

CITY SIZE IN LATE POSTCLASSIC MESOAMERICA

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This article assembles archaeological and documentary evidence on the sizes of cities in Mesoamerica on the eve of Spanish conquest. Out of several hundred documented Late Postclassic urban centers, eighty-seven have reliable archaeological data on the area of the total city and/or the area of the central administrative zone (called the epicenter). The median urban area is 90 hectares (ha), and the median epicenter is 2.0 ha. These data are analyzed in terms of geographical zone, political type, population size and density, and rank-size distributions. The results suggest that political and administrative factors were the primary determinants of city size, with geographical zone having only a minor influence.

Keywords: *Mesoamerica; archaeology; urbanism; city size; rank size*

The ancient societies of Mesoamerica—Mexico and northern Central America—are generally acknowledged as urban civilizations, yet our knowledge of the forms, functions, and meanings of Mesoamerican cities and towns remains rudimentary. Mesoamericanists have not agreed on definitions of key concepts like *city*, *town*, and *urban*. General discussions of Mesoamerican urbanism have focused on a small number of large, atypical cities, avoiding consideration of the far more numerous towns and smaller cities.¹ There are useful studies of urban form within limited Mesoamerican cultural traditions² as well as regional studies of major capitals and their immediate hinterlands.³ Systematic and comprehensive data are scanty, however, limiting progress in understanding the nature and history of urbanism in ancient Mesoamerica. One of the more popular approaches today—speculative discussions of the possible cosmological symbolism of ancient cities—contributes little to our understanding of the nature of Mesoamerican urbanism.⁴

The Late Postclassic period (a.d. 1200-1520) was a time of great social and cultural dynamism throughout Mesoamerica. Populations grew rapidly, city-states and empires expanded across the landscape, commercial trade reached new heights, and elites exchanged information, styles, and goods through a

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variety of processes of long-range interaction.⁵ These processes show a cross-cultural association with urbanization in early civilizations,⁶ and it is no surprise that urban centers were numerous and widespread in Mesoamerica at the time of European conquest. Yet scholarship on Late Postclassic urbanism has focused heavily on one city—the Aztec imperial capital Tenochtitlan—with some attention to a few other large cities such as Mayapán and Tzintzuntzan. Tenochtitlan, the most powerful city in Late Postclassic Mesoamerica, does enjoy unmatched levels of historical and archaeological documentation.⁷ But Tenochtitlan was the least typical city in all of Mesoamerica, and any attempt to understand Postclassic urbanism and its social context must consider the many smaller and much more poorly documented cities and towns that thrived in nearly all parts of Mesoamerica. In this article, I survey available archaeological evidence on the sizes of Late Postclassic Mesoamerican urban centers. By presenting a comprehensive and systematic account of a narrow domain, I hope to contribute to the task of building a body of scholarship on the nature of urbanism among the ancient civilizations of Mesoamerica.

APPROACHES TO MESOAMERICAN URBANISM

Mesoamericanists have been unable to come up with generally accepted definitions of *city*, *urbanism*, or *urbanization*. Instead, archaeologists have engaged in arguments about whether demography or function is more important in defining and analyzing ancient cities and towns. William T. Sanders and his colleagues have presented a consistent argument for a demographic definition of urbanism. Following the lead of sociologist Louis Wirth, Sanders defines cities as settlement with large, dense populations and evidence for social or economic complexity.⁸ For Sanders, the huge Central Mexican imperial capitals of Teotihuacan (Classic period, a.d. 200-600) and Tenochtitlan (Late Aztec period, a.d. 1350-1520) represent the “ideal” Mesoamerican urban forms. The Classic period capitals in the Mayan lowlands are viewed by Sanders as nonurban ceremonial centers because of their smaller overall population sizes, lower settlement densities, and lower level of economic specialization.

Other Mesoamericanists favor a functional definition of urbanism that defines cities as settlements whose institutions and activities affect a larger hinterland.⁹ These and other scholars have been critical of Sanders’s restricted use of the labels *urban* and *city* for only a few of the largest Mesoamerican sites.¹⁰ The impressive Classic Mayan sites, with their towering pyramids and newly deciphered hieroglyphic inscriptions, were clearly political capitals,¹¹ and thus from a functional perspective, they qualify as urban settlements. In one paper, Sanders and Webster adopted several themes from Richard G. Fox’s functional approach to preindustrial cities and suggested that the largest Mayan capitals—notably, Tikal and Copán—could be considered urban

settlements.¹² More recently, however, these scholars changed their minds, arguing that the Mayan settlements are better off not classified as urban.¹³ Although I favor a functional definition of urbanism,¹⁴ my purpose here is to present data on urban size that will increase understanding of both the functional and demographic characteristics of Postclassic Mesoamerican cities and towns.

METHODS AND SAMPLE

My sample consists of all Late Postclassic urban-type settlements that have published data on urban form. I use a heuristic definition of “urban-type” settlement as an archaeological site 10 hectares (ha) or larger in area that has more than one public building (stone structures such as pyramids, palaces, ball courts, and the like). The data presented here were generated as part of a larger investigation of urban architecture and layout in Late Postclassic Mesoamerica.¹⁵ Analyses of other data from that project will be presented separately. The project involved the construction of a database (in Microsoft Access) containing information on sites and urban architecture. Project members assembled information on sites with published maps and data on public architecture and/or an overall site map. We began with a broad strategy that included smaller, more specialized settlements—such as hilltop ceremonial zones and fortresses—not typically considered “urban” in character, in addition to the cities and towns discussed below. The initial sample includes numerous sites that turned out to have almost no usable data (i.e., no site map or reliable data on urban architecture or layout). We made an effort to find as many published Late Postclassic sites as possible, reviewing numerous works published in the United States, Mexico, Guatemala, Britain, France, Germany, and Spain. Most of these are monographs or articles describing excavations or mapping operations at urban sites.

The sample does not include cities whose only archaeological documentation is in regional settlement survey reports. I made this decision, which eliminates numerous Late Postclassic urban settlements with size data, for several reasons. First, few of the sites discovered in regional survey projects have good architectural maps. Second, many of the Late Postclassic settlements documented in survey reports coincide spatially with earlier settlements (many of them urban in character), and it is impossible to date their public architecture reliably in the absence of excavations. Third, and most important, only a few areas of Mesoamerica have been surveyed intensively, and the inclusion of city size data from regional settlement surveys would bias the sample strongly toward those regions with good survey coverage: the Valley of Oaxaca and surrounding areas, and the Basin of Mexico.¹⁶ The present sample is not the largest sample that could be generated of Late Postclassic urban centers, but it does have the advantage of covering most parts of Mesoamerica at a roughly

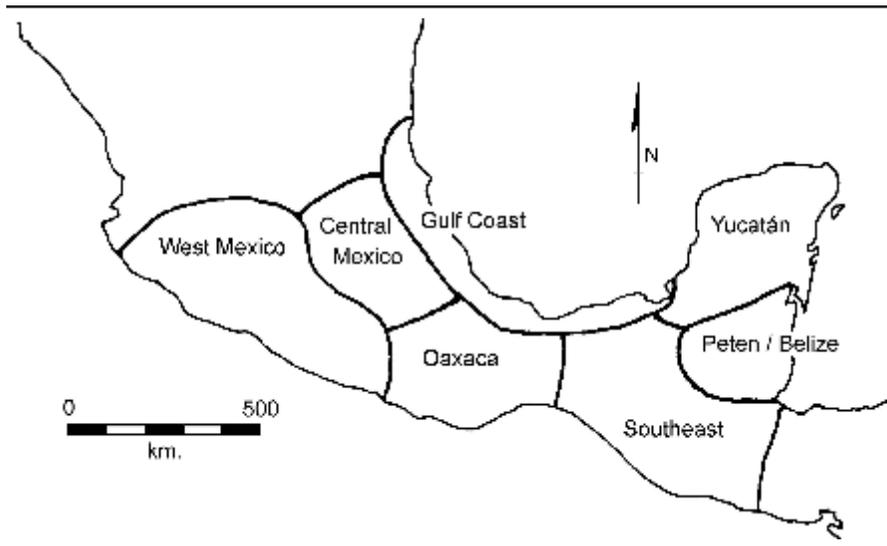


Figure 1: Map of Mesoamerica Showing the Spatial Zones Used in This Article

comparable level of inclusion. Regional comparability is more important than total sample size for the topics addressed here.

Sites are recorded within six regional categories that I call *zones* (see Figure 1). *Central Mexico* is the central Mexican highlands, including northeast Guerrero; *Gulf Coast* includes the Huasteca and lowland areas of the states of Veracruz and Tabasco; *Southeast* includes the Mexican state of Chiapas, highland Guatemala, and northwestern Honduras; *Oaxaca* corresponds to the modern state of that name; *Petén* includes the Petén region of Guatemala and the nation of Belize; *West Mexico* includes the Mexican states of Michoacán, Guerrero, and Jalisco; and *Yucatán* covers the states of Yucatán, Campeche, and Quintana Roo. These zones were initially isolated as convenient categories to organize data collection, but the analyses presented below suggest that some of the zones may correspond to the spatial/functional entities known as systems of cities. Zones are larger than the units normally called *regions*. In economic geography and economic anthropology, a region is typically defined as the hinterland of a high-order central place.¹⁷ The Central Mexico zone, for example, includes a number of areas typically considered economic regions in Late Postclassic times, such as the Basin of Mexico, Morelos, the Toluca Valley, the Puebla/Tlaxcala area, and other highland valleys.

