THE MORPHOSYNTAX AND PROCESSING OF NUMBER MARKING IN YUCATEC MAYA

by

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SIGNED:  Lindsay Kay Butler
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DEDICATION

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ABBREVIATIONS USED

1 - first person
2 - second person
3 - third person
A - Set A cross-reference marker
AL - animal
AN - animate
B - Set B cross-reference marker
CL - classifier
CMP - completive
D1 - proximate deictic particle
D2 - distal deictic particle
DEF - definite
FEM - feminine
IMPF - imperfective
IN - inanimate
INC - incompletive
IND - indicative
IRREG - irregular
LOC - locative
MSC - masculine
NEG - negation
NOM - nominative
OM - object marker
PST - past
PL - plural
PRN - pronoun
PROG - progressive
PROX - proximate
PFV - perfective
REG - regular
SG - singular
Sp - Spanish
TOP - topic
TR - transitive
This dissertation is a theoretical and experimental investigation of number marking in Yucatec Maya, a language in which number marking has different properties than better known Indo-European languages with inflectional plural marking and obligatory number agreement. The primary goal of this thesis is to propose a formal syntactic analysis of plural marking in Yucatec Maya in the nominal and verbal domains. I do this by examining the distribution and interpretation of the plural morpheme and by proposing an analysis within a Minimalist framework. The secondary goal is to investigate how the formal representation of plural marking interacts with real-time sentence processing mechanisms. I do this through timed translation experiments (and a picture description experiment) with bilingual speakers of Yucatec Maya and Spanish, two languages in which the formal representation of number marking and agreement differs. These experiments are tests of the formal syntactic analyses proposed in this thesis, and they examine the effect of language-particular syntax on sentence processing mechanisms.

In the nominal domain, I argue that the plural marker is adjoined to the Determiner Phrase, rather than heading a Number Phrase, following the syntax of plural marking proposed by Wiltschko (2008). It merges as an adjunct to the DP, lacking the ability to change the label of the element with which it merges. This analysis
explains the distributional and interpretational properties of plural marking as well as the otherwise peculiar lack of morphosyntactic persistence in certain conditions in an experimental translation task.

I also propose an analysis of plural marking in the verbal domain and its relationship to word order. In verb-initial clauses, the aspect-mood particle is the main predicate in $T^0$ which is $\phi$-deficient. There is no $Agree$ for number between the plural-marked full DP and verb due to the absence of $C^0$ (Chomsky, 2008). For DP-initial clauses, a DP bearing plural morphology moves to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on $C^0$ probes via $T^0$ for an interpretable valued feature in its domain (Chomsky, 2001). This analysis predicts asymmetric number agreement in Yucatec Maya, which is tested experimentally.
CHAPTER 1

INTRODUCTION

1.1 Introduction

In this introductory chapter, I present some background on the variety of sub-fields of linguistics which I bring together to present an analysis of plural marking in Yucatec Maya that looks at the problem from all sides. In this dissertation, I present a formal syntactic analysis of plural marking in the nominal and verbal domains along with the results of four sentence production experiments which test the predictions of the formal analyses investigate the real-time use of plural marking in the language.

In Section 1.2, I discuss the typological variation in plural marking. In Section 1.3, I discuss the analysis of number marking in the Minimalist framework and the role of the Number Phrase. In Section 1.4, I discuss the operation of number agreement in a Minimalist framework, explaining the probe-goal approach to agreement. In Section 1.5, I discuss the literature on the processing of number agreement. And, in Section 1.6, I present the basics of Yucatec Maya grammar. Finally, in Section 1.7, I present a brief outline of the dissertation.
1.2 Number marking in grammar

Number marking across languages is extremely varied, more so that even some linguists may realize. Corbett (2000) points out a number of common misconceptions about number marking in grammar, shown below in (1).

(1) Misconceptions about number in natural language:

- Number is simply an opposition of singular versus plural
- All relevant elements (e.g. nouns) will mark number
- Elements which do mark number will behave the same
- Number must be expressed
- Number is a nominal category

In many languages, number has two values, singular and plural. Some languages, however, have three, four or even five number values. A language with three number values expresses singular (one), dual (two) and plural (more than two) number. A language may also express paucal (a small number).

Corbett (2000) also points out that in some languages, not all nouns mark number overtly. For example, some abstract nouns in English, such as *honesty*, do not show number morphology, while others do, e.g. *insult(s)*.\(^1\) He also notes that languages vary widely in the proportion of elements on which number morphology is marked. Some languages mark number on very few items, while other languages mark number on many.

\(^1\)I thank Heidi Harley for the example of *insult.*
Moreover, it is not the case that all elements which mark number will behave the same. In some languages, like Maltese, a variety of Arabic spoken in Malta, there are a few nouns which mark singular, dual and plural number, while the majority of nouns, along with the pronouns, mark only a singular-plural contrast (Corbett, 2000).

Also, in many languages, number does not need to be expressed, nor is exclusively a nominal category. In some languages, like Bayso, a Cushitic language of Ethiopia, items can be marked by a form which is ambivalent as to number, in contrast to number-specifying forms (Corbett, 2000). In addition, in some languages, number marking can refer to the plurality of the event in a verbal expression rather than the number of participants in a nominal expression. Corbett argues that these misconceptions show evidence for the special significance of the topic of number marking in natural human language.

1.3 Number marking in GB/Minimalism

The diversity of number marking has been examined in the functional-typological literature (Corbett, 2000; Mithun, 1999; Smith-Stark, 1974; Stebbins, 1997), but it has not received as much attention in formal generative syntactic theory. There are important issues raised by number marking for formal generative morphosyntactic theory. Harley and Ritter (2002) present a feature geometry of person and number features to account for a wealth of cross-linguistic variation in the typology
of person-number systems a formal generative standpoint. Another notable theory with implications for plural marking is that of Chierchia (1998). Chierchia proposes a semantic parameter according to which languages vary according to two features, that govern the way noun are mapped onto their semantic interpretation. Chierchia predicts that languages which are $[\pm \text{arg(ument)}]$ and $[\pm \text{pred(icate)}]$, like Chinese and Japanese, will have noun classifiers and lack plural morphology. Chierchia’s proposal has been argued to be too rigid (Chung, 2000; Deprez, 2005; Sato, 2008; Gebhardt, 2009, *inter alia*), and I discuss how Yucatec Maya also presents empirical problems for this theory. Then, I present a morphosyntactic analysis of plural marking in the nominal domain in Chapter 2.

1.3.1 Number Phrase

In the GB/Minimalism literature, number marking is generally taken to be the head of a functional phrase in the nominal domain, most often referred to as the Number Phrase (Ritter, 1991, 1995; Abney, 1987; Bernstein, 1991; Valois, 1991, *inter alia*). The Number phrase is selected by the DP, and it plays a role similar to that of the inflectional domain at the clausal level, the TP or IP (Abney, 1987; Brame, 1982; Szabolcsi, 1983, 1987) (see Bernstein (2001) for an overview). Ritter (1991) shows that in the free state noun phrase in Hebrew, the noun raises to Num for its number in (2). Ritter proposes the derivation in (3) to account for the example in (2) in which the noun *axila* ‘eating’ raises to Num to receive its number specification and
to derive the surface word order.

(2) ha-axila shel Dan et ha-tapuax
the-eating of Dan of the-apple
“Dan’s eating of the apple.”

(3) Evidence from Hebrew for NumP

This analysis of number marking has proven convincing and able to account for number marking in a variety of languages from Hebrew to English (Embick and Noyer, 2007), Romance and Walloon (Bernstein, 1991), and a wealth of other languages. Yet there are numerous other languages for which this analysis has been argued to be unlikely or problematic. Kwon and Zribi-Hertz (2004) examine the differences in plural marking in Korean and French and conclude that Korean lacks a Number Phrase. Similarly, Deprez (2005) analyzes Hatian Creole French, a language without plural marking, as a language that does not project a Number phrase.²

²See also Wiltschko (2008) for arguments that not all languages project NumP.
Borer (2005) proposes that plural marking heads a Classifier Phrase in languages like English and Hebrew. This is the same phrase which hosts classifiers in classifier languages. Her analysis is based on the assumption that the function of plural marking is similar to the function of classifiers: individuation of stuff into countable entities. I examine these issues in Chapter 2, as I present the properties of plural marking in Yucatec Maya. Yucatec Maya is a particularly interesting case because it allows plural marking to co-occur with classifiers in the same phrase.

1.3.2 Number marking in the DP

There have been a few arguments for number marking occurring at the level of DP, rather than NumP. Delfitto and Schroten (1991) present an analysis of plural marking in French involving raising of N to to D. Ghomeshi (2003) argues that the plural marker in Persian occurs in the Q/DP as well. Li (1999) proposes that the morpheme -men in Mandarin is a plural marker (though it has formerly been considered a marker of collectivity). Li presents data to support her claim and presents an analysis of -men as occupying the DP. I will explore the possibility that plural morphology in Yucatec is adjoined to the DP, based on the diagnostics outlined by Wiltschko (2008) in Chapter 2. The DP-adjoined plural hypothesis is attractive because it can account for the co-occurrence of plural marking and classifiers as a syntactic restriction, rather than a functional one (Wiltschko, 2008; Borer, 2005).
1.4 Number agreement

In a Minimalist approach to agreement, *Agree* is one of three basic operations of the grammar along with *Merge* and *Move*. The *Agree* operation is a departure from previous versions of agreement, such as “Spec-head agreement” in GB and earlier versions of Minimalism, in which agreement was dependent on movement to a specifier position (Chomsky, 1995). *Agree* is an operation that involves a probe on a head, $X^0$, and a goal in the c-command domain of $X^0$. The presence of an uninterpretable feature $[uF]$ on $X^0$ triggers the probe to search within its domain for a goal with a matching interpretable feature $[iF]$ that can value its unvalued feature. Uninterpretable features must be deleted before LF in order for the derivation to converge (Chomsky, 2001).³

Number agreement asymmetries occur in a number of languages and present an interesting problem. Perhaps the most famous case is that of dialects of Arabic (Modern Standard Arabic and others) (Aoun and Benmamoun, 1999; Benmamoun, 2000, *inter alia*). The examples in (4) through (7) from Modern Standard Arabic demonstrate that in a subject-initial clause, full number agreement is grammatical, as shown by (4) and obligatory, as shown by the ungrammaticality of singular agreement in (5). In verb-initial clauses, however, number agreement on the verb is ungrammatical, shown by the example in (6), compared to the acceptability of

³I will not take up the issue of number concord at the phrasal level (but see Wiltschko (2009) for a recent proposal).
singular agreement when the verb is initial, in (7).

