted to Bruce Kaiser of Bruker Corporation, Madison, Wisconsin. Electronic document, https://www.researchgate.net/publication/236850163_ Report_on_the_Analysis_of_Obsidian_Source_Samples_by_Multiple_Analytical_Methods, accessed November 22, 2022.

Golitko, Mark, and Gary M. Feinman. 2015. Procurement and Distribution of Pre-Hispanic Mesoamerican Obsidian 900 BC–AD 1520: A Social Network Analysis. *Journal of Archaeological Method and Theory* 22:206–147.

Guillemin, George F. 1977. Urbanism and Hierarchy at Iximche. In *Social Process in Maya Prehistory: Studies in Honor of Sir Eric Thompson*, edited by Norman Hammond, pp. 227–264. Academic Press, London.

Hayden, Brian. 2020. Preliminary Report on the Coapa Lithics: First Season. In *Postclassic and Colonial Sites of the Upper Grijalva River Basin in Chiapas Mexico: Los Encuentros, Coapa, and Coneta*, edited by Douglas D. Bryant and Thomas A. Lee Jr., pp. 273–278. Papers of the New World Archaeological Foundation No. 86. Brigham Young University, Provo, Utah.

Healan, Dan. 1997. Pre-Hispanic Quarrying in the Ucareo-Zinapecuaro Obsidian Source Area. *Ancient Mesoamerica* 8:77–100.

Healan, Dan. 2002. Producer versus Consumer: Prismatic Core-Blade Technology at Epiclassic/Early Postclassic Tula and Ucareo. In *Pathways to Prismatic Blades: A Study in Mesoamerican Obsidian Core-Blade Technology*, edited by Kenneth G. Hirth and Bradford Andrews, pp. 27–35. University of Utah Press, Salt Lake City.

Healan, Dan. 2003. From the Quarry Pit to the Trash Pit: Comparative Core-Blade Technology at Tula, Hidalgo, and the Ucareo Obsidian Source Region. In *Mesoamerican Lithic Technology: Experimentation and Interpretation*, edited by Kenneth G. Hirth, pp. 153–169. University of Utah Press, Salt Lake City.

Hill, Robert M. 1996. Eastern Chajoma (Cakchiquel) Political Geography: Ethnohistorical and Archaeological Contributions to the Study of a Late Postclassic Highland Maya Polity. *Ancient Mesoamerica* 7:63–87.

Hill, Robert M., and John Monaghan. 1987. *Continuities in Highland Maya Social Organization: Ethnohistory in Sacapulas, Guatemala*. University of Pennsylvania Press, Philadelphia.

Hirth, Kenneth G. 1998. The Distributional Approach: A New Way to Identify Marketplace Exchange in the Archaeological Record. *Current Anthropology* 39:451–476.

Hirth, Kenneth G. 2002. Provisioning Constraints and the Production of Obsidian Prismatic Blades at Xochicalco, Mexico. In *Pathways to Prismatic Blades: A Study in Mesoamerican Obsidian Core Blade Technology*, edited by Kenneth G. Hirth and Bradford Andrews, pp. 81–90. Cotsen Institute of Archaeology, UCLA, Los Angeles.

Hirth, Kenneth G. 2003. Experimentation and Interpretation in Mesoamerican Lithic Technology. In *Mesoamerican Lithic Technology: Experimentation and Interpretation*, edited by Kenneth G. Hirth, pp. 1–9. University of Utah Press, Salt Lake City.

Hirth, Kenneth G. 2006. Obsidian Craft Production at Xochicalco. In *Obsidian Craft Production in Ancient Central Mexico*, edited by Kenneth G. Hirth, pp. 3–17. University of Utah Press, Salt Lake City.

Hirth, Kenneth G. 2008. The Economy of Supply: Modeling Obsidian Procurement and Craft Provisioning at a Central Mexican Urban Center. *Latin American Antiquity* 19:435–457.

Hirth, Kenneth G., and Bradford Andrews. 2002. Pathways to Prismatic Blades: Sources of Variation in Mesoamerican Lithic Technology. In *Pathways to Prismatic Blades: A Study in Mesoamerican Obsidian Core Blade Technology*, edited by Kenneth G. Hirth and Bradford Andrews, pp. 1–14. Cotsen Institute of Archaeology, UCLA, Los Angeles.

Hirth, Kenneth G., and J. Jeffery Flenniken. 2002. Core Blade Technology in Mesoamerican Prehistory. In *Pathways to Prismatic Blades: A Study in Mesoamerican Obsidian Core Blade Technology*, edited by Kenneth G. Hirth and Bradford Andrews, pp. 121–128. Cotsen Institute of Archaeology, UCLA, Los Angeles.