The data analyzed in this article, along with citations, are shown in the appendix. Many of the sites initially investigated did not turn out to have usable data. Usable data consist of accurate site maps and/or systematic information on urban architecture, plus sufficient chronological information to assign the urban site and architecture to the Late Postclassic period. Of 153 sites in the initial sample, 111 have usable data of some sort. Of these, 87 have published maps or descriptions of sufficient quality to measure their total area

TABLE 1
Numbers of Sites by Zone

<i>Zone</i>	<i>Setting</i>	<i>Sites in Sample</i>
Central Mexico	Highland	26
Oaxaca	Highland	9
West Mexico	Highland	7
Gulf Coast	Lowland	7
Southeast	Mixed	24
Petén/Belize	Lowland	6
Yucatán	Lowland	8
Total		87

and/or their epicenter area. This is the sample analyzed in the present article. Fifty-nine of the 87 sites have data on their total area, and an additional 28 have data on their epicenter area. Of the 59 sites with area data, 21 also have epicenter measurements. The numbers of sites in each category are listed by zone in Table 1. This sample is small in comparison with the total number of towns in Late Postclassic Mesoamerica. The authors of *Aztec Imperial Strategies* compiled a list of 620 towns in the Aztec Empire at the time of Spanish conquest.¹⁸ I estimate that 60 percent of the towns in all of Mesoamerica were in the empire, suggesting a total of some 1,000 urban centers. My sample can therefore be estimated at approximately 9 percent of all Late Postclassic urban centers.

In the appendix, *type* is a rough approximation of functional category based on opinions of the excavators and other writers on Late Postclassic society. The basic functional type is the *political town* (type 2), with sixty-four examples in the sample. These were urban settlements that were homes of petty kings, such as central Mexican city-state capitals;¹⁹ archaeologically, these sites typically contain an epicenter with one or more temple-pyramids, a palace, and perhaps a ball court, all grouped around a public plaza.

A few political towns with well-documented and pronounced nonadministrative urban functions are singled out as types 3 through 5. Otumba, an Aztec craft center, is the only town of type 3 (*political town, crafts specialization*). Type 4 towns (*political town, trade specialization*) are El Tigre, Naco, and El Corozal (see appendix). Mitla is the only example of type 5 (*political town, religious specialization*). Although these examples seem well documented, it is almost certain that many other, less well studied urban settlements also belonged to these specialized types. For this reason, I do not give great importance to the distinctions among types 2 through 5. Type 1, *major political capitals*, includes three central Mexican cities—the Middle Postclassic (Early Aztec) city of Teopanzolco, and the Late Postclassic (Late Aztec) cities of Tenochtitlan and Texcoco—and Tututepec, Tzintzuntzan, and Mayapán. The classification of these cities as major capitals derives predominantly from historical, not archaeological, documentation.

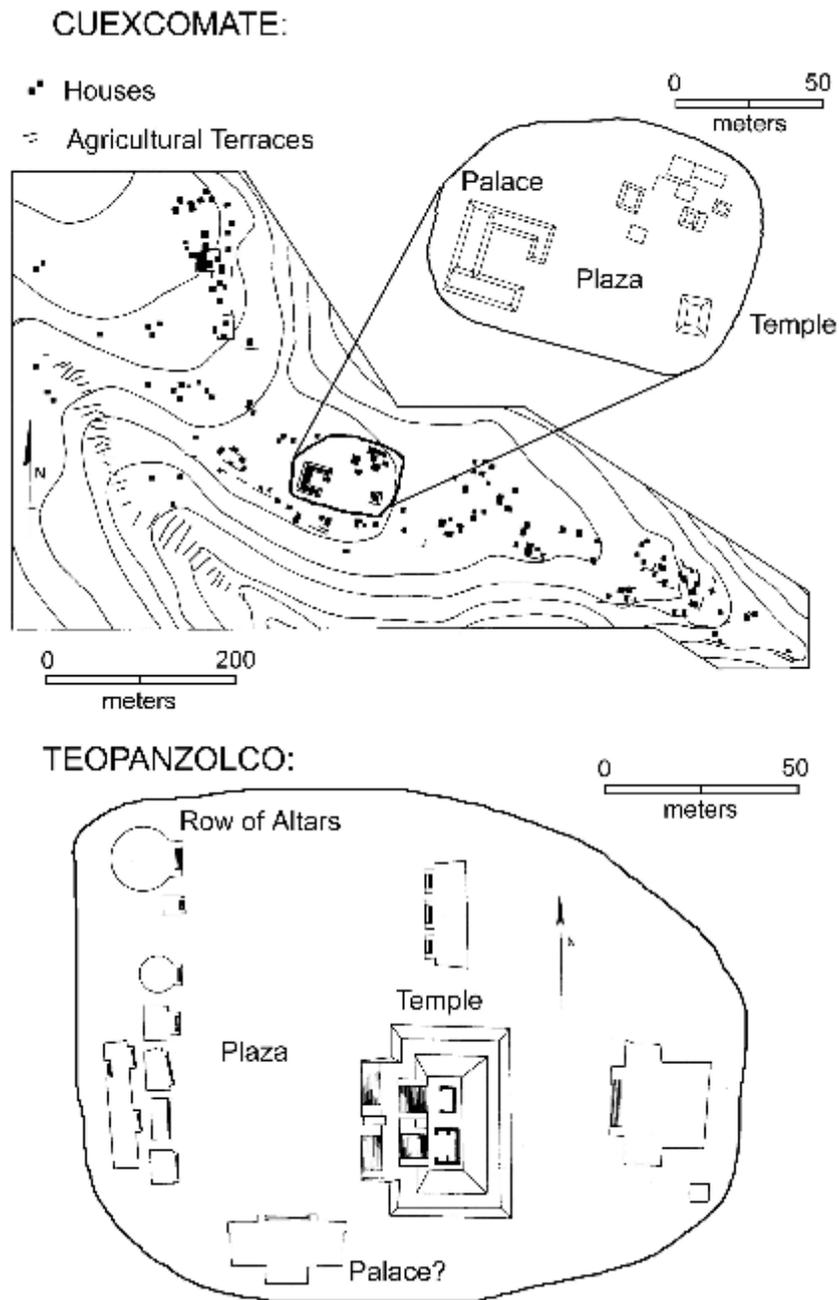


Figure 2: Definitions of Epicenters at Cuexcomate, a Small Town, and Teopanzolco, a Major Capital

SOURCE: Based on maps in Michael E. Smith, *The Aztecs*, 2nd ed. (Oxford, 2003), 75, 40.

NOTE: The architecture shown here for Teopanzolco is all that remains of this Early Aztec major capital; the rest of the site is buried under the modern city of Cuernavaca.

Site areas are measured in hectares. Published measurements by archaeologists who have worked at sites were used when available. In the absence of published data, site area was measured by digitizing site maps (using a digitizing tablet and Autosketch software). In a few cases, estimates of site area were made from imprecise comments by fieldworkers (e.g., a site said to extend 500 meters north-south by 400 meters east-west was estimated at 20 ha) or from incomplete maps; the sources of area measurements (published, digitized, or estimated) are included in the appendix. Four size classes were defined based on the quartiles of the distribution of the fifty-nine sites in the sample with area data.

Postclassic cities, like earlier Mesoamerican cities, tend to have a concentration of stone public architecture in their center, surrounded by low-density residential zones. This concentration of temples, palaces, ball courts, plazas, and other buildings is commonly called the site's *epicenter*. There are few published discussions of site epicenters (apart from treatments of individual buildings) and few measurements of their areas. I evaluated site maps to determine whether each site has an epicenter (see discussion below), and for sites that do have a central concentration of architecture, I drew a rounded shape that included the public architecture making up the epicenter (see Figure 2). I then measured the areas of these shapes with a digitizing tablet.

Published population figures for sites were recorded where available. Because of the wide variation in archaeological methods for estimating urban populations,²⁰ these data are reliable and comparable in only a rough fashion (see below). Other information was recorded in the course of data gathering—including topographic setting, locations with respect to bodies of water, and the presence of various types of public buildings—are not discussed in the present article.

URBAN SIZE

AREA

Postclassic urban centers range in size from 10 ha (my lower size limit) to the 2,100 ha Tututepec. The distribution of site size is shown in Figure 3. Because the distribution is skewed by a small number of very large cities, the median is a better indicator of central tendency than the mean; the median site size for all of Mesoamerica is 90 ha. The size data are broken down by size class and zone in Table 2. The differences in urban site size between zones—as measured by median site size and by the distribution among size classes—are considerable. The highland zones of northern Mesoamerica (Central Mexico, Oaxaca, and West Mexico) had much larger urban centers than the Mayan zones of southern Mesoamerica (Southeast, Petén/Belize, and Yucatán). Sev-

TABLE 2
Sizes of Cities by Zone

Zone	Number of Sites	Median Area	Size Category			
			1 (> 205 ha)	2 (90-205 ha)	3 (22-90 ha)	4 (10-22 ha)
Central Mexico	18	100	6	6	3	3
Oaxaca	7	68	1	2	4	
West Mexico	7	215	4	3		
Gulf Coast	4	185	2	1	1	
Southeast	10	14		2	2	6
Petén/Belize	6	41	1	1	2	2
Yucatán	7	25	1		3	3
Total sample	59	90	15	15	15	14

TABLE 3
Sizes of Cities by Political Type

Political Type	Number of Sites	Median Area	Size Category			
			1 (> 205 ha)	2 (90-205 ha)	3 (22-90 ha)	4 (10-22 ha)
Major capitals	5	674	5			
Political towns	51	68	12	14	13	12
Other towns	3	30			2	1
Total sample	59	79	17	14	15	13