(4) 'al-'awlaad-u naamu
the-children-NOM slept-3.MASC.PL
“The children slept.” (Aoun et al., 1994, 197)

(5) ‘al-'awlaad-u naama
the-children-NOM slept-3.MASC.SG
“The children slept.” (Aoun et al., 1994, 197)

(6) *Naamuu l-'awlaad-u
slept-3.MASC.PL the-children-NOM
“The children slept.” (Aoun et al., 1994, 197)

(7) Naama l-'awlaad-u
slept-3.MASC.SG the-children-NOM
“The children slept.” (Aoun et al., 1994, 197)

In Chapter 3, I propose an analysis of how number agreement is carried out in Yucatec Maya using a probe-goal approach. My analysis predicts asymmetric number agreement, which is tested experimentally in Chapter 5.

There are important issues that remain unsettled with regard to number marking in formal generative linguistic theory, as highlighted by Wiltschko (2008). It is my goal that this investigation of number marking in Yucatec Maya will present some direction for the resolution of these issues. I sum up the major issues in (8).

(8) Important issues in the formal analysis of plural marking (Wiltschko, 2008):

- Do all plurals head a Number projection?
- Is there a relationship between the Number Phrase and number agreement?
- Does identity of function imply categorial identity?
1.5 Number in language processing

Language production is a complex process which is traditionally modeled as starting with the formulation of a message, followed by a level of functional processing during which the speaker retrieves word lemmas and assigns functional roles, such as subject and object, to those lemmas. The next stage of positional processing involves constituent assembly and inflection, which then leads to phonological encoding and sentence production (see the model in (9) based on (Garrett, 1975; Levelt, 1989)).

(9) Language Production Model

![Diagram of Language Production Model]
Occasionally, the language production process can be derailed. Various types of slips of the tongue are relatively common in fast speech. These errors have been studied for a number of decades to reveal these various stages of language production (Lashley, 1951; Fromkin, 1971; Garrett, 1975).

1.5.1 Number agreement attraction

Subject-verb agreement errors are common in fast speech. Bock and Miller (1991) showed in sentence completion experiments that subject-verb agreement errors are common when a noun phrase contains two nouns: a singular head noun and plural local “distractor” noun (e.g. The key\textsubscript{SG} to the cabinets\textsubscript{PL} are\textsubscript{PL} on the table versus The key\textsubscript{SG} to the cabinets\textsubscript{PL} is\textsubscript{SG} on the table). In these cases, the verb, which bears agreement morphology, fails to match the agreement features of its controller, the head noun, key, in the subject noun phrase. In the psycholinguistic literature, this has been called the “agreement attraction effect” because a local distractor noun, rather than the head noun, agrees with the verb. It is a phenomenon that has been discussed for some time by theoretical linguists as well (den Dikken, 2001; Francis, 1986; Jespersen, 1924; Kimball and Aissen, 1971; Quirk et al., 1985, \textit{inter alia}). Since the findings of Bock and Miller (1991), a wealth of studies have been conducted on the nature of these errors. A number of factors have been found to influence agreement attraction, such as the markedness of the number feature (plural but not singular distractor nouns induce errors), the structural depth of the
distractor, and linear order (Bock and Miller, 1991; Bock and Cutting, 1992; Bock and Eberhard, 1993; Vigliocco and Nicol, 1998; Hartsuiker et al., 2001; Haskell and MacDonald, 2003; Thornton and MacDonald, 2003). Most accounts of agreement attraction assume that multiple noun phrases within a complex DP have independent number specifications (Eberhard, 1997; Eberhard et al., 2005; Franck et al., 2002; Hartsuiker et al., 2001; Solomon and Pearlmutter, 2004; Vigliocco and Nicol, 1998). These accounts differ as to what causes agreement attraction. On one account, erroneous feature spreading in the hierarchical structuring of the noun phrase is the source of agreement attraction (cf. Vigliocco and Nicol (1998); Franck et al. (2002)). On another account, agreement attraction is due to confusion between two nouns with different features while re-accessing information about the subject at the stage of verb inflection (cf. Solomon and Pearlmutter (2004); Wagers et al. (2009); Gillespie and Pearlmutter (2011)).

In the psycholinguistics literature, there has been some cross-linguistic comparison of number agreement attraction in English, Spanish, Dutch, French and Russian (Eberhard, 1999; Lorimor et al., 2008; Vigliocco et al., 1996a,b). The extent to which number-related factors other than the number feature of the particular noun phrase in question, like distributivity, lead to number agreement attraction errors has been shown to vary across languages. This variation has been linked to the inflectional richness of the language (but see Bock et al. (2012) for evidence against this position). For example, Spanish, with a rich inventory of inflectional morphology,
shows more agreement attraction with noun phrases that are more likely to be interpreted distributively (e.g. *the label on the bottles*) compared to English (Vigliocco et al., 1996a) (see also Acuna-Farina (2009) and (Jaeger and Norcliffe, 2009, Section 2.3) for an overview). There has been little work, however, on languages with non-inflectional plural marking, such as Yucatec Maya. The secondary objective of this dissertation, in addition to the formal theoretical analyses, is to investigate the use of number marking on nouns and on verbs in number agreement in language production experiments with speakers of Yucatec Maya. I hope to incorporate the results of the language production studies in this dissertation into the larger picture of number agreement processing.

1.6 Yucatec Maya basics

Yucatec Maya is a member of the Mayan language family. It has about 800,000 speakers in and around the Yucatan Peninsula of Mexico (Bohnemeyer, 2002). In this section, I will highlight the basics of Yucatec Maya grammar, from argument marking in Section 1.6.1 to constituent order in Section 1.6.2 and on to the syntax and interpretation of phrases involving number marking in Section 1.6.3. Some of the data presented here are taken from Bohnemeyer (2002), Bricker et al. (1998) and Bricker (1987, 1979, 1981), Verhoeven (2007) and Norcliffe (2009) who have built on earlier work by Andrade (1955), Blair (1964), Blair and Vermont-Salas (1967) and Owen (1968) on the grammar of Yucatec Maya. The data which are not attributed
to one of these sources were collected by the author, either in elicitation sessions or in experimental settings.

1.6.1 Argument marking

Yucatec is a head-marking language that uses morphological cross-reference markers which affix to the verbal core. Yucatec, like other Mayan languages, has two paradigms of cross-reference markers that encode person and number information. Mayanists use the theory-neutral terms “Set A” (which has also been called the ergative set) and “Set B” (which has also been called absolutive set). I will also adopt the Set A, Set B naming convention. Table 1.1 shows the Set A cross-reference markers.

<table>
<thead>
<tr>
<th>Person</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>in(w)</td>
<td>k...-o’on</td>
</tr>
<tr>
<td>Second</td>
<td>a(w)</td>
<td>a(w)...-e’ex</td>
</tr>
<tr>
<td>Third</td>
<td>u(y)</td>
<td>u(y)...(-o’ob)</td>
</tr>
</tbody>
</table>

The Set A marker follows the aspect-mood (AM) marker but precedes the lexical verb. In the plural, the Set A marker is a discontinuous morpheme. The first part of the plural morpheme is the Set A singular form, and the second part of the morpheme, which follows the lexical verb and other inflectional material, is the same as the set B plural forms. The set A prefix (which has been argued to be a clitic (Bohnmeyer, 2002; Verhoeven, 2007)) is followed by an epenthetic glide when it precedes a vowel-initial verb stem. The third person plural Set A marker, o’ob
is optional, while the first and second person plural Set A markers are obligatory (Bohnemeyer, pc.).

The Set B cross-reference markers are shown in Table 1.2. In the plural, the Set B verbal suffixes are homophonous with the second part of the discontinuous plural Set A plural marker.

<table>
<thead>
<tr>
<th>Person</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>-en</td>
<td>-o‘on</td>
</tr>
<tr>
<td>Second</td>
<td>-ech</td>
<td>-e’ex</td>
</tr>
<tr>
<td>Third</td>
<td>-∅/-ij</td>
<td>-o’ob</td>
</tr>
</tbody>
</table>

The third person plural Set B marker, o’ob, though homophonous with the third person plural Set A marker, is not optional in Set B uses, though it is in Set A. The Set A markers cross-reference the agent of a transitive verb, while the Set B markers cross-referencing the patient or undergoer of a transitive, though the third person plural marker is ambiguous between referring to the agent (as the second part of the Set A plural morpheme) or the patient/undergoer (as a Set B marker), a phenomenon which I will return to briefly in example (15).

