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Supplementary Materials for

Settlement scaling and increasing returns in an ancient society

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This PDF file includes:

Materials and Methods
Fig. S1. The Basin of Mexico.
Table S1. Civic-ceremonial structures at Tenochtitlan-Tlatelolco.
Table S2. Civic-ceremonial architecture volumes and associated subject populations.
Table S3. Mean domestic-mound areas and settlement populations.
Table S4. Domestic mound area distributions in the Basin of Mexico through time.
Table S5. Within-period scaling analyses.

Supplementary Materials

Settlement Scaling and Increasing Returns in an Ancient Society

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Data Sources and the BOM Survey **2**

- **A. Population and Settled Area** **4**
- **B. Polity Population and Monument Construction** **4**
- **C. Settlement Population and House Area** **7**

Within-period results **12**

References **13**

Figure S1 **16**

Table S1 **17**

Table S2 **17**

Table S3 **19**

Table S4 **21**

Table S5 **22**

Materials and Methods

We examine scaling relations in the ancient world using settlement data from archaeological surface surveys conducted in the Basin of Mexico (BOM), the epicenter of Pre-Hispanic Mesoamerican civilization. These surveys took place between 1960 and 1975, prior to the destruction of many sites by the expansion of modern Mexico City. Figures 1 and S1 show the location of our study area, the surveyed areas relative to Mexico City when the surveys took place, and the distribution of Pre-Hispanic settlements for two cultural periods. We compiled a database of information for some 4,000 archaeological sites resulting from these surveys, beginning with existing digital compilations (*1, 2*) and adding information from the original survey reports (*3-11*). We also added data for a few important sites outside the surveyed area (Cuicuilco, Tenochtitlán/Tlatelolco, Tenayuca, Xochicalco) and for Teotihuacan based on information in the literature (*12-17*). In addition, we tabulated the dimensions of civic-ceremonial mounds reported in the survey volumes or in other sources (*13, 14, 18-20*) and we associated Aztec-period settlements with native political units based on ethno-historic information summarized by Hodge and others (*21-23*). The resulting database contains information on the settled area, population, time period, location, functional classification, political affiliations, and architectural remains of every recorded settlement. For more details and background on this database, see (*24*).

The BOM survey data have two great advantages for settlement scaling research. First, surveyors recorded data across the entire range of settlement sizes, from the smallest farming hamlets to the largest cities, in a common format. Second, the survey methods allowed the population densities of settlements to vary. As a result, it is possible to examine scaling relations across five orders of magnitude in settlement population in a settlement system that spanned the urban-nonurban divide. However, a potential problem with the BOM survey data is that the method used to estimate population for most sites was not independent of the settled area (*3, 19*). This method involved: 1) determining the extent of the surface artifact scatter for each period of occupation by mapping its boundary on low-altitude aerial photos; 2) assigning each scatter to one of a series of artifact density classes based on the observed potsherd density within the scatter; and 3) multiplying the extent of the scatter for each period by a population density derived from associations of surface potsherd densities with population densities of various settlement types in 16th and 20th century records from the area. This method ensures that there will be a relationship between the settled area and settlement population. Fortunately, we have previously shown that the estimates produced by this *area-density* method are nearly identical to those produced using *house-counting* methods that do not rely upon settled area but are instead based on the count or surface area of residential mounds at sites where such remains are well-preserved (*24*). Thus, there is a sound basis for viewing the population estimates derived from the BOM surveys as reasonably accurate in both a relative and an absolute sense.

The BOM surveys assigned remains dating to each archaeological phase at each settlement to a separate site record. We assigned these records to one of four chronological periods dating from initial colonization of the Basin up to the Spanish Conquest, following the chronology in the most recent publications of these data (*4, 7*). The Formative period (1150 B.C.E.-150 C.E.) saw the beginnings of detectable settlements and the rise of local polities; the Classic period (150-650 C.E.), the political and economic dominance of Teotihuacan (ca. 100,000 people); the Toltec period (650-1200 C.E.), the formation of a number of small competitive polities; and the Aztec period (1200-1520 C.E.), the unification of these into an empire centered on Tenochtitlán-Tlatelolco (ca. 200,000 people). Collectively, these four chronological groups span more than three millennia and capture the development of an ancient urban system that was independent of its old-world counterparts.