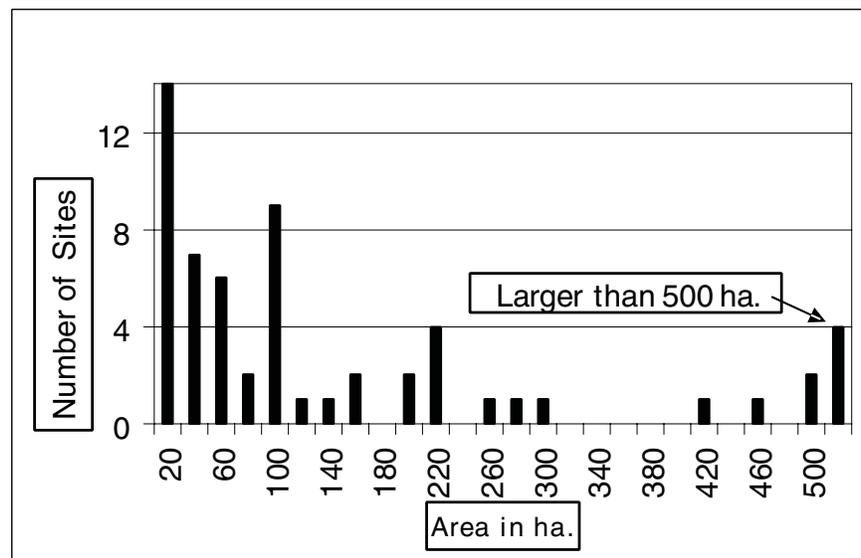


Figure 3: Urban Site Areas in Late Postclassic Mesoamerica

TABLE 4
The Largest Late Postclassic Cities (Size Class 1)

<i>City</i>	<i>Zone</i>	<i>Type</i>	<i>Size (ha)</i>	<i>Population</i>	<i>Epicenter Size</i>
Tututepec	Oaxaca	1	2,100		
Tenochtitlan	Central Mexico	1	1,350	212,500	16.9
Zacapu	West Mexico	2	1,100	20,000	
Tzintzuntzan	West Mexico	1	674	30,000	34.4
El Tigre	Gulf Coast	4	500		
Santa Rita	Petén/Belize	2	500	7,000	
Texcoco	Central Mexico	1	450	24,100	
Mayapan	Yucatán	1	420	21,000	12.8
Huexotla	Central Mexico	2	300	17,100	
Eronguaricuaro	West Mexico	2	275		
Chalco	Central Mexico	2	250	11,000	
Otumba	Central Mexico	2	220	10,700	
Zempoala	Gulf Coast	2	220		16.0
Acambaro	West Mexico	2	215	6,000	
Yautepec	Central Mexico	2	209	15,100	

eral sources of bias in the data, however, may contribute to this pattern. Whereas large cities are known from all zones (Tables 2 and 3), the identification and study of smaller Mesoamerican urban centers are affected by several factors. Fewer such smaller urban sites are known and studied in areas with dense vegetation, in remote areas far from modern cities and roads, and in areas that have seen less archaeological fieldwork. Whereas it is unlikely that any additional Late Postclassic sites with public architecture are lurking in the well-studied Basin of Mexico or the Valley of Oaxaca, for example, there are probably numerous unreported (or at least unstudied) smaller Postclassic urban centers in tropical lowland environments.

Nevertheless, in the drier and well-studied zones of northern Yucatán and highland Guatemala (included in the Southeast zone), most urban sites are much smaller than in northern Mesoamerica, suggesting that the northern/southern contrast in site size is not entirely an artifact of sampling and data reporting. There appears to have been a real difference in urban site size between these parts of Late Postclassic Mesoamerica. The major political capitals with size data were larger than political towns by an order of magnitude (Table 3). The list of the largest urban sites (size class 1) includes all the sites classified as major political capitals (Table 4).

POPULATION SIZE AND DENSITY

I located population estimates for only sixteen of the sites with measured areas (Table 5). Given the wide variation in methods of population estimation—including estimates from both archaeological and documentary data—I am hesitant to attach too much significance to these data. The huge size of

TABLE 5
Population Size and Density for Late Postclassic Cities

<i>Site</i>	<i>Zone</i>	<i>Type</i>	<i>Population</i>	<i>Area (ha)</i>	<i>Density</i>
<i>Low-density sites</i>					
Siguatecpan	Central Mexico	2	1,100	106	10.4
Santa Rita	Petén/Belize	2	7,000	500	14.0
Ixtapaluca Veijo	Central Mexico	2	1,400	90	15.6
Zacapu	West Mexico	2	20,000	1,100	18.2
Acambaro	West Mexico	2	6,000	215	27.9
<i>Medium-density sites</i>					
Chalco	Central Mexico	2	11,000	250	44.0
Tzintzuntzan	West Mexico	1	30,000	674	44.5
Otumba	Central Mexico	3	10,700	220	48.6
Mayapan	Yucatán	1	21,000	420	50.0
Coatlan Viejo	Central Mexico	2	800	15	53.3
Cuexcomate	Central Mexico	6	800	15	53.3
Texcoco	Central Mexico	1	24,100	450	53.6
Huexotla	Central Mexico	2	17,100	300	57.0
Naco	Southeast	4	10,000	160	62.5
Yautepec	Central Mexico	2	15,100	209	72.2
<i>High-density site</i>					
Tenochtitlan	Central Mexico	1	212,500	1,350	157.4
Mean			24,287.5	379.6	48.9
Standard deviation			49,711.5	376.7	34.4
Median			10,850	235	49

Tenochtitlan clearly skews this distribution, which has a very high standard deviation relative to the mean. The median population for these sites is 10,850. More interesting than the populations per se are the data on population densities. There are two clear breaks in the distribution of population density, and I have used these to define three density classes. There are five low-density urban sites whose densities range from 10.4 to 27.9 persons per ha, ten medium-density sites (44.0 to 72.2 persons per ha), and one high-density site (Tenochtitlan, with a density of 157.4). The correlation between site area and population is only .765 for the entire sample in Table 5, but within the low-density and medium-density groups the correlations are very high (.980 and .975 respectively), suggesting that these categories are meaningful in capturing real patterns in the distribution of population sizes and densities.

An interesting feature of the three density-based categories of Late Postclassic urban centers is that they do not show an association with zones or environmental setting. This finding goes against the assertion that highland Mesoamerican cities were more densely occupied than lowland cities.²¹ Tenochtitlan was clearly the most densely occupied Postclassic city, but the data in Table 5 are notable for the variation in density within zones. Apart from Tenochtitlan, all major capitals, in whatever zone, were medium-density sites,

suggesting a broad association between political preeminence and urban population density.²²

THE URBAN EPICENTER

I use the term *epicenter* to describe the central, “downtown” portions of Postclassic urban settlements. The epicenter contains the largest buildings and the greatest concentration of public buildings at a site. Most of the mapped sites in the sample have an identifiable epicenter, although some do not. At Calixtlahuaca in Central Mexico, for example, the public architecture (several temple-pyramids, a palace, and some large platforms of unknown function) is spread out across the landscape with no clear focal point,²³ and the city of Coixtlahuaca in Oaxaca may similarly have no definable architectural epicenter.²⁴ Most epicenters consist of one or more public plazas flanked by public buildings. In most ancient Mesoamerican cities, the architecture in the epicenter was carefully planned and laid out, sometimes with astronomical alignments; in contrast, the surrounding residential areas usually show little or no overall planning.²⁵ Figure 4 illustrates two epicenters of differing size.

The most common buildings in Mesoamerican urban epicenters were temple-pyramids, palaces, and ball courts. Mesoamerican ball courts were the setting for a poorly understood ball game that combined ritual, sport, and politics.²⁶ For present purposes, the significance of ball courts is that they were a basic Mesoamerican urban feature, most commonly located in urban epicenters. Formal plazas were probably used for religious ceremonies and state events. Some Postclassic plazas had associated public art (inscriptions and/or mural paintings) that communicated various political, ritual, and ideological messages. Periodic markets probably met in open areas in city epicenters. The activities and features of urban epicenters pertained to two broad domains: (1) the administration of the city and the basic social activities and needs of urban residents, and (2) the role of the city as a political capital. For the latter role, important architectural features were the tall temple-pyramids, large public plazas, and visual and symbolic expressions of planning in the arrangement of public architecture. Although the data discussed here do not permit detailed functional inferences, the size of an urban epicenter can serve as a rough approximation of the significance of urban administration and political power in Postclassic towns.

I was able to measure epicenter areas for fifty-two sites. Of these, twenty-one are included in the fifty-nine sites with total site area data, and twenty-eight have epicenter data without total site area. The large number of sites with measured epicenters but no area data is a function of the history of archaeological research at Mesoamerican urban sites. In the past, many fieldworkers concentrated exclusively on the public architecture at the center of urban sites and ignored residential zones. Their maps of site epicenters can be used, but there

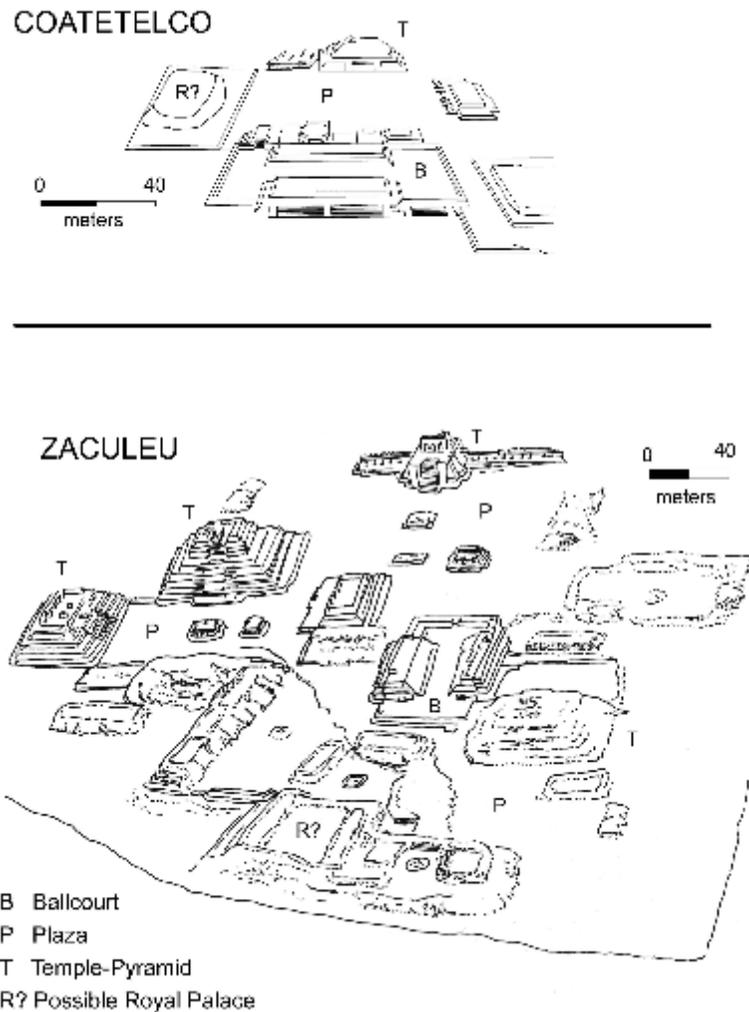


Figure 4: Sketches of Urban Epicenters at Coatetelco (1.1 ha) and Zaculeu (6.0 ha)
 SOURCE: Coatetelco drawing from Michael E. Smith, *The Aztecs*, 2nd ed. (Oxford, 2003), 178; and Zaculeu drawing after William M. Ferguson and Richard E. W. Adams, *Mesoamerica's Ancient Cities: Aerial Views of Pre-Columbian Ruins in Mexico, Guatemala, Belize, and Honduras*, rev. ed. (Albuquerque, N.M., 2001), 165.
 NOTE: Like most Late Postclassic urban sites, only some structures have been excavated and restored.

