Introduction

Our understanding of ancient Maya economies has changed drastically over the last few decades. Mayanists long argued that real markets did not exist in Maya societies before the Postclassic period (see for example Porter-Weaver 1972; Thompson 1970). Barring a few archaeologists who recognized patterns of market exchange in the Classic Maya archaeological record (see for example Fry 1969, 1979; Fry and Cox 1974; Rands 1967), it is only during the last years that the majority of archaeologists recognized that ancient Maya economies were much more complex than previously thought, and concepts of commerce and market exchange started to be much more widely applied to Classic Maya economies (King 2020a, 443). While a few decades ago, the existence of Maya markets was barely considered possible, they are now an important and growing topic of research (see for example Becker 2015; Braswell 2010; Chase et al. 2015; D. Chase and A. Chase 2014; Dahlin et al. 2010; Freidel, Masson, and Rich 2017; Hutson 2017a, 2021; Hutson, Dahlin, and Mazeau 2010; King 2015, 2020; Masson and Freidel 2012; Masson, Freidel, and Demarest 2020; McAnany 2010; Paris 2021; Ruhl, Dunning, and Carr 2018, 83; Shaw 2012; Wells 2006). New investigative techniques and rising scholarly interest in Maya economies have provided many new insights into the organization of Classic Maya society and demonstrated the importance of market exchange. It is becoming clear that there is no singular overarching model that can explain ancient Maya economy, and the variability and complexity of Maya economies are now recognized and have become a major topic of investigation for Mayanists.

The goal of this work is to analyze the economic system of an ancient Maya Lowlands secondary center: the site of Uxul, Campeche, Mexico. This site serves as a case study of a Classic Maya economy, aimed at contributing to our understanding of the forms Maya economies could take. For this, I use a household-based approach, as households are the basic economic and social units of society, and reflect the economic systems in which they play central roles (following Gonlin 2020, 393–94). I study the economy of Uxul by combining multiple lines of evidence and deploying both quantitative and qualitative methods. I examine how wealth was distributed among households, and how this related to patterns of well-being, mobility, and access to goods and resources. I also study what patterns of intra-site mobility and settlement organization tell us about socio-economic structures at Uxul. Finally, I analyze how patterns of household consumption and production can reveal the exchange processes behind them and reflect the way individual households were integrated into the wider settlement economy.

Uxul was a secondary urban center located in southern Campeche, just north of the border with Guatemala, within the current Calakmul Biosphere Reserve (see Figure 1.1 for a map showing the location of Uxul). From 2009 to 2015, the Uxul Archaeological Project of the University of Bonn, Germany has conducted extensive survey and excavation at the site under the general direction of Nikolai Grube and Antonio Benavides Castillo. Research was performed in collaboration with the Mexican Institute of Anthropology and History (INAH) and was funded by the Deutsche Forschungsgemeinschaft (DFG) (Grube et al. 2012). Uxul was a dispersed Central Maya Lowlands settlement, at its peak during the Late Classic period in the 7th and 8th centuries CE, with an estimated total of at least 5000 to 7000 inhabitants. During this time, it was under the influence of the major political center of Calakmul, located some 34 km to the northeast. It is estimated that the settlement occupied some 5 km², 3.8 km² of which have been mapped (see Figure 1.2) (Grube and Delvendahl 2015c, iii).

The primary goal of the Uxul Archaeological Project was to investigate the relationship between Uxul and Calakmul and to understand the integration of the site into the Calakmul political sphere (Grube et al. 2012). After the initial investigation of the ceremonial and residential compounds that make up the core of the settlement, research goals expanded to include the examination of the Uxul hydraulic system (Seefeld 2013b) as well as its residential contexts, and the excavation of household groups in different parts of the settlement became a major focus of the research strategies at the site. This provides a wealth of information on which to base the analysis of Uxul's Late Classic economy through an examination of its households. Extensive excavations were conducted at ten of the household groups that were identified at Uxul. These were located both at the center of the site and on its peripheries, and included households ranging in status and size from the monumental palace complex to commoner households containing mainly perishable structures. Additionally, a test-pit program concerning 42% of all household groups identified in Uxul provided data on the chronology of their construction and occupation (Grube and Delvendahl 2014b). The remaining household groups, although not archaeologically investigated, were mapped in detail, providing information about not only their location, but also their layout, size, and relationships with each other.