Population and Settled Area

Data Selection

BOM surveyors classified each site into a series of settlement types based on the spatial extent, density, and character of the surface remains. Because our theory suggests population-area scaling relations arise from the interactions of residents within settlements, this analysis excludes site types that do not conform to the "interaction container" model, namely: 1) sites lacking permanent residential populations, such as isolated ceremonial centers, quarries and salt mounds; and 2) dispersed sites consisting of isolated residences interspersed with farmland. We also exclude sites with settled areas less than 1 ha from this analysis due to limits in the precision of the recorded data. Approximately 1,500 settlements in our database meet these criteria. The resulting dataset is available at http://www.tdar.org. In addition, we tabulated the populations and settled areas of BOM settlements in the 1960 census of the area to provide a point of modern comparison (*24*).

Polity Population and Monument Construction

Linking arguments

Several factors make it possible to treat the total volume of public monuments in administrative and ceremonial centers as a measure of the total production of the subject population over a period of time. First, ethno-historic evidence suggests these monuments were constructed primarily using corvée labor, a type of labor tax in which each household owed the polity a certain number of days of labor per year (*13, 22*). Second, cross-sections of these buildings indicate that their final volumes accumulated over a period of time, as new phases of construction encased the existing structure (*13, 18, 25*). Finally, a recent study of the energetics of monument construction at Teotihuacan found that as much as 85% of the total cost involved in building these monuments derived from transporting earth and stone to the construction site (*18*). As a result, it is reasonable to view public monument volumes as resulting from the piling of earth and stone by subject populations over a period of time.

To relate public monuments to settlement scaling theory, several additional assumptions are necessary. First, following ethno-historic records, we assume corvée labor forces had some freedom to self-organize: "The building of the temples and the houses of the lords and public works was always a common undertaking, and many people worked together with much merriment . . . Each worked a little and did what he could, and no one hurried or mistreated him for it . . . Thus they went about their work, cheerfully and harmoniously" (Zorita, in *13:127*). Such statements suggest the labor forces involved in monument construction were mixing populations of the type that produce emergent scaling properties. Second, we assume labor forces derived from the total populations subject to specific administrative centers. During certain periods, the political organization of the BOM was characterized by multi-level administrative and decision-making hierarchies (*19, 21, 22, 26, 27*). We assume the composition of labor forces reflected this multi-tiered organization. For example, "building the Great Temple in Tenochtitlán was organized by a division of labor based on regional state or provincial affiliation. When this temple was being enlarged by Motecuhzoma I, Texcoco and the Aculhua communities built the front, Tlacopan and the Tepaneca the back, Chalca the left side, and the

Xochimilca the right. The Otomi area furnished sand and the Tierra Caliente area supplied lime" (*22*). Finally, we assume corvée labor forces represent a relatively consistent fraction of subject populations (for example, all males within a certain age range), and that the sizes of the labor force varied much more substantially than the average labor tax imposed by political authorities during different archaeological periods.

Data Compilation

Many settlements with civic-ceremonial architecture were inhabited during multiple periods. In such sites, BOM surveyors examined the types of potsherds on the tops of mounds, or eroding out of the sides, to estimate periods of construction and use. We simply carried forward these field judgments in this analysis. We also estimated the volumes of civic-ceremonial structures by modeling them as rectilinear pyramids, cones, or rectilinear solids, depending on the recorded dimensions. For rectilinear solids $V = l \times w \times h$; for pyramids and cones, when $h > 1m$, $V = 2/3\, bh$, with $b = base\ area$; otherwise $V = b$. When no height is recorded, we conservatively assume $h = 1m$. The largest concentrations of civic-ceremonial architecture in our database come from Teotihuacan, Texcoco and Tenochtitlán-Tlatelolco. The data for these specific sites derive from Murakami (*18*) for Teotihuacan; Parsons (*3:361-362*) and Smith (*13:22*) for Texcoco; and a variety of sources for Tenochtitlán-Tlatelolco (*13, 14, 20*). Table S1 presents our tabulation of public monuments at Tenochtitlán-Tlatelolco, the Mexica capital.