are no maps of the total extent of urban settlement at these sites. Even when archaeologists do explore beyond the epicenter to excavate houses and workshops, however, it can be very difficult to map urban sites in settings of dense tropical forest cover, particularly when commoner residences are small and difficult to locate without excavation. Many Late Postclassic sites today lie buried under modern cities, also preventing analysis of residential zones.

TABLE 6
Sizes of Urban Epicenters by Zone

Zone	Number of Sites	Median Area	Size Category		
			1 (> 9 ha)	2 (3-9 ha)	3 (< 3 ha)
Central Mexico	13	1.9	3	1	9
Oaxaca	4	6.6	1	3	
West Mexico	1		1		
Gulf Coast	4	3.7	1	1	2
Southeast	22	1.9	2	6	14
Petén/Belize	2	1.0			2
Yucatán	3	1.1	1		2
Total sample	49	2.0	9	11	29

TABLE 7
Sizes of Urban Epicenters by Political Type

Political Type	Number of Sites	Median Area	Size Category		
			1 (> 9 ha)	2 (3-9 ha)	3 (< 3 ha)
Major capital	4	14.9	3		1
Political town	35	1.9	6	9	20
Hilltop ceremonial zone	2	0.4			2
Fortress	2	4.2		1	1
Political status unknown	6	2.1		1	5
Total sample	49	2.0	9	11	29

The sizes of urban epicenters in the sample range from 0.3 ha to 34.4 ha (Figure 5),²⁷ with a median size of 2.0 ha. There is some variation in epicenter size by zone (Table 6), although the small size of the sample for most zones limits the reliability of these data. In fact, the two zones with more than ten measured epicenters—Central Mexico and Southeast—have the same median epicenter area (1.9 ha). Epicenter size varies more systematically with political type; the median size of epicenters of major capitals is an order of magnitude larger than the epicenters of political towns (Table 7).

Epicenter size is also strongly associated with city size. Epicenter size increases with overall site size in a logarithmic pattern (Figure 6); the correlation coefficient (R^2) for the logarithmic relationship (.776) greatly exceeds the value for a linear relationship (.323). The outlier in this graph (Tenochtitlan) does not greatly affect the relationship, which is almost unchanged when Tenochtitlan is removed. Epicenter size increases rapidly with site size at the lower end of the size scale, and then, above 10 ha, it begins to flatten out. Larger cities have more public architecture (i.e., a larger epicenter) than smaller cities, but only up to a point. This finding is puzzling, and the data discussed in this article are not adequate to provide an explanation. I will suggest

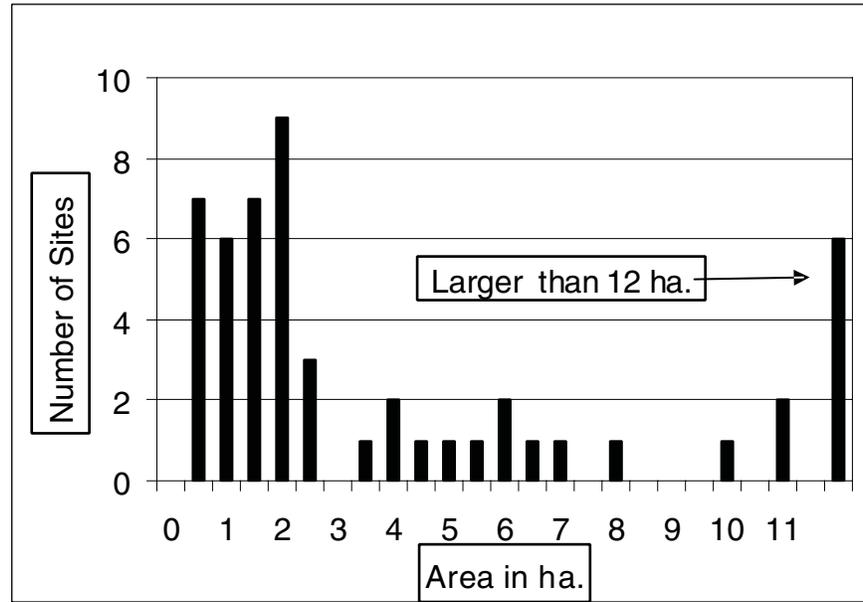


Figure 5: Urban Epicenter Areas in Late Postclassic Mesoamerica

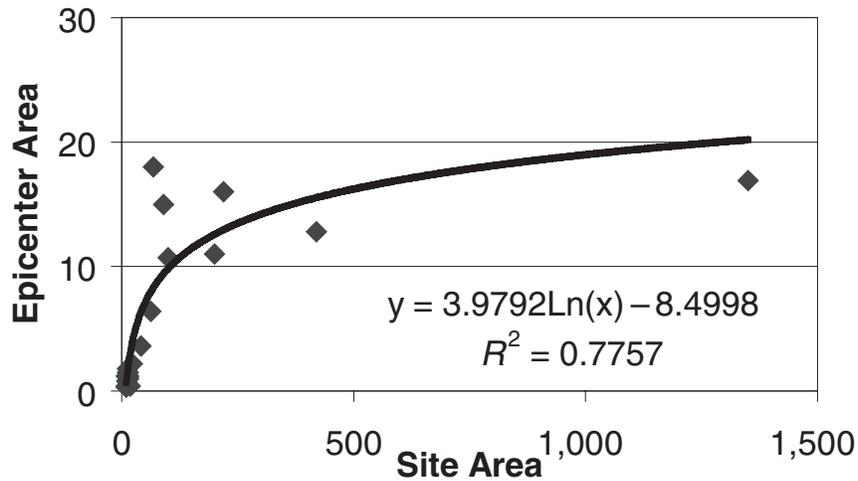


Figure 6: Association between Site Area and Epicenter Area for Late Postclassic Cities

some of the implications and possible explanations for this finding, leaving it to future research for more complete analysis.

Because many of the buildings and spaces in the epicenter related to urban administration, epicenter size should be correlated with city size (or, more precisely, with urban population). The flattened epicenter size distribution in Figure 6 may result from the presence of smaller urban administrative zones within the largest cities. For example, the Aztec imperial capital

Tenochtitlan—the largest city in Figure 6—had four smaller civic precincts (in addition to the central epicenter), one in each quarter of the city.²⁸ This pattern, designated the “multiple nuclei model” by Joyce Marcus, is not uncommon in large Mesoamerican cities.²⁹

The strong variation of epicenter size with political type (Table 7) suggests that the buildings located there played important roles in polity administration, propaganda, and state ceremony. Roland Fletcher has shown that the size of ancient (and modern) settlements is limited by the nature of information technology and patterns of crowding and interaction.³⁰ Perhaps similar factors placed an upper limit on the size of urban epicenters in Late Postclassic Mesoamerica. Alternatively, Late Postclassic rulers simply may not have felt the need to construct grandiose epicenters on the scale of their Classic ancestors. Classic Mayan cities had larger epicenters on average than Late Postclassic cities,³¹ a pattern typically attributed to the smaller sizes of Late Postclassic polities and the greater emphasis on commercial exchange compared to the Classic period.³²

CITY SIZE DISTRIBUTIONS

The distribution of city sizes provides clues to urban functions on a macroregional scale. In the 1950s and 1960s, geographers developed the technique of *rank-size analysis* to study the sizes of cities within nation-states.³³ An empirical pattern was observed in a number of areas of the world in which the second-largest city has roughly one-half the population of the largest city, the third-largest city has one-third the population, and so on down the size scale. This distribution, known as the *log-normal* distribution, is illustrated by plotting city size (Y axis) against rank (X axis). When these variables are graphed using logarithmic scales, the log-normal distribution is expressed as a declining straight line. Two major kinds of deviations from the log-normal pattern have been noted for various nations and regions: primate distributions (in which the largest city is “too large” for the log-normal pattern) and convex distributions (in which there are “too many” very large cities). Much of the literature on rank-size analysis is devoted to exploring the causes and implications of deviations from log-normal distributions.³⁴

Archaeologists seized on rank-size analysis as a potentially useful tool for analyzing settlement patterns, and they joined the discussion of the determinants of the various rank-size distributions. Most applications by archaeologists have been conducted on a regional scale, such as the Valley of Oaxaca and the Basin of Mexico, or the plains of Mesopotamia.³⁵ A number of archaeologists went beyond the limits of the method to address the distribution of the sizes of tiny settlements that were not central places.³⁶

To summarize the findings of geographers, anthropologists, and archaeologists, log-normal distributions tend to be found in large urban systems with a long history of commercial and demographic interaction among central places