Ancient Maya Lowland societies showed a high degree of variation in urban economic systems, which varied depending on the type and size of communities, political
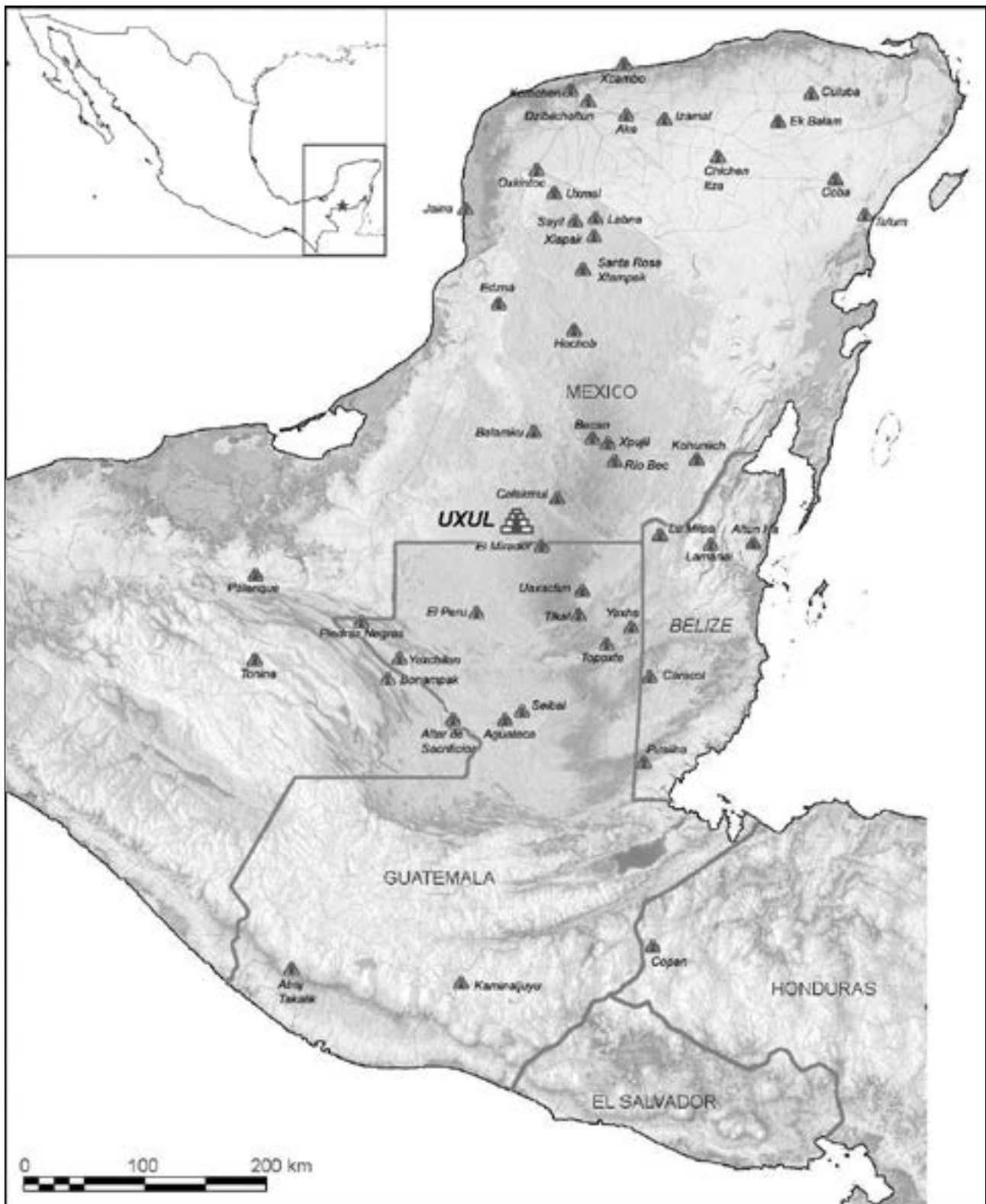
Figure 1.1. Map showing the location of Uxul (after Grube and Delvendahl 2015c, ii).