Yucatec Maya is a split ergative language. The split is based on aspect marking and only applies to intransitive clauses. The subject of an intransitive verb is marked with the appropriate Set A marker in the incompletive, or imperfective, aspect but with the appropriate Set B marker in the completive, or perfective, and in the subjunctive and extrafocal aspects (Bricker, 1981; Bohnemeyer, 2002). The example in (10) shows that in a transitive sentence, the agent is marked with the third person
Set A marker -uy and the undergoer is marked with the first person Set B marker -en.

(10) k uy il-ik-en
    IMPF A3.SG see-INC-B1.SG
    ‘S/he sees me.’

In an intransitive sentence in the completive, or perfective, aspect, the argument is marked with the third person Set A marker, u in the sentence in (11) and with the first person Set A marker in in the sentence in (12).

(11) k u wen-el
    IMPF A3.SG sleep-INC
    ‘S/he sleeps.’

(12) j in jook'-ol
    IMPF A1.SG go.out-INC
    ‘I go out.’

The same intransitive sentence in the imperfective (or incompletive) aspect, however, is marked with the third person Set B marker, -ij in the sentence in (13) and with the first person Set B marker -en in the sentence in (14).

(13) j wen-ij
    CMP sleep-INC.B3.SG
    ‘S/he slept.’

(14) j jook’-∅-en
    PFV go.out-CMP-B1.SG
    ‘I went out.’
The plural morpheme -o’ob can optionally be used with a Set A marker in a transitive clause. It also applies optionally to nominal phrases to indicate the plurality of the noun. When it attaches to verbs and predicate adjectives, as a Set B marker, it is obligatory and cross-references a third person plural argument. Thus, the third person plural marker -o’ob is three ways ambiguous, between referring to the agenthood, patienthood or plurality of a noun phrase. In (15), the plural morpheme can be interpreted as modifying the noun ‘dog’ or the third person possessor. In (16), the plural morpheme can be interpreted as modifying either the agent or undergoer of the carrying event.

(15) u pék’-o’ob
    A3 dog-PL
    ‘their dog’ / ‘his dogs’ / ‘their dogs’ (Lucy, 1992, 47)

(16) T-u bis-aj-o’ob
    PFV-A3 carry-CMP-PL
    ‘S/he took them.’ / ‘They took it.’ / ‘They took them.’ (Lucy, 1992, 53)

In Chapter 2, I examine more closely the morphosyntax and agreement properties of plural marking in Yucatec Maya.

1.6.2 Constituent order

Constituent order is a highly debated topic among Yucatec Maya scholars. First, there is some debate as to which constituent order should be considered canonical, basic or underlying, VOS or SVO. Durbin and Ojeda (1978) and Hofling (1984)
argue that both VOS and SVO orders are basic orders due to the high frequency of occurrence. They, among others (Bohnemeyer, 2009a; Tonhauser, 2009; Norcliffe, 2009), argue that SVO order is derived by left dislocation of a focused or topicalized argument. Evidence for this position is based on the observation that the same order obtains in relative clauses and agent-focus information questions. Bricker (1979) reports that VOS is the order that is first encountered in elicitation sessions. She also reports that SVO is also commonly used, especially in narratives. In addition, Butler et al. (2010) reported a rate of over 98 percent of SVO sentences in a sentence production experiment in which Yucatec Maya speaking participants described animated videos of transitive events between two characters (human, animal and inanimate). Gutierrez-Bravo and Monforte (2009) argue that the basic word order in Yucatec is SVO and propose that the language is subject to the EPP which requires a preverbal phrasal subject. I will not address the issue of which order is unmarked, but I will address the issue of how the different orders arise and what the properties of number agreement are in the different constituent orders in Chapter 3.

1.6.3 Plural marking

The nominal plural marker -o’ob is the homophonous with the third person set B plural cross-reference marker -o’ob. In a noun phrase referring to more than one entity, plural marking is never obligatory. For this reason, Yucatec nouns may be said to be neutral with respect to number (Lucy, 1992). Lucy (1992) notes that
Yucatec marks plural for a relatively small number of nouns, and he did comparative experiments with speakers of English and Yucatec Maya to examine use of noun classification by shape, material and number. He reports that English speakers mark plurals for animate and discrete objects significantly more than for substances, as would be expected given that number marking is obligatory for count nouns in English. He reports that Yucatec speakers, however, mark plurals significantly more on noun phrases referring to animate entities compared to discrete objects or substances. In the experiments reported in this dissertation, I do not focus on these factors (though I do examine DPs referring to humans versus animals). The focus is on other semantic and morphosyntactic factors that condition plural marking in Yucatec Maya. Nonetheless, there might be some interesting points to be made about the differences between the populations that participated in Lucy’s studies and those reported here. Lucy’s Yucatec Maya-speaking participants were exclusively middle-aged men with little education, while his English-speaking participants were male college students. My Yucatec speaking participants were mostly university students as well, but they include a balance of male and female participants. I discuss this more in the general discussions of the experiments.

There has been a recent surge of interest in plural marking in Yucatec Maya as well as in other Mayan languages. Pfeiler (2009) reports the results of a developmental study with two Yucatec Maya speaking children on the acquisition of numeral classifiers and plural marking. There are a number of interesting issues
from her work that I will mention throughout this dissertation. Henderson (2009) and England (2011) examine number marking splits in Kaqchikel (Henderson) and K’ichee’ as well as Mam (England) in which number agreement may or may not be instantiated based on the animacy of the nouns. This dissertation differs in a number of ways from these recent proposals. Mainly, I focus on the formal analysis of plural marking and agreement rather on cognitive or functional influences, such as animacy, which may also contribute to the use of plural marking in Yucatec and other Mayan languages. But, also, I test for effects of humanness on the use of plural marking in my experimental designs to find no such effect.

In the following chapters, I will present novel elicitation and experimental data from Yucatec to supplement the description of the language and to examine a number of issues relevant to current debates on plural marking, agreement and constituent order.

1.7 Outline of the dissertation

In Chapter 2, I present a formal analysis of plural marking in the DP in Yucatec Maya. This analysis is couched within a Minimalist/Distributed Morphology framework. I propose that the nominal plural marker does not head a functional Number projection, as has been proposed for many other languages. I present distributional and interpretational evidence that the plural marker is instead adjoined to the DP. This type of language is predicted by Wiltschko (2008), in which she proposes that
plural marking can vary according to where the plural is merged (\(\sqrt{P}\), nP, NumP, DP) and how the plural is merged (as a head or an adjunct). Yucatec Maya is the DP-adjunct type.

In Chapter 3, I develop a theory of number agreement in Yucatec Maya. I argue that in verb-initial intransitive clauses in the imperfective, the aspect-mood particle is the main predicate in T\(^0\) which is \(\phi\)-deficient. There is no Agree for number between the verb and full DP subject due to the absence of C\(^0\), which is a phase and host for uninterpretable features (Chomsky, 2008). For DP-initial clauses with plural morphology, the DP moves to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on C\(^0\) is inherited by T\(^0\) and then probes for a matching valued feature in its domain (Chomsky, 2001). This C-to-T inheritance analysis predicts asymmetric number agreement in Yucatec, a phenomenon which is tested experimentally in Chapter 5.

In Chapter 4, I present the results of two experiments which test the adjunct status of the plural marker in Yucatec Maya. Experiment 1 is a translation task in which participants translated sentences from Spanish to Yucatec. The stimulus sentences presented an intransitive verb with a subject that varied in number: singular, “two” and plural. I look at the use of plural marking in the various number conditions, and how often it was used with a numeral. In addition, I look at whether participants prefer covariant plural marking, i.e. marking on both the subject and verb. Experiment 2, which is a picture description task, rules out the potential of
cross-linguistic priming, or morphosyntactic persistence, from Spanish to Yucatec which could have influenced the use of plural marking in the Yucatec responses in the translation task in Experiment 1.

In Chapter 5, I present the results of two additional experiments which test the constituency and agreement properties predicted by my proposals in Chapters 2 and 3. In Chapter 2, I argued for an analysis of the nominal plural marker as adjoined to the DP. Experiment 3 tests this hypothesis in a translation task in which participants translated sentences with intransitive verbs and conjoined noun phrases varying in number marking from Spanish to Yucatec. Experiment 4 tests the predictions of the C-to-T inheritance hypothesis presented in Chapter 3, which predicts that in verb-initial clauses, there is no obligatory formal agreement operation between the predicate AM marker and a full DP bearing plural morphology within the nominalized clause it selects. When a full DP is moved to a pre-verbal position, however, it predicts that there is an obligatory formal agreement operation for number.
2.1 Introduction

In this chapter, I present a formal analysis of the nominal plural marker in Yucatec Maya in a Minimalist/Distributed Morphology framework. First, I discuss some interesting cross-linguistic variation in the morphosyntax of plural marking. I discuss how this variation has triggered important theoretical debates about nominal denotation and the nature of nominal arguments as well as number features and agreement. Following that, I discuss the basics of the DP in Yucatec Maya. I discuss what elements reside in the DP and what their syntax is. Based on those assumptions, I present arguments for the analysis of the Yucatec Maya nominal plural marker as adjoined to the Determiner projection. This analysis of Yucatec Maya fits into Wiltschko (2008)’s formal syntactic typology of plural marking and expands the empirical coverage of the typology.

2.2 The typology of number marking

Number is inflectional and obligatory on countable nouns in many well-known Indo-European languages. In these languages, there is often number agreement within the
noun phrase (concord) and between nominal and verbal elements. The examples in (17) through (20) below show that in Spanish, there is obligatory concord for number between the determiner and noun and there is obligatory number agreement between the noun and the verb.

(17) Las muchach-as est-án cant-ando def.fem.pl girl fem.pl be-prog.3.pl sing-ger ‘The girls are singing.’