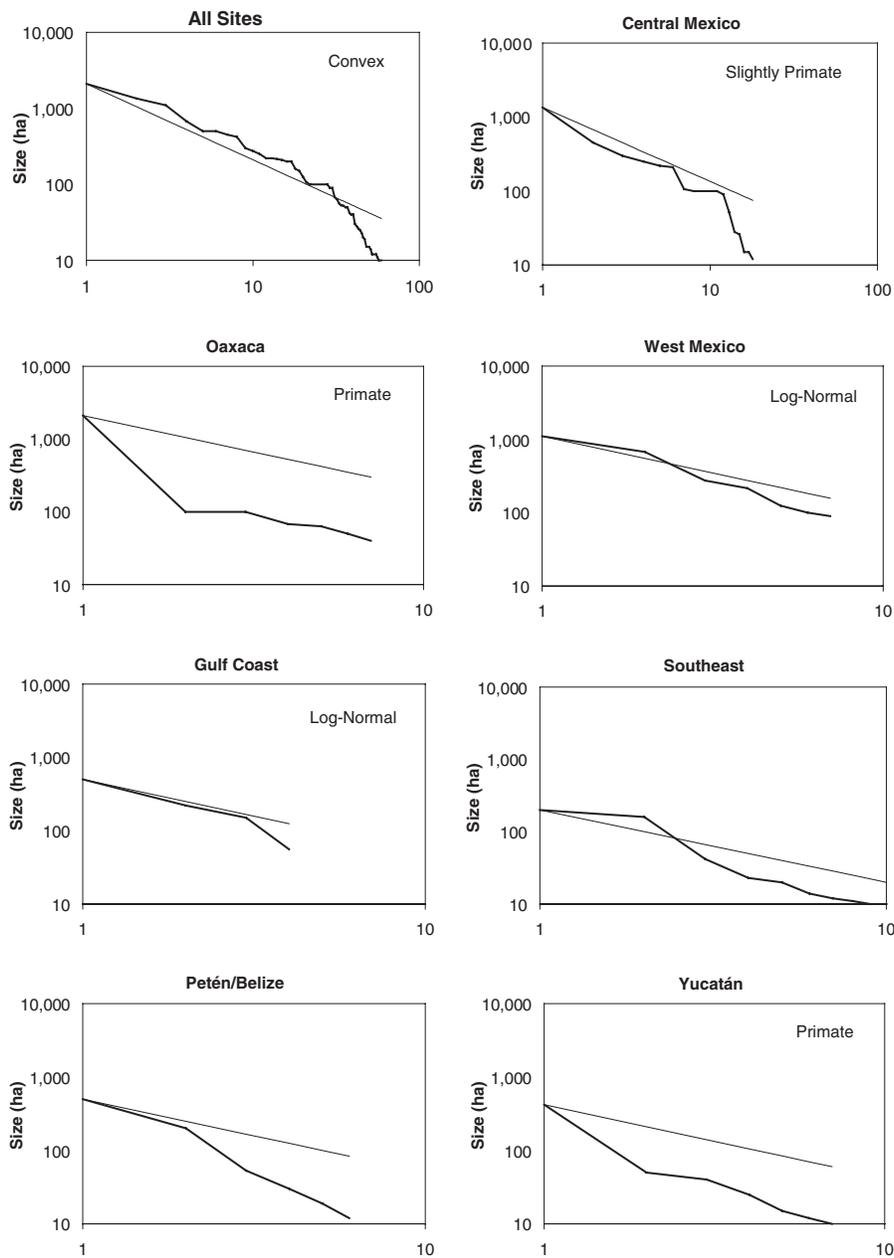


Figure 7: Rank-Size Plots for Late Postclassic Cities

(as well as between central places and their hinterlands); this is generally considered the expected pattern in modern industrialized nations. Primate distributions, in the words of G. William Skinner, “indicate an excess of centrality

and suggests [*sic*] either an extraordinary centralization of regional services or a role for the primate city that extends beyond its regional hinterland.”³⁷ For ancient civilizations, primacy is found for imperial capitals and other cities that served as powerful political capitals. Finally, convex distributions indicate either an error of scale (the pooling of autonomous urban systems) and/or situations of low overall system integration.³⁸ These patterns can be applied to the Postclassic Mesoamerican city-size data within zones.

RANK-SIZE GRAPHS

Rank-size plots of Postclassic Mesoamerican city sizes are presented in Figure 7. The plot for all of Mesoamerica has a convex shape, suggesting that the relevant urban systems were smaller in size and/or that the overall urban integration of Mesoamerica was low. Given the large size of Mesoamerica relative to the primitive transport technology, this convex distribution is not surprising. Two of the zones have strongly primate distributions: Oaxaca and Yucatán. The major capital city Mayapán—the largest city in the latter zone—dominated the area politically and economically in Late Postclassic times.³⁹ In Oaxaca, the large size of Tututepec relative to other cities produced a very strongly primate pattern. Although probably the capital of a small empire, it is unlikely that Tututepec dominated all of Oaxaca, and this distribution appears to be an anomaly.⁴⁰

Central Mexico has a slightly primate pattern. Whereas Tenochtitlan was much larger than Texcoco—the second-largest city—there were a number of other large cities as well (Table 4), making this distribution less strongly primate than Oaxaca and Yucatán. The functional implication is that Tenochtitlan’s degree of political and economic dominance within central Mexico may have been less than Mayapán’s level of control in Yucatán. Indeed, rank-size graphs for just the Basin of Mexico reveal more strongly primate distributions in both the Classic and Early Postclassic periods (with Teotihuacan and Tula as the primate centers) than in the Late Postclassic period.⁴¹

Two zones—West Mexico and Gulf Coast—exhibit size distributions that are close to the ideal, log-normal form. Minimally, this suggests that these zones were not dominated by their largest center. In fact, the most powerful capital in West Mexico—Tzintzuntzan—was not the largest city (Table 4). Whether it is possible to go further and infer that these two areas were well-integrated urban systems is unclear. The remaining two areas have ambiguous rank-size distributions: Southeast Mesoamerica has a very slightly convex pattern, whereas Petén/Belize has a very slightly primate pattern (with Santa Rita the largest city). The Late Postclassic period in Southeast Mesoamerica has seen less systematic research than many other zones, and in the early stages of archaeological fieldwork, the largest sites tend to be reported and studied first.

SYSTEMS OF CITIES?

Some of the spatial units I used initially for the sake of convenience in data gathering—*zones*—may approximate areas with functional significance known as systems of cities. A city system is an integrated collection of urban centers, each the center of a marketing region, that interact with one another through exchanges of goods and information.⁴² Most discussions have focused on city systems that are contained within modern nation-states. Walters, however, has pointed out that city-systems can exist at various levels, including a cross-polity world-system level in which the city-system covers a group or system of independent city-states.⁴³ This describes the general political landscape in Late Postclassic Mesoamerica, where city-states and other forms of small polities predominated.⁴⁴ Commercial exchange and other forms of long-distance interaction were extensive in Late Postclassic Mesoamerica far more than in any earlier period,⁴⁵ and such interaction is a prerequisite for the existence of integrated systems of cities that transcend individual regions. The city-system concept has been little used by archaeologists, who have framed most rank-size analyses of city size at the level of the region.⁴⁶

The fact that most of the rank-size plots for individual zones (Figure 7) exhibit either log-normal or primate distributions suggests that some of the zones may be integrated systems of cities. For example, Mayapán was capital of an extensive state, perhaps a small empire, whose extent corresponds roughly to the Yucatán zone as discussed here. This zone may correspond to a city system that included Buena Vista, El Cedral, Muyil, and other cities of northern Yucatán. The Central Mexico zone was the setting for numerous city-states that together comprised the core area and inner provinces of the Aztec triple alliance empire. This zone has long been recognized as an area of extensive trade and interaction among its constituent regions,⁴⁷ and central Mexico provides probably the strongest case for the existence of a Late Postclassic city system in Mesoamerica. West Mexico, the zone with the greatest number of large cities after Central Mexico (Table 2), was the home of the Tarascan Empire. Documentary and archaeological research reveal extensive networks of trade and interaction within the empire and between the empire and its neighbors,⁴⁸ suggesting that this zone too may have comprised a functional city system. For the other zones discussed in this article, there is less archaeological and documentary evidence for the nature of macroregional interaction patterns, and it would be premature to suggest the presence of integrated city systems in those areas.

CONCLUSIONS

This is the first study to examine a large sample of ancient cities from a single time period in Mesoamerica.⁴⁹ Although an adequate understanding of

Mesoamerican urbanism must await the integration of city sizes with data on urban form (architecture, layout, and planning) and urban functions (economic, administrative, and religious) the size data presented above do provide a number of insights into Late Postclassic Mesoamerica. There was no “typical” Late Postclassic urban settlement; the variation in the sizes of sites and epicenters is extensive. Some of that variation appears to relate to environmental setting. Cities in highland zones, for example, were much larger than cities in lowland zones (Table 2). Other attributes do not show an association with environmental setting, however. Population density—claimed by some to vary between highland and lowland urban Mesoamerican cities—does not seem related to environmental setting, nor do the rank-size plots (Figure 7) vary systematically with the highland/lowland dichotomy.⁵⁰

The data discussed in this article illuminate some of the political dimensions of city size in Late Postclassic Mesoamerica. There are little systematic data, however, on other kinds of urban functions, such as retail marketing, craft production, and religious activity. Research on Aztec cities in Central Mexico reveals considerable variation in the intensity and diversity of craft production at city-state capitals, from major multiple craft industries at Otumba through moderate household production at Yautepec to minimal production (beyond domestic textile production, ubiquitous at Aztec sites of all sizes) at Huexotla.⁵¹ Unfortunately, there are not enough urban sites like these with good economic data to explore the associations and implications of urban economic functions in the wider arena of Late Postclassic Mesoamerica.

Major political capitals—as identified from historical documents—are ten times as large, on average, as political towns, the dominant type of Postclassic urban center (Table 3). They have larger epicenters (i.e., more public buildings) than political towns. Major capitals also tend to have higher population densities than political towns (Table 5), but the difference is not nearly as striking as in the case of city and epicenter areas. The existence of discrete categories of population density (Table 5) is an interesting characteristic of these data. There is no clear zonal or environmental association with population density; both low-density and medium-density cities are found in a variety of zones and settings. No major capital, however, falls in the low-density category.