organization, availability of natural resources, connection to long-distance exchange networks, etc., and there is no single overarching economic model for the Classic Maya (Demarest et al. 2020; Freidel 2020; Hutson 2020b; King 2020a, 2020b; Lemonnier 2009, 87). This variability applies to the roles that people of varying socio-economic status played in economic systems and the amount of economic control that rulers and nobles had over the economy. The study of Classic Maya economic systems, especially with regard to processes outside of elite and
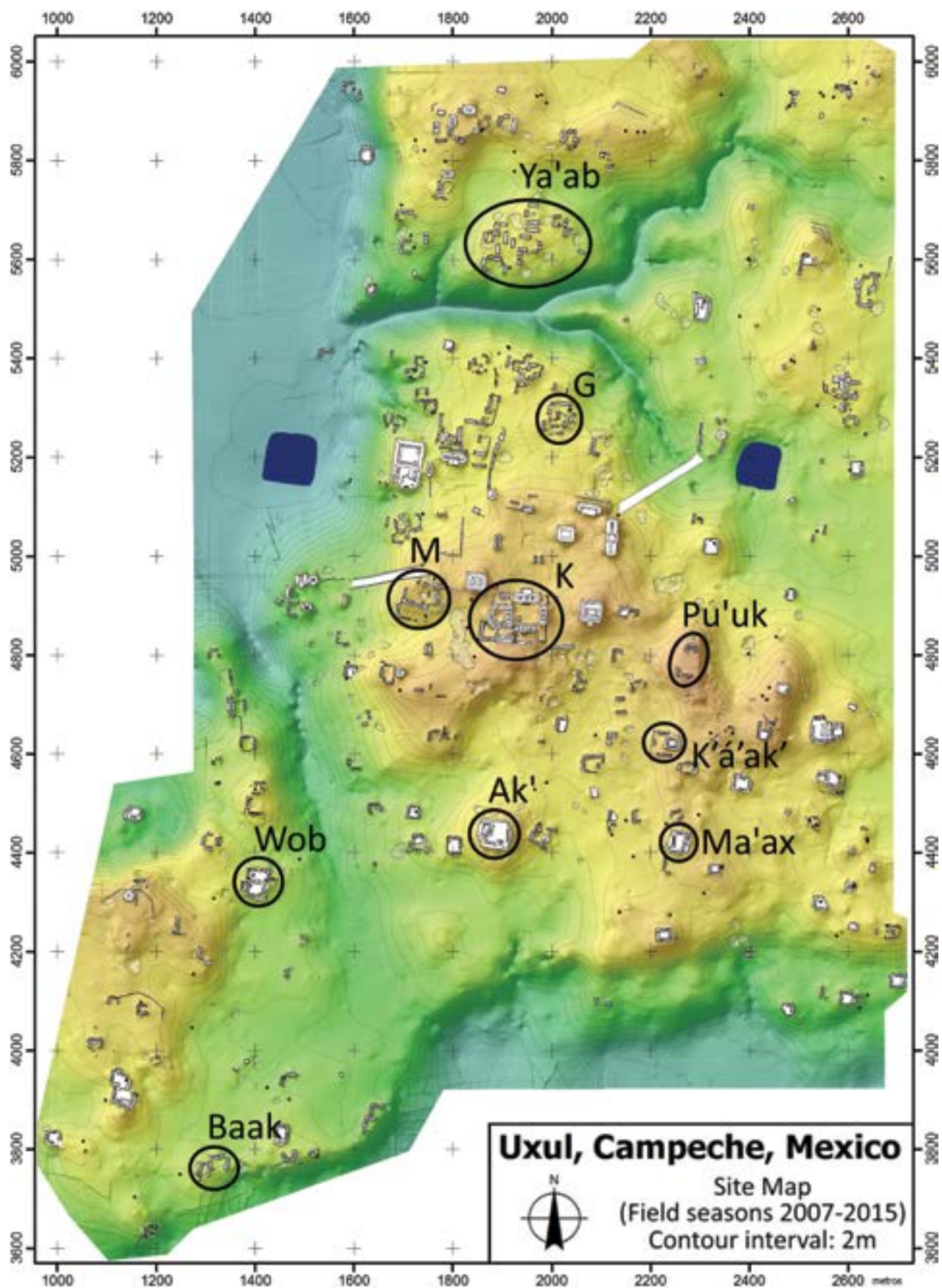
Figure 1.2. Site map of Uxul showing the locations of the ten extensively excavated households (modified from map created by B. Volta and I. Paap, Uxul Archaeological Project).