(18) *Las muchach-a est-án cant-ando def.fem.pl girl fem.sg be-prog.3.pl sing-ger ‘The girls are singing.’

(19) *La muchach-as est-án cant-ando def.fem.sg girl fem.pl be-prog.3.pl sing-ger ‘The girls are singing.’

(20) *Las muchach-as est-á cant-ando def.fem.pl girl fem.pl be-prog.3.sg sing-ger ‘The girls are singing.’

In the example in (17), the determiner and noun match in plural form along with the noun and the verb. The example in (18), however shows that a sentence in which the determiner is in the plural form while the noun is in the singular form is ungrammatical. Likewise, the example in (19) shows that a singular determiner with a plural noun is ungrammatical, even if the noun and verb match, both having a plural form. Finally, the example in (20) shows that even if there is concord between the determiner and noun, which show the same plural forms, the sentence is ungrammatical because the plural form of the nominal does not match the singular
form of the verb. Number concord within the noun phrase and agreement between
the nominal and verbal elements is obligatory in Spanish.

In many other languages, however, number is not marked, or is optional, or
conditioned by syntax-external factors, such as the animacy of the noun (Corbett,
2000; Mithun, 1999). In Yucatec Maya, plural marking in the noun phrase is not
required for a noun to be interpreted as referring to a plurality, as shown in (21).

(21) le x-ch’úupal-o’
   DEF FEM-girl-D2
   ‘the girl (there)’ / ‘the girls (there)’

There are other aspects of number marking in Yucatec which present empirical
challenges for some common approaches to number marking. In the next section, I
will investigate more of the typological variation in plural marking as it relates to
theoretical debates about the syntax of number, the function of number marking,
nominal denotation and nominal argumenthood and number features and number
agreement.

2.3 Theoretical issues

There is a wealth of literature on the semantics of bare nouns, genericity and the
mass/count distinction (especially since Carlson (1977)), but there has been less
research into the morpho-syntax related to these issues. In the next sections, I
discuss these issues, even though I will not be able to propose conclusive solutions to all of them.

2.3.1 Number Phrase

The generally accepted analysis of inflectional plural morphology in the DP is that it occupies the head of a functional projection, called Number Phrase or #P. This analysis has been well established cross-linguistically for languages such as Hebrew (Ritter, 1991, 1992), Romance (Bernstein, 1993), Arabic (Fassi-Fehri, 1993; Zabbal, 2002), Welsh (Rouveret, 1994), English (Embick and Noyer, 2007) and Kiowa (Harbour, 2007), among others. Some languages, however, have been argued to lack a Number Phrase completely (Ghomeshi, 2003, for Persian) (Deprez, 2005, for Haitian) (Kwon and Zribi-Hertz, 2004, for Korean). Lacking a Number Phrase has been connected to the absence of agreement for number (Kwon and Zribi-Hertz, 2004) (but see Wiltschko (2009) for an alternative proposal under which a language could have number agreement without a Number Phrase). Additionally, some languages have been argued to have plural morphology which resides in some phrase other than NumP. For example, Wiltschko (2008) proposes that the plural in Halkomelem Salish is adjoined to the $\sqrt{P}$. Arguments for plurals in nP have been made by Acquaviva (2008) and Alexiadou (2010) as well as Kramer (2009) for Amharic irregular plurals and Gillon (in prep.) for some plural marking in Innu-Aimun. Additionally, plural marking in D/QP has been proposed for Persian (Ghomeshi, 2003), but
see Gebhardt (2009) for arguments against the D/QP analysis and for the NumP analysis of plural morphology in Persian.

I argue that the plural marker in Yucatec Maya is adjoined to the DP, based the syntactic typology of plural marking Wiltschko (2008). I do not necessarily take the position that because the overt plural marker resides in DP, the language lacks a NumP. It may be possible that NumP is the phrase which hosts a numeral classifier. It is also possible that there is a null head in NumP. Also, there may be evidence from N-movement to believe that Yucatec Maya does in fact have a NumP. I discuss these issues more in Section 2.5.

2.3.2 Nominal denotation

What do bare nouns denote? Is the mass/count distinction lexically based or derived in the syntax? There is increasing evidence for the position that the mass/count distinction is rather elastic (Chierchia, 2010). There are many nouns that appear in mass and count contexts alike (e.g. *much hope, many hopes*) (Katz and Zamparelli, 2011, who present a a large-scale quantitative distributional analysis of mass/count in English).\(^1\) If these analyses are on the right track, the mass/count distinction is not lexically-based (as argued by Chierchia (1998)) but is a syntactic phenomenon. It brings the analysis of languages such as English much closer to languages with classifiers, in which the mass/count distinction is argued to be absent at the lexical

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\(^1\)See also Barner and Snedeker (2005); Barner et al. (2008) for evidence from psycholinguistic experiments that individuation of countable nouns is derived from the syntax.
level and necessarily derived in the syntax. If the mass/count distinction is derived through the syntax, as argued by Borer (2005), then the role of the Number Phrase is increasingly important. Borer (2005) proposes that a Classifier Phrase is responsible for individuation of stuff into countable entities in all languages, but languages vary as to what lexeme fills that position: number marking or classifier. There are a number of languages which present empirical problems for any theory which rigidly rules out the co-occurrence of plural morphology and classifiers, such as Borer (2005), Chierchia (1998) and Sanches and Slobin (1973). Plural marking and classifiers co-occur even within the same noun phrase in Yucatec Maya. This phenomenon can be found in elicited examples, as in (22), as well as in narratives, examples (23) and (24).²

(22) ka’a-túul x-ch’úupal-o’ob
    two–CL–AN Fem–girl–PL
‘two girls’

(23) óox-p’él ja’ab-o’ob
    three–CL–IN year–PL
‘three years’ (Blair and Vermont–Salas, 1967, 454)

(24) le óox-p’él siidra-o’ob-o’
    DEF three–CL–AN cider–PL–D2
‘the three ciders’ (Andrade and Máas–Collí, 1999, 216)

Plural marking and classifiers have been shown to co-occur within the same

²These examples are not partitives. In Yucatec the partitive has a definite determiner between the numeral-classifier and noun, e.g. ka’a-túul le x-ch’úupal-o’ob (two–CL–AN DEF Fem–girl–PL) ‘two of the girls.’ I thank Scott AnderBois for this question.
³I thank Judith Aissen for the suggestion to look for examples in narratives.
phrase in Persian as well (Gebhardt, 2009) (and Karimi, pc.). Examples are shown in (25) and (26).

(25) se ta gorbe-ha
     three CL cat-PL
     ‘three cats’ (Gebhardt, 2009, 20)

(26) un do ta mænzel-ha
     DEM two CL house-PL
     ‘those two houses’ (Gebhardt, 2009, 75)

Classifiers co-occur with plural morphology in a number of other Mayan languages as well. In Jakaltek Maya, the plural morpheme co-occurs with numeral and noun classifiers. The plural morpheme heb’ used for nouns referring to humans, as in (27), co-occurs with the numeral classifier wañ as well as the noun classifier naj. Likewise in (28), the plural morpheme hej, used for nouns referring to animals, co-occurs with the numeral classifier c’oñ and the noun classifier no7.4

(27) ca-wañ heb’ naj winaj
     2-CL.NM.HUMAN PL.HUMAN CL.N.MAN man
     “the two men”

(28) ca-c’oñ (hej) no7 nok’
     2-CL.NM.ANIMAL PL.ANIMAL CL.N.ANIMAL animal
     “the two animals” (Craig, 1986, 15)

If the DP-adjoined nominal plural analysis, which I present in this chapter, is correct, it suggests one way in which plural morphology and classifiers can co-occur,

4Another interesting aspect of Jakaltek grammar is that there are numeral classifiers as well as noun classifiers which co-occur along with plural marking. I leave this for future research.
if the plural resides in a position other than the head of the Number/Classifier phrase. Another possibility would be to posit two separate functional phrases, NumP and ClassifierP, as argued for Persian by Gebhardt (2009).

In addition, there are a variety of languages in which plural marking is somewhat freely applied to mass nouns, such as Korean (Kwon and Zribi-Hertz, 2004), Lillooet Salish, (Davis and Matthewson, 1999), Innu-aimun (Gillon, in prep.) and Ojibwe (Mathieu, submitted). And, there are languages in which plural morphology can have double exponence, such as Amharic (Kramer, 2009), Somali (Lecarme, 2002) and Arabic (Zabbal, 2002). These cases support the idea that individuation is a function that is related to the syntactic representation, rather than something that is lexically marked for a subset of countable nouns.

2.3.3 Nominal arguments

Closely related to the issue of nominal denotation is the issue of nominal argument-\text{-}hood. Some languages allow bare nouns as arguments (e.g. Mandarin (Cheng and Sybesma, 1999)), while others do not (e.g. French, which requires determiners on nominal arguments).

Chierchia (1998) proposed a semantic parameter that predicts how languages can vary in terms of what bare nouns denote and if they can appear as arguments. Chierchia proposes two semantic features, $[\pm \text{arg(ument)}]$ and $[\pm \text{pred(icate)}]$, that govern the way in which the syntactic category $N$ is mapped onto its LF interpre-
tation. There are three mapping possibilities: kinds, properties, or mixed (with features of both kinds and properties). In a [+arg] [-pred] language, such as Chinese and Japanese, bare nouns are mapped onto kinds, which are functions from worlds to pluralities (type $<e>$). This language type will display three major morphosyntactic properties that follow from the settings of the two semantic features: 1) They allow bare noun to be arguments, 2) They lack plural morphology (since kinds are the neutralization of the singular/plural distinction) and 3) They have a generalized classifier system that functions to individuate nouns. On the other hand, a [-arg] [+pred] language maps bare nouns onto properties. These languages, such as French and Italian, do not allow bare nominal arguments, but arguments must combine with a determiner to be morphosyntactically licensed. A final type of language, [+arg] [+pred], is mixed, and maps bare arguments to kinds for mass nouns and bare plurals and to properties for count nouns. This explains why in English count nouns require determiners but mass nouns and bare plurals are licensed without determiners.