In summary, the most striking variation in Postclassic urban size relates to political status. This suggests that political role and government administration were among the most important forces influencing city size (and probably other urban characteristics) in Late Postclassic Mesoamerica. I conclude that the role of the local environmental setting was of less importance in shaping Postclassic Mesoamerican urbanism than many have traditionally maintained. What are needed now are analyses of other aspects of the Postclassic cities examined here and parallel studies of Mesoamerican urbanism from other time periods. It is only by gathering data on a large number of smaller cities that we can escape the pitfalls of generalizing about “Mesoamerican urbanism” from a small number of atypical cities.

Venta Salada	2	100	e	2	10.7	f	16
Xaltocan	2	26	d	3			23
Yautepec	2	209	p	1	8.0		24
Zultepec	2						25
<i>Gulf Coast</i>							
Cotaxtla	2	150	e	2			26
Cuatlamayan	0				2.1	e	27
El Tigre	4	500	p	1			28
Juarez/El Cuyo Grande	2				5.2	e	29
Mozomboa	2	56	d	3			30
Xochicatlan-Yahualica	0				2.2	e	31
Zempoala	2	220	p	1	16.0	p	32
<i>Southeast Mesoamerica/ highland Guatemala</i>							
Acapetahua	2	23	d	3	2.2	d	33
Cahyup	2	12	d	4	1.8	e	34
Canajasté	2	10	d	4	0.3	e	35
Cawinal	2	14	d	4	1.5	d	36
Chalchitan	0				0.8	e	34
Chisalin	2				4.0	d	37
Chitinamit (Hacawitz)	2				2.0	d	34
Chutinamit-Atitlan	2				10.0	d	34
Chutinamit-Sacapulas	2				6.0	d	34
Chutixiox	0				2.0	e	34
Cucul	2				1.0	d	34
Iximché	2				4.5	e	38
Jilotepeque Viejo	2	11	d	4	0.8	e	34
Mixco Viejo	2	20	d	4			39
Naco	4	160	p	2			40
Patzak	2	10	d	4	1.2	e	34
							10,000

(continued)

APPENDIX (continued)

Site	Site Area			Epicenter			Source
	Type	Hectares	Area Measurement Method	Size Class	Hectares	Area Measurement Method	
Pueblo Viejo Canilla (Xoyabaj)	2				1.7	d	34
Pueblo Viejo Malacatancito	2				0.5	d	34
Tenam-Aguacatan	2				1.9	d	34
Tzak Pokoma	2				5.0	d	34
Utatlan	2	200	p	2	11.0	d	41
Xolchum	2				1.7	e	42
Zacualpa	2	42	d	3	3.6	d	43
Zaculeu	2				6.0	e	44
<i>Oaxaca</i>							
Chachoapan	2	100	pe	2			45
Coixtlahuaca	2	40	pe	3			46
Guiengola	8	63	de	3	6.4	d	47
Mitla	5	68	d	3	18.0	d	48
Tehuantepec	2	50	d	3			49
Tututepec	1	2,100	p	1			50
Yagul	0				3.2	d	51
Yucuita	2	100	pe	2			45
Zaachila	2				6.7	d	52
<i>Petén</i>							
Bandera	2	53	e	3			53
Caye Coco	2	30	e	3			54
Ichpaatun	2	12	d	4	1.5	d	55

Santa Rita	2	500	p	1			7,000	57
Sarteneja	2	200	e	2				53
Zacpeten	2	19	d	4	0.4	d		58
<i>West Mexico</i>								
Acambaro	8	215	e	1			6,000	59
Eronguaticuaro	2	275	p	1				60
Ihuatzio	2	125	p	2				60
Patzcuaro	2	100	p	2				60
Tzintzuntzan	1	674	p	1	34.4	d	30,000	61
Urichu	2	90	p	2				62
Zacapu	2	1,100	p	1			20,000	63
<i>Yucatán</i>								
Aguada Grande	2	10	p	4				64
Buena Vista	2	25	d	3	0.4	d		64
El Cedral	0	40	p	3				64
Mayapán	1	420	p	1	12.8	d	21,000	65
Muyil	2	50	p	3				66
Tulum	2	12	p	4				67
Xcaret	2	15	d	4				68
Xelha	0				1.1	d		55

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61. Helen Perlstein Pollard, "An Analysis of Urban Zoning and Planning in Prehispanic Tzintzuntzan," *Proceedings of the American Philosophical Society* 121 (1977): 46-69; and Helen Perlstein Pollard, *Tariacuri's Legacy: The Prehispanic Tarascan State* (Norman: University of Oklahoma Press, 1993).

62. Helen Perlstein Pollard and Laura Cahue, "Mortuary Patterns of Regional Elites in the Lake Patzcuaro Basin of Western Mexico," *Latin American Antiquity* 10 (1999): 259-80.

63. Gérald Migeon, "Sites tarasques de la région de Zacapu: confrontation des données archéologiques et ethnohistoriques," in *Vingt études sur le Mexique et le Guatemala: réunies à la mémoire de Nicole Percheron*, Alain Breton, Jean-Pierre Berthe, and Sylvie Lecoin, eds. (Toulouse, France: Presses Universitaires du Mirail, 1991), 95-115; and Helen Perlstein Pollard, "Recent Research in West Mexican Archaeology," *Journal of Archaeological Research* 5 (1997): 345-84.

64. David A. Freidel and Jeremy A. Sabloff, *Cozumel: Late Maya Settlement Patterns* (New York: Academic Press, 1984).

65. Harry E. D. Pollock et al., *Mayapan, Yucatan, Mexico*, vol. 619, publication (Washington, D.C.: Carnegie Institution of Washington, 1962). The site is considerably larger than the 1962 figure; current fieldwork at Mayapán, directed by Marilyn A. Masson, should clarify the situation soon.

66. Walter R. T. Witschey, "The Archaeology of Muyil, Quintana Roo, Mexico: A Maya Site on the East Coast of the Yucatan Peninsula" (Ph.D. dissertation, Tulane University, 1993); and Walter R. T. Witschey, "Recent Investigations at the Maya Inland Port City of Muyil (Chunyaxche), Quintana Roo, Mexico," *Mexicon* 10, no. 6 (1988): 111-17.

67. Samuel K. Lothrop, *Tulum: An Archaeological Study of the East Coast of Yucatan*, vol. 335, publication (Washington, D.C.: Carnegie Institution of Washington, 1924); and Ernesto Vargas Pacheco, *Tulum: Organización Político-Territorial de la Costa Oriental de Quintana Roo* (Mexico City: Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México, 1997).

68. E. Wyllys IV Andrews and Anthony P. Andrews, *A Preliminary Study of the Ruins of Xcaret, Quintana Roo, Mexico: With Notes on Other Archaeological Remains on the Central East Coast of the Yucatan Peninsula*, vol. 40, publication (New Orleans, La.: Middle American Research Institute, 1976); and Vargas Pacheco, *Tulum*.

Key to Codes

Code	Category
Code	Unique Identifier for Each Site
Type	Functional Type
0	Uncertain
1	Major political capital
2	Political town, general
3	Political town, crafts specialization
4	Political town, trade specialization
5	Political town, religion specialization
6	Town, small
7	Hilltop ceremonial zone
8	Fortress
p	Published data used
d	Site area digitized
e	Site area estimated
Size	Size Class (Quartile)
1	> 205 ha
2	90-205 ha
3	22-90 ha
4	10-22 ha
5	< 10 ha (not part of urban sample)