centralized contexts, however, is relatively new. For a long time, models of Classic Maya economic systems were mainly based on an understanding of elite contexts, positioning rulers as dominating economic processes through control over redistribution and long-distance trade (D. Chase and A. Chase 2014, 239; Dahlin 2009, 356; Golitko and Feinman 2015, 238; Shaw 2012, 118). Markets were all but absent from these conceptions of ancient Maya economies, and the role of non-elites was largely ignored. It has become clear in recent years, however, that Maya households and settlements showed much higher degrees of differentiation, interconnection, and complexity than such models entail (Shaw 2012, 117). Research emphasizing the role of market exchange in complex ancient economies has gained significant traction, improving our understanding of these economies and the roles of non-elites within them. Systematic research into Maya economies is being performed at increasing rates, allowing for a better understanding of ancient Maya economies and their variability (see for example Becker 2015; Braswell 2010; Cap 2015; Chase et al. 2015; D. Chase and A. Chase 2014; Dahlin 2009; Dahlin et al. 2010; Folan et al. 2009; Freidel, Masson, and Rich 2017; Halperin et al. 2009; Hutson 2017a; Hutson, Dahlin, and Mazeau 2010; King 2015, 2020; Masson and Freidel 2012; McAnany 2010; Ruhl, Dunning, and Carr 2018; Shaw 2012; Shaw and King 2015; Terry, Bair, and Coronel 2015; Wells 2006). Although it is now generally accepted that marketplaces and market exchange often played an important role in Classic Maya economies, their configuration, organization, and variability, however, are still far from being fully understood. The present research serves as a case study of the economy of a Classic Maya Lowlands secondary center, and aims to contribute to our understanding of the different forms ancient Maya economies could take.

The present research is in line with recent analytical trends, combining quantitative and qualitative methods to study the economy of ancient Uxul through a household-based approach. Because households form the basic social and economic units of society they offer an opportunity to study economic processes from both an individual household perspective and a settlement-wide perspective through the examination of their similarities, differences, and relations. By using quantifiable archaeological data, it is possible to study ancient economic processes in a systematic way, identify observable trends, and enable comparison both internally (between the households of Uxul) and externally (with other archaeological sites). The combination with qualitative methods allows for a study of individual ancient households, contributing to our understanding of the place of these different units within the wider Uxul economy.

When dealing with the archaeological record a known issue is that of equifinality: a single observed pattern can be the result of a number of economic mechanisms, while a single economic mechanism can result in different observed patterns. In order to deal with this, it is necessary to incorporate multiple lines of evidence and analytical tools to reach higher degrees of certainty (Feinman and Garraty 2010, 178; Friesen and Scheidel 2009, 63; Hutson 2020b; Peterson and Drennan 2018). This is what the present research aims to achieve by integrating multiple lines of evidence and several analytical approaches to gain a better understanding of the economy of ancient Uxul. The main methods and analytical tools that form the basis of this research are the following:

- The analysis of wealth inequality (using a Gini index)
- The analysis of settlement patterns (using GIS applications and Social Network Theory)
- The analysis of intra-site mobility (using GIS applications)
- The analysis of household consumption patterns (using a distributional approach (Hirth 1998) and artifact data)
- The analysis of the chemical composition of materials (using pXRF to source and distinguish obsidian and ceramic samples)
- The analysis of household production and specialization patterns (using artifact data)

The lines of evidence and sources of data used to perform the above analyses are the following:

- Survey maps
- Excavation reports
- Artifacts and databases

The survey map forms an important part of many of the analyses performed throughout this book. It contains a wealth of information about Uxul's households, even when they were not included in excavation strategies. The map allows for the analysis of site-wide patterns of household size, location, and configuration. It allows for an examination of the site-wide distribution of wealth among households during the Late Classic period. It also forms the basis for the analysis of spatial relationships between households, as well as with other elements of city life. Furthermore, it permits the examination of intra-site mobility, settlement patterns, and the processes responsible for them.

Ten extensively excavated households (Groups Ak', Baak, G, K, K'áak', M, Ma'ax, Pu'uk, Wob, and Ya'ab, see Figure 1.2) form a major source of information about artifact patterns at the site and the roles that households along the socio-economic spectrum and in different parts of the city played in the economy of the settlement. Several different layers of society, as well as households both in the center and on the periphery of the site, are represented in this sample. These ten household groups form an important source of information for our understanding of economic processes in different types of households, and their integration into the wider economic system. Their examination allows for both an analysis of the individual economic characteristics of these household groups, and for the identification of economic patterns observable in the distribution of artifact assemblages.

I use data from these excavations in order to study the distribution of different types of artifacts and gain insight into consumption patterns. Furthermore, the results of the extensive excavations are used to identify household production and specialized activities.

Overall, I focus on the distribution of wealth, measures of general well-being, consumption patterns, and the organization of production in order to gain a more complete understanding of economic processes existing in Uxul, and their implications for their organization and the mechanisms responsible for them. The research questions that are crucial to the present study and our understanding of Uxul's economic organization through the use of a household-based approach are presented below.

1.1. Research questions

There are three main research questions that are central to the present research:

1. What was the nature of production, distribution, and consumption processes in Late Classic Uxul?
2. How was wealth distributed in Late Classic Uxul?
3. How were economic, social, and political processes organized and interrelated in Late Classic Uxul?

Each of these research questions consists of a number of related subordinate questions, which together allow for the study of the economy of ancient Uxul from a number of different perspectives and through a number of different approaches.

Ad 1. What was the nature of production, distribution, and consumption processes in Late Classic Uxul? This topic includes questions such as: *To what extent was market exchange present in Uxul? Who had access to different types of consumer goods? How was production organized? How is market exchange reflected in the consumption and production patterns of Uxul? Who had economic power and agency?*

Ad 2. How was wealth distributed in Late Classic Uxul? This topic includes questions such as: *Does the distribution of wealth correspond to a highly stratified society? Who was able to accumulate wealth? How was wealth reflected in daily life? How does the distribution of wealth reflect the economic and political processes that were in place in Uxul?*

Ad 3. How were economic, social, and political processes organized and interrelated in Late Classic Uxul? This topic includes questions such as: *What were the relationships between wealth and power? To what degree did the ruling class have control over economic processes in Uxul? What role did people and households along the socio-economic spectrum play within their neighborhoods and the wider settlement? What differences in access to resources and services were there between socio-economic classes? How was the settlement of Uxul organized? Where did people* *along the socio-economic spectrum live in Uxul? How do these settlement patterns reflect the political and economic organization of Uxul?*

Although the questions outlined above form the main focus of the present research, there are additional questions that are explored throughout this work. This includes topics relating to the place of Uxul in the wider economic network, its relationship with the major political center of Calakmul, the development of Uxul's economic system over time, and the ways its economic system compared to other Maya cities at the time. This included questions such as *How was Uxul integrated into the long-distance trade network? What role did it play in regional trade systems? What characterized the connection between Uxul and Calakmul? To what extent was Uxul economically dependent on its political overlords? How did the economic system of Uxul and its reliance on market exchange change over time? How did the economy of Uxul resemble and differ from contemporary urban economies in the Maya area?* Although each of these questions is deserving of thorough examination, it was beyond the scope of this work to investigate them exhaustively. However, through studying the main research topics listed above, some answers to these questions were touched upon, and preliminary conclusions on these topics are discussed where relevant.