We have enough facts already about Yucatec Maya already to predict that it should be a [+arg] [-pred] language in Chierchia’s theory. Yucatec would be expected to be of the same type as Chinese and Japanese because it is a language that has obligatory numeral classifiers. There is however, one glaring problem: Yucatec allows classifiers to co-occur with plural morphology, even within the same phrase. Chierchia’s proposal has been convincingly argued elsewhere to be far too rigid
An alternative to Chierchia’s proposal is that the syntax requires nouns to have some minimal amount of functional structure in order to function as an argument. Rather than the semantic requirements that Cheirchia proposes, there is a potential syntactic explanation for the distribution of nominal arguments. Some argue that in order for nouns to function as arguments, there has to be some content in D or some movement to D (Szabolcsi, 1987; Stowell, 1989; Longobardi, 1994; Progovac, 1998, inter alia). There are arguments that nominal arguments can be DPs or NumPs, e.g. in Mandarin (Li, 1998). Sato (2008) proposes a universal nominal morphosyntactic hierarchy, shown in (29) in which languages vary according to how much functional structure they require of their nominal arguments, based on previous proposals by Grimshaw (1990, 2005), Massam (2001), Guilfoyle and Noonan (1992), and Vainikka (1993/1994). His proposal also varies as to what number values a language has available in Num: singular and plural or neutral and plural.

(29) Universal nominal morphosyntactic hierarchy (from Sato (2008))
Sato argues that English has three possible sets of number values, singular, plural and neutral, and requires nominal arguments to have a QP or DP. Indonesian and Javanese, in contrast, have only the number values neutral and plural, and they only require nominal arguments to be NumPs. These parameters, he argues, explain the differences in nominal denotation and nominal arguments across these languages.

This is a promising proposal, attributing differences in nominal denotation and nominal argumenthood to morphosyntactic, rather than semantic, parameters, but it still faces empirical problems when more cross-linguistic data are considered. Sato’s proposal, like those of Chierchia (1998) and Borer (2005) predicts that number marking and classifiers are mutually exclusive categories. Sato states: “The individuation function encoded by the singular value of the \{singular, plural\} set has the same function as that encoded by the classifier. Under the theory that semantic composition is computed in the bottom up fashion in a strictly local manner, the projection of the NumP with the relevant values makes the projection of the dominating ClP redundant.” (Sato, 2008, 284). Sato’s proposal is on the right track, I believe, in postulating a morphosyntactic parameter and also in assuming a feature valuation relation between the Num head and its complement n. In the next section, I discuss the feature representation and valuation mechanism that I assume.

Another question related to number marking concerns the details of feature specification. Some languages appear to have a singular/plural distinction, like English
and Spanish, while other have a general/plural distinction, like Yucatec Maya and Indonesian. General number can be described as a lack of specification for number, and it is cross-linguistically common (Corbett, 2000). In a language with general number, like Yucatec, a noun which is not marked with plural morphology can still be interpreted as referring to a plurality. The interpretation of general number and the optionality of plural marking in languages with general number seems to suggest that when the plural marker is not present, the noun phrase is unspecified for number. That is to say, when the plural morpheme is present, some morpho-semantic feature is present, but when the plural morpheme is absent, the contrast does not indicate the presence of a singular-denoting feature, such as a [+singular] or [−plural] feature. There is even cross-linguistic psycholinguistic evidence to suggest that there is no [+singular or [−plural] feature present, even in languages with a singular/plural distinction, while there is a [plural] feature present in plural noun phrases. Number agreement attraction has been shown to take place only when a local distractor noun is plural and not singular (Bock and Miller, 1991; Bock and Eberhard, 1993; Eberhard, 1997; Fayol et al., 1994; Vigliocco et al., 1996a). Berent et al. (2005) showed that speakers of Hebrew were susceptible to a Stroop-like effect regarding morpho-semantic number features. When participants had to say how many strings (of letters) were on screen, they took longer to indicate that there was just one string when it had plural morphology, but they did not take longer to indicate that there were two strings when neither string had plural morphol-
ogy. These findings are consistent with Nevins’ (2011) work building on Jakobson’s (1941) proposal that [−plural] is marked with respect to singular in English based on the observation that there are fewer gender distinctions in the plural compared to the singular.\(^5\)

These findings suggest that even for speakers of English and Hebrew, for whom number agreement is obligatory, there may not be a singular or [−plural] feature present in singular noun phrases. These findings are quite compatible with the theory of person and number features presented by Harley and Ritter (2002). Harley and Ritter (2002) propose that person and number features are arranged hierarchically. The diagram in (30) shows that the presence of the feature [GROUP], which triggers insertion of a plural form, is dependent on the presence of a feature [INDIV], which implies individuation of the nominal referent. Notice that there is no singular feature which alternates with the plural [GROUP] feature. A singular noun phrase is not as highly specified as a noun phrase with a plural feature. But, there is still a feature which implies that the noun phrase, though under-specified for number, is individuated into countable entities.

\(^5\)Thanks to Heidi Harley for this discussion.
If we adopt this system of number features, the result is a simpler and more economical representation than assuming three distinct features (e.g. singular, plural and neutral). General number and singular number are both the result of the presence of the \textit{[INDIV]} feature, while plural number is the result of \textit{[INDIV]}–\textit{[GROUP]}. This analysis is especially appealing since there is growing psycholinguistic evidence which brings into question the psychological reality of a morpho-syntactic feature marking singular nouns. These observations are supported by other research on the status of the singular as unmarked with respect to the plural, both in morphosyntax and semantics (e.g. Sauerland et al. (2005)).

Now that I have discussed a few major theoretical issues related to the analysis of plural marking, I will move on to the description of plural marking in Yucatec and the analysis of the nominal plural marker as adjoined to the DP. In this chapter, I examine the distribution and interpretation of noun phrases with the plural marker \textit{-o’ob} in Yucatec Maya. I argue that this plural marker in the nominal
phrase is adjoined to the Determiner projection, not at the Number Phrase. If this analysis is on the right track, we can recover the generalization of complementary distribution between plurals and classifiers as proposed by Borer (2005). We can also formalize the intuition of Greenberg (1963) and Chierchia (1998) who also assert the complementarity of plurals and classifiers, at least for plural marking in the familiar Western/European sense. This means that the complementary distribution of plural marking and classifiers is essentially syntactic, as argued by (Borer, 2005): plurals and classifiers may not both reside in NumP. If some plural marking is adjoined to the DP, however, as is the case in Yucatec Maya, then in such languages, plural marking and classifiers may co-occur, even within the same phrase. I incorporate this analysis into a formal typology of the syntax of plural marking (Wiltschko, 2008), and I argue that this analysis of Yucatec Maya expands the empirical coverage of Wiltschko (2008) showing distributional and interpretational evidence for a DP plural. Also, I provide arguments that though the plural morpheme does not reside in NumP, the language may not necessarily lack that projection.

2.4 Plural marking in Yucatec Maya

In this section, I describe some basic properties of plural marking with the nominal plural and third person Set A plural marker -o’ob in Yucatec Maya. I show how

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6 This analysis leaves open the possibility that a language can have a Classifier Phrase in addition to a Number Phrase, as Gebhardt (2009) argues for Persian. This is another potential explanation for the co-occurrence of plurals and classifiers.
neither number concord nor agreement (at least for intransitive imperfective verb-initial clauses) is obligatory. I outline the distribution of the plural marker with respect to other elements of the DP, and I outline the structure of the DP that I assume for Yucatec Maya. In the following sections, I introduce the syntax of plural marking (Wiltschko, 2008), which provides a typology of plural marking, which I adopt. I show that the nominal plural marker in Yucatec Maya is adjoined to the DP, a language type predicted by the system of (Wiltschko, 2008).

2.4.1 No obligatory agreement

Plural agreement between nominal and verbal elements is not obligatory, at least not for the predicate-initial sentences presented here (In Chapter 3, I develop a theory of constituent order and agreement for intransitive imperfective verb-initial and DP-initial clauses in Yucatec). The sentence in (31) without plural morphology on the noun or the verb can still be interpreted as referring to a plural argument.

\[(31) \text{Taan u k'aay le x-chúupal-o'}
\text{PROG A3 sing DEF FEM-girl-D2}
\text{The girl is singing.' / 'The girls are singing.'}\]

The noun phrase can be marked with plural morphology, and there is no requirement for the verb phrase to co-vary in form. The example in (32) shows that the noun phrase can be plural-marked while the verb phrase is not, at least when the
A verbal complex is initial. A sentence with plural marked on the noun and verb, as in (33) is grammatical as well.

(32) T´aan u k’aay le x-ch’úupal-o’ob-o’
    PROG A3 sing DEF FEM-girl-PL-D2
    ‘The girls are singing.’

(33) T´aan u k’aay-o’ob le x-ch’úupal-o’ob-o’
    PROG A3 sing DEF FEM-girl-PL-D2
    ‘The girls are singing.’

A sentence with a plural-marked verb but no plural marking on the noun is grammatical as well, as in (34).

(34) T´aan u k’aay-o’ob le x-ch’úupal-o’
    PROG A3 sing DEF FEM-girl-PL-D2
    ‘The girls are singing.’