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Hirth, Kenneth G., Jacques Pelegrin, Peter Kelterborn, and Bradford Andrews. 2003. Experimentation and Interpretation in Mesoamerican Lithic Technology. In *Mesoamerican Lithic Technology: Experimentation and Interpretation*, edited by Kenneth G. Hirth, pp. 234–238. University of Utah Press, Salt Lake City.

Ichon, Alain. 1993. Los sitios postclásicos de la cuenca de San Andrés Sajcabajá (El Quiche, Guatemala). In *Representaciones del espacio político en las tierras altas de Guatemala*, edited by Alain Breton, pp. 111–161. Centro de Estudios Mexicanos y Centroamericanos, Mexico City.

Johnston, René. 2002. Arqueología histórica de dos pueblos perdidos en el área de Cotzumalguapa, Escuintla. In *XV Simposio de Investigaciones Arqueológicas en Guatemala, 2001*, edited by Juan Pedro Laporte, Héctor Escobedo, and Bárbara Arroyo, pp. 13–27. Museo Nacional de Arqueología y Etnología, Guatemala City.

Kidder, A. V. 1975. Appendix C—The Artifacts of Zacualpa. In *Zacualpa, El Quiche, Guatemala: An Ancient Provincial Center of the Highland Maya*, edited by Robert Wauchope, pp. 158–163. MARI Publication 39. Tulane University, New Orleans, Louisiana.

Macario Calgua, Micaela Raquel. 2006. *The Inhabitants of Q'umarkaj, Late Postclassic K'iche'-Mayan Capital: Guatemalan Highlands*. Report submitted to FAMSI. Electronic document, http://www.famsi.org/reports/03057/03057Macario01.pdf, accessed November 14, 2022.

Macario Calgua, Micaela Raquel. 2007. *The Sociopolitical Configuration in the City of Q'umarkaj: The Palaces and* Nimja *or Long Houses of the* Chinamit Nija'ib'. Report submitted to FAMSI. Electronic document, http://www.famsi.org/reports/06044/06044Macario01.pdf, accessed November 14, 2022.

Macario Calgua, Micaela Raquel. 2012. La configuración espacial en Q'umarkaj intramuros analizada a través de la Arqueología y la Etnohistoria, 1225–1524 d.c. Licensure thesis, Archaeology Program, Universidad de San Carlos de Guatemala, Guatemala City.

Macario Calgua, Raquel, Yvonne Putzeys, Marie Fulbert, Edgar Telón, Edgar Ortega, Jorge Cáceres, Juan Manuel Palomo, et al. 2007. Proyecto etnoarqueológico Q'umarkaj, Quiché, Guatemala (2003–2006). In *XX Simposio de Investigaciones Arqueológicas en Guatemala, 2006*, edited by Juan Pedro Laporte, Bárbara Arroyo, and Hector Mejía, pp. 971–986. Museo Nacional de Arqueología y Etnología, Guatemala City.

Mann, Michael. 2005. The Sources of Power Revisited: A Response to Criticism. In *An Anatomy of Power: The Social Theory of Michael Mann*, edited by John A. Hall and Ralph Schroeder, pp. 343–396. Cambridge University Press, Cambridge.

Martindale Johnson, Lucas, Jeffrey R. Ferguson, Kyle P. Freund, Lee Drake, and Daron Duke. 2021. Evaluating Obsidian Calibration Sets with Portable X-Ray Fluorescence (ED-XRF) Instruments. *Journal of Archaeological Science: Reports* 39:103126. https://doi.org/10.1016/j.jasrep.2021.103126.

Masson, Marilyn A. 2002. Community Economy and the Mercantile Transformation in Postclassic Northeastern Belize. In *Ancient Maya Political Economies*, edited by Marilyn A. Masson and David A. Freidel, pp. 335–364. AltaMira Press, Walnut Creek, California.

Matsumoto, Mallory E. 2017. *Land, Politics, and Memory in Five Nija'ib' k'iche Titulos: The Title and Proof of Our Ancestors*. University Press of Colorado, Boulder.

McKillop, Heather. 2005. *In Search of Maya Sea Traders*. Texas A&M University Press, College Station.

Nance, C. Roger, Stephen L. Whittington, and Barbara E. Borg. 2003. *Archaeology and Ethnohistory of Iximche*. University Press of Florida, Gainesville.

Norris, Susan. 2001. Ethnohistory, Archaeology, and the K'iche Maya: An Interdisciplinary Approach to Political Economy. In *The Past and Present Maya: Essays in Honor of Robert M. Carmack*, edited by John M. Weeks, pp. 29–45. Labyrinthos, Lancaster, England.