NOTES

1. William T. Sanders and David Webster, "The Mesoamerican Urban Tradition," *American Anthropologist* 90 (1988): 521-46; and David Webster and William T. Sanders, "La antigua ciudad mesoamericana: teoría y concepto," in *Reconstruyendo la ciudad maya: el urbanismo en las sociedades antiguas*, Andrés Ciudad Ruiz, María Josefa Iglesias Ponce de León, and María del Carmen Martínez Martínez, eds. (Madrid: Sociedad Española de Estudios Mayas, 2001), 43-64.
2. George F. Andrews, *Maya Cities: Placemaking and Urbanization* (Norman: University of Oklahoma Press, 1975); Andrés Ciudad Ruiz, María Josefa Iglesias Ponce de León, and María del Carmen Martínez Martínez, eds., *Reconstruyendo la ciudad maya: el urbanismo en las sociedades antiguas* (Madrid: Sociedad Española de Estudios Mayas, 2001); Kenneth G. Hirth, "Urbanism at Xochicalco: A Community Perspective," in *Archaeological Research at Xochicalco*, vol. 1, *Ancient Urbanism at Xochicalco: The Evolution and Organization of a Pre-Hispanic Society*, Kenneth G. Hirth, ed. (Salt Lake City: University of Utah Press, 2000), 270-83; and Alba Guadalupe Mastache and Robert H. Cobean, "Ancient Tollan: The Sacred Precinct," *Res: Anthropology and Aesthetics* 38 (2000): 100-33.
3. For example, Stephen A. Kowalewski, "The Evolution of Complexity in the Valley of Oaxaca," *Annual Review of Anthropology* 19 (1990): 39-58; and William T. Sanders, *The Teotihuacan Valley Project, Final Report*, 5 vols., Occasional Papers in Anthropology (University Park: Department of Anthropology, Pennsylvania State University, 1994-2000).
4. Examples include Wendy Ashmore and Jeremy A. Sabloff, "Spatial Orders in Maya Civic Plans," *Latin American Antiquity* 13 (2002): 201-15; and Kathryn Reese-Taylor, "Ritual Circuits as Key Elements in Maya Civic Center Design," in *Heart of Creation: The Mesoamerican World and the Legacy of Linda Schele*, Andrea Stone, ed. (Tuscaloosa: University of Alabama Press, 2002), 143-65. For a critique of this approach, see Michael E. Smith, "Can We Read Cosmology in Ancient Maya City Plans? Comment on Ashmore and Sabloff," *Latin American Antiquity* 14 (2003): 221-28.
5. For a discussion of these trends in Late Postclassic Mesoamerica, see the chapters in Michael E. Smith and Frances F. Berdan, eds., *The Postclassic Mesoamerican World* (Salt Lake City: University of Utah Press, 2003).
6. Mogens Herman Hansen, "Conclusion: The Impact of City-State Cultures on World History," in *A Comparative Study of Thirty City-State Cultures*, Mogens Herman Hansen, ed. (Copenhagen: Royal Danish Academy of Sciences and Letters, 2000), 597-623; Richard Hodges, *Towns and Trade in the Age of Charlemagne* (London: Duckworth, 2000); Michael Hudson and Baruch A. Levine, eds., *Urbanization and Land Ownership in the Ancient Near East*, vol. 7, Peabody Museum Bulletin (Cambridge, Mass.: Peabody Museum of Archaeology and Ethnology, Harvard University, 1999); J. Kathirithamby-Wells and John Villiers, eds., *The Southeast Asian Port and Polity: Rise and Demise* (Singapore: Singapore University Press, 1990); and Helen M. Parkins, ed., *Roman Urbanism: Beyond the Consumer City* (New York: Routledge, 1997).
7. Edward E. Calnek, "The Internal Structure of Tenochtitlan," in *The Valley of Mexico: Studies of Pre-Hispanic Ecology and Society*, Eric R. Wolf, ed. (Albuquerque: University of New Mexico Press, 1976), 287-302; Eduardo Matos Moctezuma, *The Great Temple of the Aztecs* (New York: Thames and Hudson, 1988); and José Luis de Rojas, *México Tenochtitlan: economía e sociedad en el siglo XVI* (Mexico City: Fondo de Cultura Económica, 1986).
8. William T. Sanders and Barbara J. Price, *Mesoamerica: The Evolution of a Civilization* (New York: Random House, 1968); William T. Sanders and Robert S. Santley, "A Tale of Three Cities: Energetics and Urbanization in Pre-Hispanic Central Mexico," in *Prehistoric Settlement Patterns: Essays in Honor of Gordon R. Willey*, Evon Z. Vogt and Richard Leventhal, eds. (Albuquerque: University of New Mexico Press, 1983), 243-91; and Sanders and Webster, "Mesoamerican Urban Tradition," 521-46. See Louis Wirth, "Urbanism as a Way of Life," *American Journal of Sociology* 44 (1938): 1-24.
9. Richard E. Blanton, "Anthropological Studies of Cities," *Annual Review of Anthropology* 5 (1976): 249-64; Kowalewski, "Evolution of Complexity," 39-58; and Joyce Marcus, "On the Nature of the Mesoamerican City," in Vogt and Leventhal, *Prehistoric Settlement Patterns*, 195-242.
10. Diane Z. Chase, Arlen F. Chase, and William A. Haviland, "The Classic Maya City: Reconsidering the 'Mesoamerican Urban Tradition,'" *American Anthropologist* 92 (1990): 499-506; and Michael E. Smith, "Cities, Towns, and Urbanism: Comment on Sanders and Webster," *American Anthropologist* 91 (1989): 454-61.
11. Simon Martin and Nikolai Grube, *Chronicle of the Maya Kings and Queens: Deciphering the Dynasties of the Ancient Maya* (New York: Thames and Hudson, 2000).

12. Sanders and Webster, "Mesoamerican Urban Tradition," 521-46; and Richard G. Fox, *Urban Anthropology: Cities in their Cultural Settings* (Englewood Cliffs, N.J.: Prentice Hall, 1977).

13. Webster and Sanders, "La antigua ciudad mesoamericana," 43-64.

14. I have defined urbanism as follows:

An urban settlement is defined here as one whose activities and institutions (whether economic, political, religious, or cultural) affected areas outside of the settlement proper. Cities are large settlements with many urban functions that affect a larger hinterland, whereas towns are small settlements with fewer urban functions affecting a smaller region.

From Michael E. Smith, "Urbanization," in *The Oxford Encyclopedia of Mesoamerican Cultures: The Civilizations of Mexico and Central America*, David Carrasco, ed., vol. 3 (New York: Oxford University Press, 2001), 290-94.

15. That project was conducted as part of a graduate seminar in Mesoamerican urbanism at the State University of New York at Albany. I thank seminar participants Jessica Child, Josalyn Ferguson, and Ryan Mongelluzzo for help with bibliographic citations and data collection. All measurements and analyses presented in this article were done by the author.

16. Andrew K. Balkansky et al., "Archaeological Survey in the Mixteca Alta of Oaxaca, Mexico," *Journal of Field Archaeology* 27 (2002): 365-90; Laura Finsten and Stephen A. Kowalewski, "Spatial Scales and Process: In and around the Valley of Oaxaca," in *Settlement Pattern Studies in the Americas: Fifty Years since Virú*, Brian R. Billman and Gary M. Feinman, eds. (Washington, D.C.: Smithsonian Institution Press, 1999), 22-38; Stephen A. Kowalewski et al., *Monte Alban's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlan, The Valley of Oaxaca, Mexico*, vol. 23, *Memoirs* (Ann Arbor: Museum of Anthropology, University of Michigan, 1989); and William T. Sanders, Jeffrey R. Parsons, and Robert S. Santley, *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization* (New York: Academic Press, 1979). City sizes have been analyzed on a regional scale in these areas; see Richard E. Blanton, "The Role of Symbiosis in Adaptation and Sociocultural Change in the Valley of Mexico," in Wolf, *Valley of Mexico*, 181-201; and Kowalewski, "Evolution of Complexity," 39-58. Such analyses complement the larger spatial scale of the research described in this article.

17. *Ibid.*; Harry W. Richardson, *Regional Economics* (Urbana: University of Illinois Press, 1979); and Carol A. Smith, ed., *Regional Analysis*, 2 vols. (New York: Academic Press, 1976).

18. Frances F. Berdan et al., *Aztec Imperial Strategies* (Washington, D.C.: Dumbarton Oaks, 1996).

19. Michael E. Smith, "Aztec City-States," in Hansen, *Comparative Study*, 581-95.

20. Fekri A. Hassan, "Demographic Archaeology," *Advances in Archaeological Method and Theory* (1978): 49-103; and Don S. Rice and T. Patrick Culbert, "Historical Contexts for Population Reconstruction in the Maya Lowlands," in *Pre-Columbian Population History in the Maya Lowlands*, T. Patrick Culbert and Don S. Rice, eds. (Albuquerque: University of New Mexico Press, 1990), 1-36.

21. Sanders and Webster, "Mesoamerican Urban Tradition," 521-46; and Webster and Sanders, "La antigua ciudad mesoamericana," 43-64.

22. Regional survey data suggest that Late Postclassic urban population density could be quite variable within individual regions (Stephen A. Kowalewski, personal communication, December 2002). The sites discussed in this article are not an optimal sample for addressing questions of population size and density because of potential variation among regions and among approaches to population estimation; demographic issues are more profitably addressed by regional fieldwork within individual areas.

23. José García Payón, *La zona arqueológica de Tecaxic-Calixtlahuaca y los matlatzincas: etnología y arqueología (primera parte), edición facsimilar de la de 1936, preparada por Mario Colín*, vol. 29, *Biblioteca Enciclopédica del Estado de México* (Toluca: Estado de México, 1974).

24. Kowalewski, personal communication, December 2002. See Ignacio Bernal, "Exploraciones en Coixtlahuaca, Oaxaca," *Revista Mexicana de Estudios Antropológicos* 10 (1948): 5-76.

25. Anthony F. Aveni, *Skywatchers*, 2nd ed. (Austin: University of Texas Press, 2001); and Smith, "Urbanization," 290-94.

26. Vernon L. Scarborough and David R. Wilcox, eds., *The Mesoamerican Ballgame* (Tucson: University of Arizona Press, 1991); and E. Michael Whittington, ed., *The Sport of Life and Death: The Mesoamerican Ballgame* (New York: Thames and Hudson, 2001).

27. The largest value—34.4 ha for Tzintzuntzan—may not correspond to the definition of epicenter used here (see text). This value is reported by Pollard for the central area of the city, and it probably includes more land beyond the main public buildings than I included in my measurements of epicenter area; see Helen Perlstein Pollard, "An Analysis of Urban Zoning and Planning in Prehispanic Tzintzuntzan," *Proceedings of*

the American Philosophical Society 121 (1977): 46-69. For this reason, Tzintzuntzan is omitted from the graphs of epicenter size (Figures 5 and 6).

28. Calnek, "Internal Structure of Tenochtitlan," 287-302.

29. Marcus, "On the Nature of the Mesoamerican City," 195-242, modified a model in Chauncey D. Harris and Edward L. Ullman, "The Nature of Cities," *Annals of the American Academy of Political and Social Sciences* 242 (1945): 7-17.

30. Roland Fletcher, *The Limits of Settlement Growth: A Theoretical Outline* (New York: Cambridge University Press, 1995).

31. Andrews, *Maya Cities: Placemaking and Urbanization*.

32. David A. Freidel and Jeremy A. Sabloff, *Cozumel: Late Maya Settlement Patterns* (New York: Academic Press, 1984); William L. Rathje, "Last Tango at Mayapan: A Tentative Trajectory of Production-Distribution Systems," in *Ancient Civilization and Trade*, Jeremy A. Sabloff and C. C. Lamberg-Karlovsky, eds. (Albuquerque: University of New Mexico Press, 1975), 409-48; and Smith and Berdan, *Postclassic Mesoamerican World*.

33. Brian J. L. Berry, "City Size and Economic Development: Conceptual Synthesis and Policy Problems with Special Reference to South and Southeast Asia," in *Urbanization and National Development*, L. Jakobsen and V. Prakesh, eds. (Beverly Hills, Calif.: Sage, 1971), 111-55; Brian J. L. Berry, "City Size Distribution and Economic Development," *Economic Development and Cultural Change* 9 (1961): 573-88; Peter Haggett, Andrew D. Cliff, and Allan Frey, *Locational Analysis in Human Geography*, 2nd ed. (London: Edward Arnold, 1977); and Anatol Rapoport, "Rank-size Relations," in *International Encyclopedia of the Social Sciences*, David L. Sills, ed. (New York: Macmillan, 1968), 319-23.