1.2. Book organization

In order to provide answers to the research questions, the main body of this book is organized into eight chapters. In the first part of the book, the general framework of the research is discussed, including the geographical, historical, and cultural context of Uxul, as well as the theoretical and methodological frameworks used throughout this research, and an in-depth discussion of the available data. In Chapter 2, the theoretical and methodological framework used to answer the main research questions of this study is discussed. Here, I provide definitions of some of the most important and ambiguous concepts and terms that are central to this research and the way they are used. I also provide a discussion of our current understanding concerning these concepts, in particular on ancient Maya households, economic organization, power structures, and settlement organization. In this way, I aim to provide context for these topics, which are central throughout this research on the Uxul case study. Furthermore, I provide an in-depth discussion of how the research questions are approached and the models that are used for interpreting the results of these analyses.

Chapter 3 introduces the ancient Maya settlement of Uxul. I discuss its geographic setting, layout, the history of research on the site, as well as an overview of our current understanding of its history, organization, and cultural situation. Here, I also introduce and discuss the data that are available for this research, their context, and the ways in which they are analyzed, both quantitatively and qualitatively. I present the ten households that were

extensively excavated at Uxul. These are the households that form an important basis for our understanding of both general patterns of economic organization at Uxul, and the role of individual households within it. This chapter, then, provides context for many of the analyses and patterns that are discussed throughout this work.

In the second part of the book, the analysis of the data available on the economy of ancient Uxul is presented. In Chapter 4, I study the distribution of wealth at Late Classic Uxul using a Gini index, based on household construction volumes. I discuss the implications of the observed distribution of wealth with regard to the economic processes responsible for it.

In Chapter 5, I study the way the settlement of Uxul was organized with regard to mobility, household location, and neighborhood identification. I use spatial analyses in order to understand how the settlement of Uxul was organized, and how the wealth of different households was reflected in their household location with regard to visibility, mobility, social integration, access to resources such as the water reservoirs, religious services, and underground storage.

In Chapter 6, I study the distribution of artifacts and household assemblages at Uxul. This includes the analysis of consumption patterns, the organization of production, and their implications for our understanding of exchange processes. I discuss the distribution patterns of diverse types of artifacts: ceramics, obsidian, greenstone, shell, spindle whorls, bone implements, figurines, musical instruments, clay earspools, incense burners, bark beaters, and chert. This chapter includes a discussion of the implications of consumption and production patterns for our understanding of the organization of the exchange processes that were responsible for them.

In the final part of this book, the results of the analyses are discussed. In Chapter 7, I combine the findings from each of the different lines of research in order to provide an interpretative synthesis and discuss their implications for our understanding of the ancient Uxul economy. I discuss the evidence and its implications for the topics of wealth inequality, the possible existence of a middle class, settlement organization, consumption patterns, and production patterns. I also discuss the evidence available for our understanding of the place of Uxul in a wider economic network, its chronology and evolution, and some of the ways in which Uxul may compare to other ancient Maya economies. In this chapter, I show how the different analyses combine to present a coherent model of the economic and political organization of ancient Uxul, and how they each contribute to a better understanding of Uxul's economic system as a whole without obscuring individual characteristics, through the use of a household-based approach.

Finally, in Chapter 8, I present the main conclusions of this research. I return to the research questions and discuss how these are answered using the present data and analyses. I present a model of the Late Classic Uxul economy, with regard in particular to the importance of market exchange, the relationships between wealth and political organization, and economic independence at and of Uxul.