Similarly, number concord within the noun phrase is not obligatory in Yucatec. The example in (35) shows that the prenominal adjective is not in a plural form, while the noun is.

(35) le ki’ichpam x-ch’úupal-o’ob
    DEF pretty FEM-girl-PL
    ‘the pretty girls’

\footnote{In Chapter 3 I examine number agreement and constituent order. Agreement has different properties in alternative constituent orders. For the moment, I will leave it aside to focus on the nominal plural.}

\footnote{Some speakers report a slightly different interpretation for a sentence that is verb-initial and has plural marking on the verb but not the noun. The interpretation of (34) has been reported by one speaker to mean “They are singing with the girl.” I leave this issue for future research.}
In fact, plural marking on a prenominal adjective is judged by native speakers as ungrammatical, as shown in (36). When the adjective is in postnominal position, however, as in (37), it can take the plural marker, a curious fact that I will return to in Section 2.7.2.

(36) *le ki’ichpam-o’ob x-ch’úupal-o’ob  
  DEF pretty-PL  FEM-girl-PL  
  ‘the pretty girls’

(37) le x-ch’úupal-o’ob-o’ ki’ichpam-o’ob  
  DEF FEM-girl-PL-D2  pretty-PL  
  ‘the pretty girls’

In the next section, I present a description of the elements in the DP in Yucatec Maya in order to argue for an analysis of the nominal plural marker as adjoined to the Determiner projection. In Chapter 3, I present a proposal for the syntax of the plural marker in the verbal domain along with an analysis of number agreement and constituent order in Yucatec.

2.4.2 The distribution of the nominal plural marker

In this section, I examine the distribution of the plural marker with respect to other elements of the noun phrase. Here, I describe the co-occurrence of the plural marker with the determiner. Then, I examine the co-occurrence of the plural marker with the phrase-final particles and classifiers.
2.4.3 Determiner

The plural marker in Yucatec Maya can co-occur with the definite determiner, as in example (38), and the definite determiner can occur without the plural, as in (39). Likewise, the plural marker can occur without the determiner as in (40) and (41).

(38) le x-ch’úupal-o’ob
    DEF FEM-girl-PL
    ‘the girls’

(39) le x-ch’úupal
    DEF FEM-girl
    ‘the girl’ / ‘the girls’

(40) x-ch’úupal-o’ob
    FEM-girl-PL
    ‘girls’

(41) kaax-o’ob
    chicken-PL
    ‘chickens’ (Tec-Tun et al., 2003, 184)

When the plural marker occurs without a definite determiner, it results in a generic or kind interpretation. The bare plural nouns in (42) and (43) refer to the generic noun “red hammocks” or to a kind “women.”

(42) Juan-e’ k-u-meent-ik chak k’áan-o’ob
    Juan-TOP IMPF-A3SG-do red hammock-PL
    ‘As for Juan, he makes red hammocks.’ (Tonhauser, 2009, 4)

(43) Ko’lel-o’ob-e’ ma’ táan u bin-i’
    woman-PL-TOP NEG PROG A3 go-D4
    ‘Women don’t go there.’ (Verhoeven, 2007, 105)
2.4.4 Phrase-final particles

In addition, the plural marker can be used with the three particles that occur in the final position of the noun phrase in Yucatec Maya. The phrase-final particles include the distal deictic marker -o’, glossed as d2 by Yucatec Mayanists, shown in (44), the proximal deictic marker -a’, glossed as d1 by Yucatec Mayanists, shown in (45), and the topic marker -e’, shown in (46). The plural marker can co-occur with any of these phrase-final particles.

(44) le x-ch’úupal-o’ob-o’
    DEF FEM-girl-PL-D2
    “the girls (there)"

(45) le x-ch’úupal-o’ob-a’
    DEF FEM-girl-PL-D1
    ‘the girls (here)’

(46) le x-ch’úupal-o’ob-e’
    DEF FEM-girl-PL-TOP
    ‘as for the girls’

2.4.5 Classifiers

In Yucatec Maya, numeral classifiers are obligatory when a noun is enumerated.

There are three very common classifiers: -túul is used to count animate entities, -p’él is used for counting inanimate entities, and as a general classifier, and -kúul is used for counting plants. There are over 250 classifiers documented by Miram (1983). Some are “massifiers” in the terms of Cheng and Sybesma (1999) which
measure out mass nouns. Other classifiers indicate shape, material or time. The most interesting property for the current analysis is that numeral classifiers can co-occur with plural markers. This phenomenon can be found in elicited examples and in narratives. These examples were introduced in Section 2.3.2 and are repeated here in (47), (48) and (49).

(47) ka’a-túul x-ch’úupal-o’ob  
    two-CL.AN FEM-girl-PL  
    ‘two girls’

(48) óox-p’éel ja’ab-o’ob  
    three-CL.IN year-PL  
    ‘three years’ (Blair and Vermont-Salas, 1967, 454)

(49) le óox-p’éel siidra-o’ob-o’  
    DEF three-CL.AN cider-PL-D2  
    ‘the three ciders’ (Andrade and Máas-Colli, 1999, 216)

2.5 DPs in Yucatec Maya

2.5.1 The syntax of DP elements in Yucatec Maya

In Sections 2.4.2 through 2.4.5, I examined the co-occurrence of the plural marker with other elements of the noun phrase, the determiner, phrase-final particles and numeral classifiers. In this section, I outline a number of assumptions about the the syntax of these elements.

It has long been argued that determiners head a Determiner phrase, which is the functional head of a nominal phrase, rather than the nominal, lexical constituent
(Abney, 1987; Brame, 1982; Szabolcsi, 1983). At this preliminary juncture, I see no arguments against the proposal that the definite determiner in Yucatec Maya is the head of the determiner phrase. I follow Karimi (1989) and Gebhardt (2009) in assuming that numerals are weak quantificational elements that head a (Weak) Quantifier phrase in the nominal domain. It has been argued that classifiers head their own functional projection, a classifier phrase (ClP) (Borer, 2005; Simpson, 2005; Cheng and Sybesma, 1999). For Borer (2005), the NumP and ClP are the same, but Gebhardt (2009) argues that languages can have both a NumP and a ClP.

For Yucatec Maya, it is possible that the classifier heads Borer’s Num/ClP. Currently, I have no evidence to distinguish the two accounts (given the analysis of nominal number marking argued for in this paper). The numeral classifier is obligatory with a numeral (except for those borrowed from Spanish). It is also possible that the classifier is base-generated as the head of the quantifier phrase, with the numeral in the specifier of the same phrase, since the numeral classifier appears to be selected by the numeral, though it reflects properties of the noun. If the classifier heads the Num/ClP, then we might expect it to license bare noun+classifier arguments without a numeral, but in Yucatec it does not. It is also possible that the classifier head-joins to the numeral in QP, or that it heads the QP, with the numeral in Spec-QP. This analysis has potential, because a classifier is also

9I thank an anonymous reviewer for this point.
obligatory with certain quantificational elements, as shown in (50).

(50) Jay-* (túul) péek' yaan waye’?
    how.many-CL.AN dog exist there
    ‘How many dogs are over there?’

No matter what the best analysis of the syntax of the numeral classifier in Yucatec is, suffice it to say that if the classifier resides in the Number Phrase domain, it would support the idea that the plural morpheme resides elsewhere (DP). Even if the correct analysis of the numeral classifier in Yucatec is that it resides in the QP, there are other arguments presented throughout this chapter that Yucatec still has a Number Phrase as a necessary landing site for N-movement (and if the classifier is in Q, then this is certainly possible).

I argue that the phrase-final deictic particles head the Kase projection, which dominates the DP (Loebel, 1994; Lagmontagne and Travis, 1986). One piece of evidence for the phrase-final deictic particles as heads of K in Yucatec is that pre-verbal nominal phrases must be marked with the phrase-final deictic particle to be interpreted as arguments. The clause in (51) with the deictic particle is interpreted as the agent/subject of the clause. When no deictic particle is present, the same nominal phrase is interpreted as being a noun with a relative clause modifier (52).

(51) Le xi’ipal-o’ k-u jaant-ik ja’as
    DEF boy-D2 IMPF-A3 eat-INC banana
    ‘The boy is eating bananas.’
Based on these observations about the syntax of the basic elements of the determiner projection in Yucatec Maya, I propose the preliminary structure in (53). In the following sections, I will argue that the plural marking in the nominal domain in Yucatec Maya is adjoined to the level of the DP. Thus, in the structure below, the plural appears in its proposed position. (I use #P to refer to the possibility that this phrase is a NumP or a ClP, which Borer proposes to be one and the same phrase, ClP. I leave open the possibility discussed above that the classifier is in QP with the numeral.)

(53) Structure of Yucatec Maya determiner phrase

In the next section, I present Wiltschko (2008)’s syntactic typology of plural marking, the basis for my arguments that the nominal plural marker in Yucatec as
adjoined to the DP.