We estimate the average size of the labor force that built these monuments by combining population estimates in BOM survey records with current understandings of the political organization of each period. The oldest recorded public buildings date from the Late Formative (500-250 BCE) and Terminal Formative (250 BCE – 150 CE) periods. For these periods, we assume a strong correlation between settlements and political units, and thus infer that public monuments were built primarily by the inhabitants of the settlements in which they occur. During the subsequent Classic (150-650 CE) period, the entire BOM population was subject to Teotihuacan, and we therefore assume the entire BOM population contributed labor to the monuments there. In addition, we assume the smaller concentrations of civic-ceremonial structures outside the Teotihuacan Valley were built by the residents of immediately-surrounding settlement clusters (*5*). During the Early Toltec (650-900 CE) period political organization appears to have fragmented into a series of independent city-states (*27, 28*). Accordingly, we infer monuments dating to this period were built by the inhabitants of the sites in which they occur along with the residents of immediately-adjacent smaller settlements. We have not included monuments from the Late Toltec (950-1200 CE) period due to uncertainties surrounding the political organization of this period. Finally, for the Aztec period we first assign all settlements to the *altepetl* or city-state to which they belonged based on Hodge's correlations between the BOM survey data and ethno-historic sources (*21-23*); then we assign these *altepéme* to their associated triple alliance political unit (Mexica and Aculhua). Following these groupings, we infer the total population of each *altepetl* contributed labor to the monuments within those settlements; and we assume the monuments at Tenochtitlán-Tlatelolco were built by citizens of the Mexica confederacy, and the monuments at Texcoco by the Aculhua confederacy. The resulting dataset of total monument volumes and subject populations is presented as Table S2.

Settlement Population and House Area

Linking arguments

Several studies have suggested that the distribution of house sizes is a reasonable proxy for the distribution of wealth in ancient and preindustrial societies (*29-34*). In general, the distribution of house sizes follows an approximate log-normal distribution, such that a histogram of log-transformed house sizes follows a normal, bell-shaped curve. Income distributions in contemporary societies are also typically log-normal over the lower 90-95% of the distribution (*35*), thus supporting the idea that domestic mound areas offer a useful proxy for production levels in archaeological contexts.

In many societies, larger residences house larger domestic groups, which can include extended families, lineages, corporate groups, servants and retainers (*33*). The clearest examples from the Pre-Hispanic BOM are the apartment compounds of Teotihuacan, which clearly housed large corporate groups (*17, 36, 37*); but one would expect servants and retainers to have lived with elite residents in the largest domestic structures dating to other periods as well. Given the difficulties involved in specifying the relationship between domestic space and people across an ancient complex society, we adopt a functional definition of the household as the basal unit of production and consumption (*38*) and associate this unit with domestic mounds recorded in the BOM surveys. From this perspective, domestic mound areas are a proxy for the relative production levels of basal socioeconomic units. Even if the number of people comprising these basal units varied over time, with socio-economic status, and with the position of residents in the political hierarchy, the range of such variation (say, 10 to 100 persons) and its scaling effect would have been small relative to aggregate effects derived from overall settlement populations (10 to 200,000 persons) and their associated social interaction networks. We thus expect summary statistics for house areas sampled across a settlement to be driven primarily by properties of the social networks in which all households are embedded.