34. Berry, "City Size and Economic Development," 111-55; Gregory A. Johnson, "Rank-Size Convexity and System Integration: A View from Archaeology," *Economic Geography* 56 (1980): 234-47; Harry W. Richardson, "Theory of the Distribution of City Sizes: Review and Prospects," *Regional Studies* 7 (1973): 239-51; Stephen H. Savage, "Assessing Departures from Log-Normality in the Rank-Size Rule," *Journal of Archaeological Science* 24 (1997): 233-44; G. William Skinner, "Regional Urbanization in Nineteenth-Century China," in *The City in Late Imperial China*, G. William Skinner, ed. (Stanford, Calif.: Stanford University Press, 1977), 211-49; Carol A. Smith, "Theories and Measures of Urban Primacy: A Critique," in *Urbanization in the World-Economy*, Michael Timberlake, ed. (New York: Academic Press, 1985), 87-117; Carol A. Smith, "Types of City-Size Distributions: A Comparative Analysis," in *Urbanization in History: A Process of Dynamic Interactions*, Ad van der Woude, Akira Hayami, and Jan de Vries, eds. (Oxford: Clarendon Press, 1990), 20-42; C. A. Vapnarski, "On Rank Size Distributions of Cities: An Ecological Approach," *Economic Development and Cultural Change* 17 (1969): 584-95; and Pamela Barnhouse Walters, "Systems of Cities and Urban Primacy: Problems of Definition and Measurement," in Timberlake, *Urbanization in the World-Economy*, 63-85.

35. Robert McC. Adams, *Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates* (Chicago: University of Chicago Press, 1981); Blanton, "Role of Symbiosis," 181-201; Johnson, "Rank-Size Convexity and System Integration," 234-47; Kowalewski, "Evolution of Complexity," 39-58; Stephen A. Kowalewski, "The Evolution of Primate Regional Systems," *Comparative Urban Research* 9 (1982): 60-78; Robert W. Paynter, "Expanding the Scope of Settlement Analysis," in *Archaeological Hammers and Theories*, James A. Moore and Arthur S. Keene, eds. (New York: Academic Press, 1983), 233-75; Charles E. Pearson, "Rank-Size Distributions and the Analysis of Prehistoric Settlement Systems," *Journal of Anthropological Research* 36 (1980): 453-62; and Charlotte A. Smith, "Concordant Change and Core-Periphery Dynamics: A Synthesis of Highland Mesoamerican Archaeological Survey Data" (Ph.D. dissertation, Department of Anthropology, University of Georgia, 2002).

36. The following archaeological studies apply rank-size analysis inappropriately to small sites on a local scale rather than to city-size data on a large regional, or macroregional, scale: Juan Albarracín-Jordan, Marc Bermann, and Timothy McAndrews, "Regional Settlement Patterns in the Tiwanaku Valley of Bolivia," *Journal of Field Archaeology* 24 (1997): 67-83; Francisco Estrada Belli, *The Archaeology of Complex Societies in Southeastern Pacific Coastal Guatemala: A Regional GIS Approach*, vol. S820, British Archaeological Reports, International Series (Oxford: BAR, 1999); Susan Keech McIntosh, "Modeling Political Organization in Large-Scale Settlement Clusters: A Case Study from the Inland Niger Delta," in *Beyond Chiefdoms: Pathways to Complexity in Africa*, Susan Keech McIntosh, ed. (New York: Cambridge University Press, 1999), 66-79; Robert S. Santley, Philip J. Arnold III, and Thomas P. Barrett, "Formative Period Settlement Patterns in the Tuxtla Mountains," in *Olmec to Aztec: Settlement Patterns in the Ancient Gulf Lowlands*, Barbara L. Stark and Philip J. Arnold III, eds. (Tucson: University of Arizona Press, 1997), 174-205; Savage, "Assessing Departures from Log-Normality," 233-44; David B. Small, "Mycenean

Polities: States or *Estates*?" in *Rethinking Mycenaean Palaces: New Interpretations of an Old Idea*, Michael L. Galaty and William A. Parkinson, eds. (Los Angeles: Institute of Archaeology, University of California, Los Angeles, 1999), 43-48; and Michael E. Whalen and Paul E. Minnis, *Casas Grandes and Its Hinterland: Prehistoric Regional Organization in Northwest Mexico* (Tucson: University of Arizona Press, 2001). Rank-size analysis, as developed by geographers and anthropologists, is used for the study of the sizes of cities. An important assumption is that each city is a central place with its own hinterland. When archaeologists apply the method to site sizes within a region, typically including numerous tiny settlements of a few hectares without any central place functions, they are violating the basic assumptions of the model. Some time ago, Pearson warned archaeologists that "a small-size threshold exists, below which rank-size regularities do not hold," Pearson, "Rank-Size Distributions," 453-62; but recent studies have not heeded this caveat. No one has proposed a theoretical model to explain the significance of different rank-size distributions for tiny, nonurban sites.

37. Skinner, "Regional Urbanization in Nineteenth-Century China," 211-49, 238.

38. Berry, "City Size and Economic Development," 111-55; Johnson, "Rank-Size Convexity and System Integration," 234-47; Richardson, "Theory of the Distribution of City Sizes," 239-51; Skinner, "Regional Urbanization in Nineteenth-Century China," 211-49; Smith, "Theories and Measures of Urban Primacy," 87-117; Smith, "Types of City-Size Distributions," 20-42; Vapnarski, "On Rank Size Distributions of Cities," 584-595; and Walters, "Systems of Cities and Urban Primacy," 63-85.

39. On the political role of Mayapán, see Marilyn A. Masson, *In the Realm of Nachan Kan: Postclassic Maya Archaeology at Laguna de On, Belize* (Boulder: University Press of Colorado, 2000); and Ralph L. Roys, *The Political Geography of the Yucatan Maya*, vol. 613, publication (Washington, D.C.: Carnegie Institution of Washington, 1957). Current fieldwork at Mayapán indicates that the city was in fact considerably larger than the 420 ha reported by previous archaeologists (see note 55 to the Appendix).

40. Recent fieldwork by Joyce et al., "Lord 8 Deer," has found Tututepec to be a very large city with varying but low population densities. If the rank-size plots were done for population, not site area, Oaxaca would not have such a strong primate city size distribution. For Tututepec, see also Ronald Spores, "Tututepec: A Mixtec Conquest State," *Ancient Mesoamerica* 4 (1993): 167-74.

41. Blanton, "Role of Symbiosis," 181-201.

42. Berry, "City Size and Economic Development," 111-55; Allan Pred, *City Systems in Advanced Economies: Past Growth, Present Processes, and Future Development Options* (New York: Wiley, 1977); Walters, "Systems of Cities and Urban Primacy," 63-85; and P. Hall, "Urban System in Geography," in *International Encyclopedia of the Social and Behavioral Sciences*, Neil J. Smelser and Paul B. Baltes, eds. (Oxford: Pergamon, 2001), 16099-104.

43. Walters, "Systems of Cities and Urban Primacy," 63-85. See also Christopher Chase-Dunn and E. Susan Manning, "City Systems and World Systems: Four Millennia of City Growth and Decline," *Cross-Cultural Research* 36 (2002): 379-98.

44. Michael D. Lind, "Mixtec City-States and Mixtec City-State Culture," in Hansen, *Comparative Study*, 567-80; and Smith, "Aztec City-States," 581-595.

45. Smith and Berdan, *Postclassic Mesoamerican World*.

46. Johnson, "Rank-Size Convexity and System Integration," 234-47; Kowalewski, "Evolution of Complexity," 39-58; Kowalewski, "Evolution of Primate Regional Systems," 60-78; and Paynter, "Expanding the Scope of Settlement Analysis," 233-75. For an exception by an economist publishing in an archaeological collection, see Denise Pumain, "City-Size Dynamics in Urban Systems," in *Time, Process, and Structured Transformation in Archaeology*, Sander E. van der Leeuw and James McGlade, eds. (New York: Routledge, 1997), 97-117.

47. William T. Sanders, "The Central Mexican Symbiotic Region: A Study in Prehistoric Settlement Patterns," in *Prehistoric Settlement Patterns in the New World*, Gordon R. Willey, ed. (New York: Wenner-Gren Foundation for Anthropological Research, 1956), 115-27; and Smith, *Aztecs*.

48. Shirley Gorenstein and Helen P. Pollard, *The Tarascan Civilization: A Late Prehispanic Cultural System*, vol. 28, Vanderbilt University Publications in Anthropology (Nashville, Tenn.: Department of Anthropology, Vanderbilt University, 1983); Helen Perlstein Pollard and Thomas A. Vogel, "Late Postclassic Imperial Expansion and Economic Exchange within the Tarascan Domain," in *Economies and Politics in the Aztec Realm*, Mary G. Hodge and Michael E. Smith, eds. (Albany, N.Y.: Institute for Mesoamerican Studies, 1994), 447-70.

49. An important recent dissertation also analyzes large numbers of urban centers from several times periods; see Smith, "Concordant Change and Core-Periphery Dynamics." Smith's methods and sample are complementary to my own in that she uses the regional survey data that I avoid in my sample.

50. Sanders and Webster, "Mesoamerican Urban Tradition," 521-46.

51. Elizabeth M. Brumfiel, "Specialization, Market Exchange, and the Aztec State: A View from Huexotla," *Current Anthropology* 21 (1980): 459-78; Thomas H. Charlton, Deborah L. Nichols, and Cynthia L. Otis Charlton, "Otumba and Its Neighbors: Ex Oriente Lux," *Ancient Mesoamerica* 11 (2000): 247-66; and Michael E. Smith, "Economic Change in Morelos Households," in Smith and Berdan, *Postclassic Mesoamerican World*, 249-58.

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