2.6 The syntax of plural marking

As we have seen, in many languages, plural morphology has been shown to head a Number Phrase within the Determiner Phrase domain. This analysis has been argued to be inadequate to capture the distributional and interpretational facts of plural marking in other languages (Li, 1999; Ghomeshi, 2003; Wiltschko, 2008; Gillon, in prep.; Kramer, 2009). Halkomelem, for example, has been argued to be a language in which plural morphology merges as a syntactic modifier to an acategorial root (Wiltschko, 2008). Wiltschko (2008) presents evidence that plural marking is optional and does not trigger agreement, and that it should be considered a syntactic modifier (i.e. an adjunct). Wiltschko (2008) argues that the fact that plural morphology in Halkomelem can occur inside of compound nouns and inside of derivational morphology is evidence that it cannot merge as high as NumP (which Wiltschko calls #P), but rather that it adjoins to an acategorial √ root. Wiltschko (2008) proposes a typology of plural marking in which plural marking can vary cross-linguistically in how and where the plural is merged. Plural morphology can be merged either as a head or as a syntactic modifier (an adjunct), summarized in Section 2.6.1. Also, plural morphology can be merged at various levels of the DP, including DP, NumP, nP and √ root, outlined in Section 2.6.2.
2.6.1 How plurals merge

The first choice in the parametric variation in the syntax of plural marking concerns how plurals merge. A plural can merge as the head of a phrase, changing the syntactic category of the phrase to Number, depicted in (54). In this case, the merger of the noun and plural marker projects to a Number Phrase, not a noun Phrase. Other plurals do not have such category-changing potential. They merge as adjuncts, as in (55). If a plural merges as a modifier to n, for example, it cannot determine the identity of the label of the resulting constituent. It remains an nP with an adjoined number constituent (Wiltschko, 2008).

(54) Plural merges as head (adapted from Wiltschko (2008))

```
x: PLURAL
  x: PLURAL  y
```

(55) Plural merges as modifier (adapted from Wiltschko (2008))

```
y
  PLURAL  y
```

I assume, following Wiltschko (2008), Hornstein and Nunes (2008), and Sato (2010), that adjuncts are syntactic objects that merge without the ability to change the category label of the item with which they merge. Hornstein and Nunes (2008) propose that specifiers and complements require concatenation and labeling, while adjuncts require only concatenation. A suggestion along these lines was also men-
tioned by (Wiltschko, 2008, footnote 13). The variation in the merging of plural morphology is summarized in (56).

(56) How plurals merge (Wiltschko, 2008)
  • **Head merge**: Number merges with nouns and results in a new syntactic object which has the same label, Number
  • **Modifier merge**: Number merges with nominals but cannot change the syntactic label

The idea that a plural can merge as a head or an adjunct in different languages is reminiscent of the behavior of negation. There is evidence that in some languages, negation instantiates a functional head, while in other languages negation is an adjunct. Zanuttini (1996, 1997) showed that the negative particle *non* in Italian is the head of a functional projection. It behaves like French *ne* (not *pas* which is an adjunct) and other Romance negation in that it cannot occur to the left of Comp. Additionally, it interferes with clitic movement. In the Piedmontese variety, however, the negative particle *nen* behaves like French *pas*, an adjunct. It does not interfere with clitic movement, and it occupies the same position as adverbs. Along similar lines, Hankamer (2011) presents arguments that in infinitival-`to` clauses in English, negation is adjoined rather than heading NegP. Thus, if negation can vary as to whether it heads a functional projection or is an adjunct, it is not alone. Plural marking appears to be similar in this regard.

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10 Thanks to Heidi Harley for mentioning this to me.
2.6.2 Where plurals merge

Wiltschko (2008) also proposes that plural morphology can vary cross-linguistically based on where the plural is merged in the spine of the DP. In the well-established analyses of Hebrew and Romance, plurals merge at the Number Phrase. In Halkomelem, though, Wiltschko argues that plural morphology merges at the level of the acategorial √ root. The main evidence for this proposal is that plural morphology in Halkomelem can occur between noun-noun compounds, as shown in (57), and that reduplicative plural morphology ignores the presence of other derivational morphology, shown in (58) through (60) (from Wiltschko (2008)).

(57) s-xexp’-iːtsel
   NOM-stripe.PL-back
   ‘chipmunk (with more than two stripes’ (Wiltschko, 2008, 644) data from (Galloway, 1980, 63)

(58) p’-eq’
   white
   ‘white’

(59) s-p’-eq’
   NOM-white
   ‘white spot on skin’

(60) s-p’-eq’-p’eq’ (*sp’eq’sp’eq’)
   NOM-white.PL
   ‘white spots on skin’ (Wiltschko, 2008, 645) data from (Galloway, 1993, 379)

The diagram in 61 below has arrows on the left which indicate the points at which a plural morpheme could merge within the DP, based on Wiltschko’s (2008) typology.
So far, we have outlined evidence that in a number of well known cases the plural heads the functional #P (Hebrew and Romance). We have also seen that Wiltschko (2008) analyzes the plural in Halkomelem as a modifier to the root. In Section 2.7, I outline the evidence that plural morphology in Yucatec Maya merges as a syntactic modifier at the level of the DP, then in Section 2.8, I examine evidence for languages that may have plural morphology that merges at other levels of the noun phrase, such as nP and QP.

2.7 The Yucatec plural as DP-joined

2.7.1 Plural is higher than the \( \sqrt{\text{root}} \)

The plural morpheme in Yucatec does not merge with the root. It can only occur outside of noun-noun compounds, shown in (63), and it cannot inside of the noun-noun compound shown in (62).

(62) le pol-ch’oom-o’ob-o’
def head-village-PL-D2
‘governors’
Yucatec Maya is not a language that makes extensive use of derivational morphology. Lois and Vapnarksy (2003) consider roots in Yucatec Maya to be highly underspecified for lexical category. Intransitive unergative roots require no derivation to be used as nominals. Intransitive unaccusative roots take an inflectional suffix which is also used with verbs. Transitive roots can undergo noun incorporation, antipassivization or anticausativization to become nominal (Bohnemeyer, 2009b). Antipassivization and anticausativization do not involve concatenative morphology. They involve supra-segmental changes to the root vowel. Thus, there is some difficulty in showing that plural morphology may not occur inside of derivational morphology. Other nominal morphology, however, may point us in the right direction (especially if we assume a theory of morphology that does not make a pre-theoretical distinction between inflectional and derivational morphology, such as Distributed Morphology).

Nonetheless, there are some examples of nominal derivational morphology which show that the plural morpheme cannot occur inside of it. The plural morpheme cannot occur inside of the instrumental suffix in Yucatec, as shown in (64), but when the plural suffix follows the instrumental suffix, the resulting phrase is grammatical, as in (65).
In fact, the instrumental suffix must appear closer to the root because the vowel of the suffix undergoes vowel harmony (or more accurately, complete vowel echo), to match the vowel of the root (contrast (65) above with (66) below).

(66) x-tsaj-ab
    AG-fry-INSTR
    ‘frying pan’ (Bricker et al., 1998, 365)

In addition, some inalienably possessed nouns require the suffix -el, which I will gloss IP for “inalienable possession.” The example in (67) shows the IP suffix. The example in (68) shows that the plural morpheme cannot occur before the inalienable possession suffix. And, the example in (69) shows that the plural suffix occurring after the inalienable possession suffix is grammatical.

(67) in b’aak-el
    A1 bone-IP
    ‘my bone’ (Bricker et al., 1998, 359)

(68) *in b’aak-o’ob-el
    A1 bone-PL-IP
    ‘my bones’
(69) in b’aak-el-o’ob
   A1 bone-IP-PL
   ‘my bones’

I take these facts as evidence that the plural morpheme occurs higher than other nominal morphology, such as that which marks inalienable possession and instrument-hood.

2.7.2 Plural is higher than NumP

In addition to the evidence that the plural -o’ob in Yucatec Maya merges higher than the root, there is evidence that it merges higher than the Number Phrase as well. In a coordinated DP, the plural marker can occur after the second noun and indicate the plurality of the either noun or the whole conjunct, as shown in (70).\(^{11}\)

(70) le x-ch’úupal yéetel le ko’o�el-o’ob-o’
   DEF FEM-girl and DEF woman-PL-D2
   ‘the girl(s) and the woman/women’

I will assume the structure in (71), based on cross-linguistic arguments for a similar structure for coordinated NPs (Progovac, 1997; Munn, 1993), which captures the long-standing intuition that the coordination of two NPs results in an NP and the coordination of two PPs results in a PP (Progovac, 1998; Jackendoff, 1977; Chomsky, 1981; Gadzar et al., 1985; Sag et al., 1985, *inter alia*).\(^{12}\) If the plural

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\(^{11}\)I thank an anonymous *Lingua* reviewer for suggesting this piece of data.

\(^{12}\)Thanks to Heidi Harley for mentioning this.
marker were merged at NumP, then it should not be possible for it to occur on the highest DP in the coordinate structure and pluralize either, or both of the preceding nouns. Though it is possible to derive the potential plurality of the first noun from the fact that nouns which are unmarked for plural are underspecified for number, in Chapter 4, I present experimental evidence that the plural morpheme is preferentially adjoined to the highest DP.

(71) Plural adjoined to DP in coordinate DP

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{DP} \\
\end{array} \quad \begin{array}{c}
\text{DP} \\
\text{&P} \\
\& \\
\end{array} \\
\end{array}
\]

I assume throughout that the plural morpheme is right adjoined to the DP, which is not in line with the antisymmetry assumptions of Kayne (1994). Given the Mirror Principle (Baker, 1985), the analysis of the plural morpheme as left-adjointed seems rather untenable, even allowing for some additional mechanisms for the manipulation of morpheme order (Harley, 2010). One piece of distributional evidence that the plural morpheme may in fact be right-adjointed to the Determiner projection is that it cannot occur on a pre-nominal adjective, but it can occur on a post-nominal adjective. The example in (72) is acceptable, but the the examples in
(73) with plural marking on a pre-nominal adjective are not, even if plural marking occurs on the head noun as well as the adjective, as in (73b).