An interesting question with respect to comparisons of archaeological data with modern economic data is whether house size is a better proxy for income inequality or wealth inequality. On the one hand houses are forms of capital investment that can be inherited, and are thus a form of wealth. On the other, most households in ancient societies stored the food and other goods they produced directly in their residences, thus suggesting house area is a function of the income of the resident group. Although it would seem that house areas are responsive to different aspects of inequality depending on the social position of the occupants, we suspect they are a better overall proxy for income than for capital accumulation, for three reasons. First, in modern societies capital ownership tends to be highly concentrated, such that nearly all wealth is owned by the top half of households (*39*), but the lower half of households still live in a dwelling, with the size of the dwelling being related to household income via rents or mortgages. Second, in modern societies income derives from both labor (wages) and wealth (rents, interest, dividends), and it seems reasonable to suggest that the ruling elites of ancient societies had incomes of both types (direct production, rents, taxes and tribute). Third, the long-term wealth to income ratios of ancient societies were likely somewhat lower than is typical of modern societies due to relatively low savings rates and high demographic rates (*39*). For these reasons it seems that house areas in ancient pre-capitalist societies are more comparable to incomes in modern societies.

Data Compilation

The primary data for this analysis consist of domestic mound areas recorded in BOM survey reports (*3-11*). The dimensions of domestic mounds are larger than those of the original house that produced the mound, but excavations suggest house floor areas are generally proportional to domestic-mound areas (*11, 40*), so the distribution of domestic-mound areas should mirror the underlying distribution of house areas. In order to examine mean domestic-mound areas from the full range of settlement sizes in Central Mexico, we included additional data for 156 domestic mounds at Xochicalco, an Epi-Classic (Early Toltec) city of ca. 10,000 people some 50km south of the BOM; the areas of 14 apartment compounds at Teotihuacan, a few of which are referred to as "palaces" (*17, 18*); and 56 house floor areas tabulated from ethno-historic sources for Tenochtitlán (*13, 16*). For the Tenochtitlán data, we multiplied the recorded house-floor area by 4 to convert these areas into estimates of domestic-mound area. This conversion factor derives from excavations at Cihuatecpan, an Aztec-period settlement at which excavated house areas are approximately one-fourth the area of the unexcavated mound (*40*) across all house sizes. We also included the three imperial palace areas from Table S2 in our data for Tenochtitlán-Tlatelolco because they were elite residences as well as administrative buildings. Palaces from Texcoco were also included, using data from (*13*).

Using these data, we computed the mean of domestic-mound areas for 80 settlements that are at least 1 hectare in area, possess well-preserved architectural remains, and are associated with at least two recorded domestic mounds. Then, we multiplied this area by the population of the settlement to create a measure of Y, the total production of that settlement, and we multiplied the area per person at that settlement by the mean domestic mound area to calculate a measure of G. This dataset is presented as Table S3.

It is important to acknowledge the limitations of these data. For many smaller settlements it is reasonable to treat the available domestic-mound dimensions as a representative sample of the total houses at those settlements. There are also a few larger, especially well-preserved settlements (TE-CL-8, IX-A-26, TX-A-24, Xochicalco) where the distribution of domestic-mound areas in the available sample likely reflects the real distribution across the population of houses. But for many settlements we do not have a representative sample of domestic mound areas, and we therefore expect the sample means to have significant errors relative to the population means. However, so long as these errors are unstructured, and so long as we compare data from a reasonable number of settlements spanning the range of variation in the data, we would still expect scaling analysis to be able to recover the average underlying relationship between household production and settlement population.

An interesting result of our approach is that it enables a direct comparison of the share of “income” that went to the top decile of households in the Pre-Hispanic Basin of Mexico and in 20th century Europe and the United States. Table S4 presents summary statistics for measured domestic mounds dating from the Classic, Toltec and Aztec periods. These data show that, although both mean and median house mound area (and most likely household composition) grew smaller through time, the distribution of house area across the population was relatively consistent, with 40-50% of domestic-mound area occurring in the top decile of house areas and 10-15% occurring in the bottom half. The share of house area in the top decile is comparable to the share of income in the top decile in contemporary US society, whereas the share of house area in the bottom half is most comparable to the share of wealth in the bottom half of contemporary US society (*39*). In light of the discussion above concerning the interpretation of house-area distributions, these data suggest either that disparity of income was more extreme in the Pre-Hispanic Basin of Mexico than in contemporary US society, or that disparity of wealth was less extreme. Other factors, such as the variation in house “value” due to location and other factors, should frame the further development of these questions.