Pastrana, Alejandro. 2002. Variation at the Source: Obsidian Exploitation at Sierra de Las Navajas, Mexico. In *Pathways to Prismatic Blades: A Study in Mesoamerican Obsidian Core Blade Technology*, edited by Kenneth G. Hirth and Bradford Andrews, pp. 15–26. Cotsen Institute of Archaeology, UCLA, Los Angeles.

Popenoe de Hatch, Marion, and Christa Schieber de Lavarreda. 2001. Una revisión preliminar de la historia de Tak´alik Ab´aj, departamento de Retalhuleu. In *XIV Simposio de Investigaciones Arqueológicas en Guatemala, 2000*, edited by Juan Pedro Laporte, A.C. Suasnávar, and Barbara Arroyo, pp. 990–1005. Museo Nacional de Arqueología y Etnología, Guatemala City.

Putzeys, Yvonne, Jorge Cáceres, Edgar Telón, and Sergio Cuyán. 2008. Año 2006 y la arqueología en Q'umarkaj: Proyecto Etnoarqueológico Q'umarkaj y rescate en tramo carretero Santa Cruz del Quiché-La Estancia. In *XXI Simposio de Investigaciones Arqueológicas en Guatemala, 2007*, edited by Juan Pedro Laporte, Barbara Arroyo, and Hector Mejía, pp. 1–15. Museo Nacional de Arqueología y Etnología, Guatemala City.

Robinson, Eugenia. 1998. Organización del Estado Kaqchikel: El centro regional de Chitak Tzak. *Mesoamerica* 35:49–71.

Schroeder, Ralph. 2005. Introduction: The IEMP Model and Its Critics. In *An Anatomy of Power: The Social Theory of Michael Mann*, edited by John A. Hall and Ralph Schroeder, pp. 1–16. Cambridge University Press, Cambridge.

Sheets, Payson D., and Guy Muto. 1972. Pressure Blades and Total Cutting Edge: An Experiment in Lithic Technology. *Science* 175:632–634.

Smith, Michael E. 2003. Key Commodities. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 117–125. University of Utah Press, Salt Lake City.

Smith, Michael E., and Frances F. Berdan. 2003. Postclassic Mesoamerica. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 3–13. University of Utah Press, Salt Lake City.

Stemp, James W., Elizabeth Graham, and Jessica Goulet. 2011. Coastal Maya Obsidian Trade in the Late Postclassic Period to Early Colonial Period: The View from San Pedro, Ambergris Caye, Belize. *Journal of Island and Coastal Archaeology* 6:134–154.

https://doi.org/10.1017/laq.2022.79 Published online by Cambridge University Press

Suyuc Ley, Edgar. 2011. The Extraction of Obsidian At El Chayal, Guatemala. In *The Technology of Maya Civilization: Political Economy and Beyond in Lithic Studies*, edited by Zachary X. Hruby, Geoffrey E. Braswell, and Oswaldo Chinchilla Mazariegos, pp. 130–142. Equinox Press, Sheffield, England.

Wallace, Dwight T. 1977. An Intra-Site Locational Analysis of Utatlan: The Structure of an Urban Site. In *Archaeology and Ethnohistory of the Central Quiche*, edited by Dwight T. Wallace and Robert M. Carmack, pp. 20–54. Publication No. 1. Institute for Mesoamerican Studies, SUNY Albany, Albany, New York.

Wallace, Dwight T., and Robert M. Carmack (editors). 1977. *Archaeology and Ethnohistory of the Central Quiche*. Publication No. 1. Institute for Mesoamerican Studies, SUNY Albany, Albany, New York.

Wauchope, Robert. 1947. An Approach to the Maya Correlation Problem through Guatemala Highland Archaeology and Native Annals. *American Antiquity* 13:59–66.

Wauchope, Robert. 1970. Protohistoric Pottery of the Guatemalan Highlands. In *Monographs and Papers in Maya Archaeology*, edited by William R. Bullard Jr., pp. 89–244. Papers of the Peabody Museum of Archaeology and Ethnology Vol. 61. Harvard University, Cambridge, Massachusetts.

Weeks, John M. 1983. *Chisalin: A Late Postclassic Maya Settlement in Highland Guatemala*. BAR International Series 169. British Archaeological Reports, Oxford.

Whittaker, John C. 1994. *Flintknapping: Making and Understanding Stone Tools*. University of Texas Press, Austin.

Yoffee, Norman. 2005. *Myths of the Archaic State: Evolution of the Earliest Cities, States, and Civilizations*. Cambridge University Press, Cambridge.

Cite this article: Horowitz, Rachel A. 2023. Economic Integration and Obsidian Consumption in the Late Postclassic Period K'iche' Region. *Latin American Antiquity* **34**, 723–741. https://doi.org/10.1017/laq.2022.79.