Within-Period Results

In the main text we point out that the data for civic architecture construction rates and mean house area per settlement are insufficient for time-series analyses of scaling parameters, but we note that the aggregate analysis results (Figure 2) suggest constancy in scaling parameters across cultural periods. The potential constancy of scaling prefactors is especially important as it suggests limited change in the basic energetics of monument construction and household economies over time. If this is the case, diachronic changes in monument construction rates and house sizes are attributable primarily to social organization as opposed to technological progress.

Table S5 presents the within-period analyses that support this position. Section A of this table shows that the relationship between polity population and civic architecture construction rates is significant for each period, but it is not possible to reject the null hypothesis of constancy in scaling parameters across periods. Section B shows that this null hypothesis also cannot be rejected for the relationship between settlement population and mean house area across periods, but in this case the within-period scaling relationships are only marginally-significant. So in the latter case, we can say that there is no evidence for change in scaling parameters through time but there is some possibility that this absence of evidence is due to limited data. In the former case, however, the absence of evidence for change in scaling parameters appears to be evidence of absence of change in these parameters.

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Figure S1. **The Basin of Mexico**. A: Location within Mexico. B: Settlements during the Formative period (circle size is proportional to population; colors denote elevation; outline marks surveyed area; gray area is the extent of Mexico City in 1964). C: Settlements during the Aztec period. During the latter period settlement expanded into the shallows of the lake. Today, modern settlement covers the entire basin and the lake has been drained.

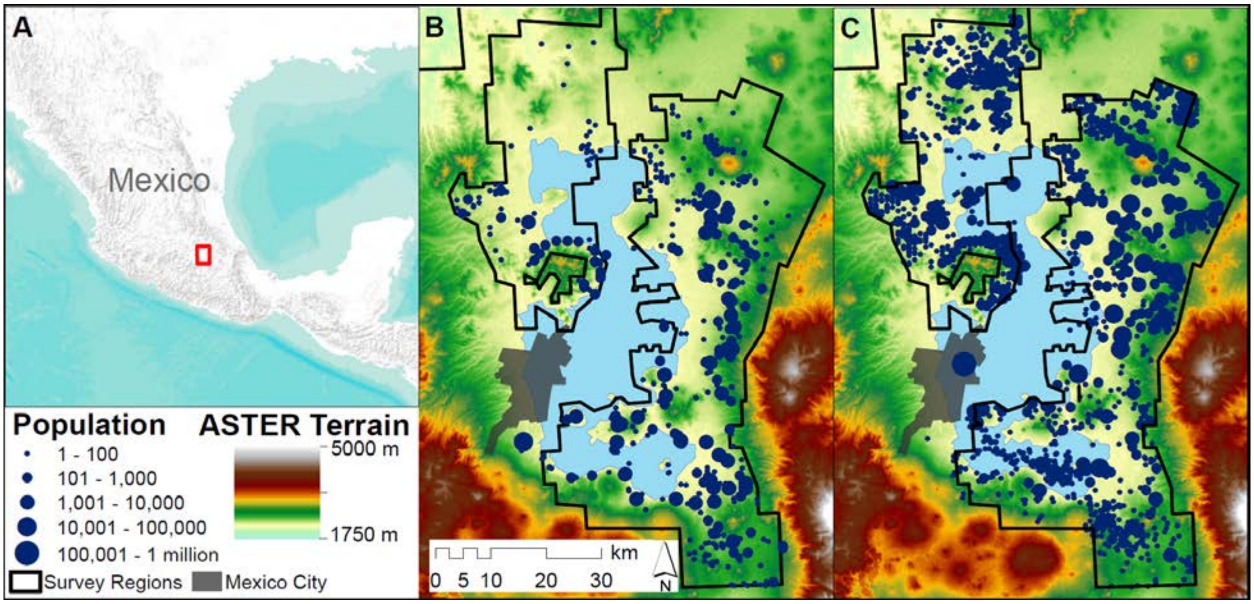

Table S1. **Civic-ceremonial structures at Tenochtitlan-Tlatelolco**. All dimensions are in meters.

Structure	Comments	Height	Length	Width	Area	Volume
Huitzilopoctli Temple	The great temple of Huitzilopoctli, data from Aguilar-Moreno (2005).	30	80	100	8000	160000
Palace 1	Motecuhzoma Ilhuicamina palace. Area from Smith 2008:Table 4.3.				7950	7950
Palace 2	Axayacatl Palace. Area from Smith 2008:Table 4.3.				11439	11439
Palace 3	Motecuhzoma Xocoyotzin Palace. Area from Smith 2008:Table 4.3.				25425	25425
Tenochtitlan Precinct	Square platform for the great temple, data from Sanders 2008:75.	11.5	400	400	160000	1840000
Tlatelolco Precinct	Area from Sanders (2008:69), est. 2m high on average, following Aguilar-Moreno (2005).	2	200	325	65000	130000
Tlatelolco Temple	Temple of Tlatelolco. Smith 2008:102 indicates this was the same size as the Great Temple.	30	80	100	8000	160000
Tezcatlipoca Temple	Temple of Tezcatlipoca, data from Aguilar-Moreno (2005).	20	40	60	2400	32000

Table S2. **Civic-ceremonial architecture volumes and associated subject populations**.

Polity	Period	Time Span (yrs)	Volume (m^3)	Political Unit Population	Notes
CH-LF-5	LF	250	5817	5200	
CH-TF-16	TF	400	11667	2200	
Cuicuilco	TF	400	85333	20000	Data from Sanders et al. (1979:99).
IX-TF-4	TF	400	3414	1850	
IX-TF-3	TF	400	133	200	
IX-TF-5	TF	400	22922	1600	
IX-TF-8	TF	400	100	50	
TX-TF-1	TF	400	3672	2650	Includes TX-TF-2
TX-TF-14	TF	400	800	500	

TX-TF-36	TF	400	2400	1200	
TX-TF-4	TF	400	6066	600	
TX-TF-51	TF	400	11467	1200	
TE-TF-101	TF	450	579	200	Tezoyuca hilltop center.
TE-TF-23	TF	450	576	440	Tezoyuca hilltop center.
TE-TF-26	TF	450	409	300	Tezoyuca hilltop center.
TE-TF-33	TF	450	557	320	Tezoyuca hilltop center.
TE-TF-34	TF	450	2125	350	Tezoyuca hilltop center.
Teotihuacan	CL	500	3020450	150000	Population is the total Classic-period BOM population.
CH-CL-12	CL	500	525	1485	Large hamlet; population is total of Cluster 1 from Parsons et al. 1982:334.
CH-CL-24	CL	500	2176	1710	Small dispersed village; population is total of Cluster 3 from Parsons et al. 1982:334.
IX-EC-17	CL	500	533	150	Small dispersed village.
IX-EC-18	CL	500	2400	550	Large dispersed village; time span includes Late Classic component (IX-LC-3).
IX-EC-7	CL	500	1250	900	Local center; time span includes Late Classic component (IX-LC-1).
TX-EC-26	CL	500	533	130	Large hamlet; population includes adjacent TX-EC-27.
CH-ET-31	ET	250	4083	800	Large nucleated village.
CU-ET-21	ET	250	3183	850	Regional Center.
TE-ET-21	ET	250	945	1015	Large Nucleated Village.
TX-ET-18	ET	250	83567	12775	Regional center; includes TX-ET-17 as per Parsons 1971:75 and IX-ET-1 as per Blanton 1972:86.
TX-ET-23	ET	250	1298	560	Small dispersed village; includes TX-ET-22.
TX-ET-4	ET	250	4320	7200	Regional center; includes TX-ET-5 as per Parsons 1971:70.
TX-ET-7	ET	250	47951	8000	Regional center.
ZU-ET-12	ET	250	6803	1500	Local center.
Tenochtitlan-Tlatelolco	AZ	320	2366814	231375	Population is Mexica portion of Triple Alliance.
Texcoco	AZ	320	681333	90975	Population is Acolhua portion of Triple Alliance.
Ixtapalapan	AZ	320	11819	4933	
Ixtapalucan	AZ	320	38607	2106	
Tenanco	AZ	320	40105	7265	

Tenayuca	AZ	320	140000	12500	Population is the average of other regional centers (Hodge 1997:220).
Amecamecan	AZ	320	11250	10585	
Tuexotla	AZ	320	44500	25590	
Chimalhuacan	AZ	320	14507	13290	
Coatepec	AZ	320	34317	3370	
Coatlinchan	AZ	320	23100	11890	
Tepetlaoztoc	AZ	320	60473	23525	
Cuitlahuac	AZ	320	21000	10125	
Xochimilco	AZ	320	14241	3595	

Table S3. **Mean domestic-mound areas and settlement populations**. All mound areas are in square meters.

Site	Population	Area (ha)	Mean Domestic-Mound Area	Sum of Mound Areas	Area of Largest Mound	Number of Mounds
ZU-LC-10	40	2.4	102	203	112	2
TE-CL-90	70	1.2	2133	8530	3330	4
TE-CL-3	90	1.5	568	1135	745	2
TE-CL-7	90	1.5	948	4738	2700	5
TE-CL-78	90	1.5	1825	3650	1850	2
TE-CL-32	240	4.4	1462	16085	3300	11
TE-CL-40	570	9.5	2925	14625	5000	5
TE-CL-31	600	10	2556	46008	20000	18
TE-CL-8	630	10.5	815	56209	3650	69
TE-CL-30	1170	19.5	1829	36583	7000	20
TE-CL-73	1260	21	1562	68744	5360	44
Teotihuacan	95597	2253	2942	35309	4875	14
TX-ET-12	30	3	144	576	144	4
TX-LT-18	40	2	425	850	625	2
TX-LT-31	40	2	62	248	132	4
ZU-LT-117	40	2.1	225	675	225	3
ZU-LT-81	70	3.3	935	4677	3025	5
Xochicalco	11984	245	950	148197	10658	156
CH-AZ-257	20	1.5	198	396	209	2
CH-AZ-280	20	2.6	165	823	350	5
CH-AZ-63	20	1	170	340	196	2
XO-AZ-14	20	1.5	635	1270	1000	2

XO-AZ-59	20	1.5	275	550	400	2
ZU-AZ-214	20	1	101	304	144	3
IX-A-68	30	1.7	625	2500	625	4
ZU-AZ-88	40	2	225	450	225	2
TE-AZ-3	42	7.4	225	1350	225	6
TE-AZ-31	42	11	506	1519	506	3
TE-AZ-15	49	8	625	3125	625	5
XO-AZ-37	50	4	632	1895	1400	3
XO-AZ-49	50	5	649	3244	1250	5
TE-AZ-5	60	1.5	863	5175	1925	6
TX-A-34	60	6	219	1973	625	9
XO-AZ-47	60	8.8	446	3122	1150	7
ZU-AZ-84	60	3.1	683	2050	1600	3
TE-AZ-50	70	4.7	173	693	216	4
TX-A-32	80	4	173	1212	625	7
TE-AZ-16	98	17	400	5600	400	14
TE-AZ-45	100	38	875	8750	1633	10
TE-AZ-14	105	26	306	3675	306	12
TE-AZ-32	105	22	400	3600	400	9
TE-AZ-78	105	12	636	6994	1406	11
CU-AZ-254	110	2.8	764	8400	1575	11
TE-AZ-77	140	24	792	10293	2500	13
TX-A-26	150	10	185	2591	441	14
TX-A-39	150	10	122	1834	400	15
TE-AZ-28	175	28	1109	17750	2500	16
TE-AZ-61	175	24	400	4400	400	11
TE-AZ-25	210	37	625	11875	625	19
TE-AZ-58	210	135	900	17100	900	19
TE-AZ-73	210	74	450	7644	900	17
TE-AZ-74	210	33	422	7175	900	17
TE-AZ-75	210	36	390	6236	1800	17
TE-AZ-82	210	21	566	11880	1406	22
TE-AZ-18	245	28	1241	31025	2500	25
TE-AZ-27	245	35	529	11644	2025	22
TE-AZ-51	245	14	301	7524	1024	25
TE-AZ-39	280	101	400	11600	400	29
TE-AZ-40	280	18	624	13100	900	21
TE-AZ-41	280	9	288	6630	550	23
TE-AZ-46	280	15	139	1806	139	13
TE-AZ-85	280	43	376	11269	1225	30
TX-A-27	300	17	203	5472	1650	27

TE-AZ-43	315	18	437	8739	891	20
TE-AZ-29	350	44	306	11331	306	37
TE-AZ-36	350	72	625	20000	625	32
TE-AZ-57	350	161	874	24475	1225	28
TE-AZ-63	350	60	400	9600	400	24
TE-AZ-62	420	47	400	14000	400	35
TE-AZ-71	420	99	564	15794	1600	32
TE-AZ-38	490	88	650	1300	1000	2
TE-AZ-101	630	102	862	37947	5625	44
TE-AZ-103	630	103	652	42378	3516	66
TX-A-38	650	65	129	3355	400	26
TX-A-31	700	50	96	4873	375	51
TX-A-59	750	75	125	1878	400	15
TX-A-30	1500	100	120	10889	3025	91
IX-A-26	1630	90	845	4226	1456	5
TX-A-24	13500	450	244	27521	1600	114
Tenochtitlan	212500	1350	2227	131398	25425	59

Table S4. **Domestic-mound area distributions in the Basin of Mexico through time**.

Period	Measured Mounds	Total Area	Mean	Med -ian	90^{th} %-ile	100^{th} %-ile	Share in Top 10%	Share in Bottom 50%
Classic (150-650 CE)	398	420706	1057	490	2755	20000	0.45	0.11
Toltec (650-1200 CE)	355	258772	729	446	1536	10658	0.42	0.16
Aztec (1200-1520 CE)	2389	1377190	576	306	1000	33750	0.50	0.13

Table S5. **Within-period scaling analyses**.*

Period	Formative	Classic	Toltec	Aztec	F-Statistic	*P*
A. Polity population vs. total civic mound volume (m^3/yr)						
Sample size	20	7	8	14		
a *(S.E.)*	1.177 (.151)	1.219 (.219)	1.065 (.294)	.991 (.210)	.247	.86
b *(S.E.)*	-2.688 (.447)	-2.958 (.707)	-2.159 (.990)	-1.878 (.869)	.202	.89
r^2	.802	.861	.686	.649		
P (F-test)	.000	.003	.011	.001		
B. Settlement population vs. mean domestic-mound area (m^2)						
Sample size	N/A	12	6	62		
a *(S.E.)*		.239 (.121)	.274 (.188)	.095 (.057)	1.928	.15
b *(S.E.)*		2.478 (.331)	1.923 (.421)	2.382 (.134)	.172	.84
r^2		.282	.345	.044		
P (F-test)		.076	.220	.102		

*Ordinary least-squares regression of log-transformed data ([log y] = a [log x] + b), thus $y = 10^b x^a$.