(72) le ki’ichpam x-ch’úupal(-o’ob)  
    DEF pretty FEM-girl(-PL)  
    ‘the pretty girls’

(73) a. *le ki’ichpam-o’ob x-ch’úupal  
    b. *le ki’ichpam-o’ob x-ch’úupal-o’ob

When the adjective is in postnominal position, however, plural marking on the adjective is possible, as shown in (74) below, whether or not the noun is marked with the plural morpheme.

(74) le x-ch’úupal(-o’ob) ki’ichpam-o’ob  
    DEF FEM-girl(-PL) pretty-PL  
    ‘the pretty girls’

If we assume Kayne (1994)’s analysis of prenominal adjectives as reduced relative clauses, predicates which are raised to the specifier of CP, then the rightward DP-adjoined analysis explains this distribution. The tree in (75) shows that a prenominal adjective moved from its base position in the complement of T is no longer adjacent to the plural which is right adjoined to the highest DP. This can explain why the sentences in (73) and (73b) with plural marking on the prenominal adjective are ungrammatical, while the sentence in (76) is grammatical. When the adjective remains in its base generated position, it is linearized adjacent to the DP-adjoined plural.
(75) No plural on prenominal adjective

This can explain why the sentences in (73) and (73b) with plural marking on the prenominal adjective are ungrammatical, while the sentence in (74), repeated here in (76), is grammatical. When the adjective is in its base generated position, it is linearized adjacent to the DP-adjoined plural.

(76) le x-ch’úupal(-o’ob) ki’ichpam-o’ob  
DEF pretty FEM-girl-PL-D2  
‘the pretty girls’

On the other hand, in Walloon, a language in which plural morphology occurs in the Number Phrase (Bernstein, 1991), the plural marker can attach to pre-nominal adjectives, shown in (77) and (78). The plural marker on the adjective is underlined (Bernstein, 2001, 556) (data from Remacle 1952 and Morin 1986).\textsuperscript{13}

\textsuperscript{13}Plurals in Walloon are only used in writing. (Bernstein, 1991).
(77) dês vêtses-ouh ‘some green doors’

(78) dês nêurs-ouy ‘some black eyes’

There is also some interpretational evidence that the Yucatec plural does not adjoin to the lexical level, nP. A modifier to a category defining head, such as n, v, or a, would be expected to modify the the meaning of the respective noun, verb or adjective (cf. Marantz (1997)). Though the plural Set B suffix -o’ob, homophonous with the nominal plural marker, can combine with verbs and adjectives, when it combines with verbs, it does not result in a pluractional event, as shown in (79). Likewise, when it combines with adjectives, it does not intensify the property of the adjective, as shown in (80). It functions as agreement to cross-reference a plural argument.

(79) Táan u yáalkab-o’ob
    PROG A3 run-PL
    ‘They are running’ / NOT: ‘Running repeatedly’

(80) ki’-o’ob
    delicious-PL
    ‘They are delicious’ / NOT: ‘very delicious’

Now, I turn to the evidence that supports the proposal the the plural morpheme in Yucatec Maya merges at the level of DP.
2.7.3 Evidence for DP adjunction

In this section, I outline additional distributional and interpretational evidence that lead to the conclusion that the plural morpheme in Yucatec Maya merges at the level of DP.

Plural outside of agreement morphology

One piece of distributional evidence that the Yucatec plural adjoins high in the Determiner Phrase is that it occurs outside of possessor agreement morphology, shown in (81). The plural -o’ob which pluralizes the noun suku’un, ‘brother,’ occurs outside of the obligatory second person plural agreement suffix -e’ex which co-references the possessor.

\[(81)\] Kux t’ uun a suku’un-e’ex-o’ob?
\[\text{what.about then A2 elder.brother-B2PL-PL}\]
\[\text{‘What about your (pl) elder brothers?’}\]

The diagram in (82) shows that the plural has to be adjoined high in order to derive correct the morpheme order. In addition, the noun must move, potentially through successive cyclic head movement from √ through n and up to Num.
This configuration may serve as preliminary evidence that though the nominal plural marker in Yucatec does not occur in the Number Phrase, this does not mean that Yucatec lacks a Number Phrase. NumP may be a necessary landing site for N-movement.

Interpretational effects of DP-adjunction

The proposal that the plural marker is adjoined to the DP raises some questions about its interpretation. For example, the DP-adjointed plural might be predicted to result in a “pronominal determiner” reading, as in the sentence “We linguists are fun” in English.\(^{14}\) In Yucatec, the number-marking plural is homophonous with the third person Set B plural cross-reference marker. Thus, a bare noun marked with -o’ob can mean either “They are linguists” or “linguists,” as shown in (83). To the

\(^{14}\)Thanks to Heidi Harley for posing this question.
best of my knowledge, the first and second person plural cross-reference markers only have the predicational reading.

(83) Lingüista-o’ob
linguist-b1.pl
‘They are linguists.’ / ‘linguists’

(84) Lingüista-o’on
linguist-b1.pl
‘We are linguists.’

(85) Yucatan-il-o’on
Yucatan-rel-b1.pl
‘We are from Yucatan.’ (Blair and Vermont-Salas, 1967)

The behavior of the third person plural and nominal plural -o’ob diverge in other aspects of the grammar as well. The paradigm of emphatic pronouns is constructed from the combination of a locative preposition ti’ and the Set B cross-reference marker. The first and second person singular and plural forms obligatorily form contractions, while the third person plural form cannot contract and requires the presence of the definite determiner Bohnemeyer (2002), shown in Table 2.1.

We expect these emphatic pronouns to be DPs. The DP-adjoined analysis of -o’ob suggests that while the first and second person forms are full DPs, the third person forms lack the referential potential of a full DP. If -o’ob is an adjunct to DP, it does not have the ability to determine the DP category, and must co-occur with the definite determiner le, which has this ability.

Another interpretational effect that could be attributed to the plural residing in the DP is that plural-marked DPs are interpreted as specific. Here is an example
Table 2.1: Yucatec Maya emphatic pronouns
(adapted from (Bohnemeyer, 2002))

<table>
<thead>
<tr>
<th>Person</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>teen &gt; ti’ + -en</td>
<td>to’on &gt; ti’ + -o’on</td>
</tr>
<tr>
<td></td>
<td>LOC + B1</td>
<td>LOC + B1PL</td>
</tr>
<tr>
<td>Second</td>
<td>tech &gt; ti’ + -ech</td>
<td>te’ex &gt; ti’ + -e’ex</td>
</tr>
<tr>
<td></td>
<td>LOC + B2</td>
<td>LOC + B2PL</td>
</tr>
<tr>
<td>Third</td>
<td>*ti’ &gt; ti’ + 0</td>
<td>*to’ob &gt; ti’ + -o’ob</td>
</tr>
<tr>
<td></td>
<td>LOC + B3</td>
<td>LOC + B3PL</td>
</tr>
<tr>
<td></td>
<td>le-ti’</td>
<td>le-ti’-o’ob</td>
</tr>
<tr>
<td></td>
<td>DEF-LOC</td>
<td>DEF-LOC-PL</td>
</tr>
</tbody>
</table>

from a Yucatec speaking consultant. If a person goes to school wearing a new pair of shoes, people might ask him or her the question in (86).

(86) Tumben le xanab-o’?
    new DEF shoe-D2
‘Are those shoes new?’

If, however, a person goes to a shoe store and sees one pair of shoes that look somewhat old on a rack with a bunch of other shoes that look shiny and new, they might ask the question in (87).

(87) Tumben le xanab-o’ob-o’?
    new DEF shoe-PL-D2
‘Are those shoes new?’

The sentence in (87) with plural marking applies to a situation in which a person is referring to one specific pair of shoes among a larger set of shoes that exists
throughout the shoe store. This conclusion is similar to the one made by Ghomeshi (2003) for Persian, but there are some issues with her analysis, primarily, the fact that a definite interpretation possible, even without the plural morpheme present (Karimi, pc.). I return to a more in-depth discussion of this in Section 2.8.2. My analysis is based on a wealth of distributional data, as well as experimental data (which will be presented in Chapter 5), and not just interpretational effects, which are not always tied to a particular syntactic position (see Coppock and Weschler (to appear) and Gillon and Armoskaite (2011) for arguments that DP does not imply definiteness).

2.8 Revisiting the typology

I have presented distributional and interpretational evidence that the plural marker in Yucatec is a modificational adjunct to the DP. Now, I review the typology of plural marking and present some arguments from other languages to show the potential of additional types in the syntax of plural marking. I focus on nP plurals and QP plurals.

2.8.1 nP plurals

Some recent proposals provide evidence for plurals that merge at the level of nP as well. Acquaviva (2008) presents an analysis of some plurals occurring in the nP. Here, I will show examples of nP languages from a some recent literature. Gillon
(in prep.) argues for a split analysis of plurals in Innu-aimun. One plural has the same semantics as the English plural and merges at NumP. The other has different semantics, similar to lexical plurals (Acquaviva, 2008; Alexiadou, 2010) and merges at nP. Gillon proposes that these two loci of merger account for why plural mass nouns have two interpretations in Innu-aimun. One plural implies individuation, ‘bottles of water,’ while the other does not, ‘lots of water,’ as shown in (88) (Gillon notes that this is similar to the interpretation of mass plurals in Greek (Alexiadou, 2010)). Likewise, count nouns can get mass interpretations, as in ‘tea’ from ‘leaf-plural’ in (89).

(88) nipiaa
    water.pl
    ‘bottles of water’ / ‘lots of water’ (Gillon, in prep., 8)

(89) nipish-a
    leaf-inan.pl
    ‘tea’ / ‘cups of tea’ (Gillon, in prep., 15)

In a similarly split analysis of plural marking in Amharic, Kramer (2009) argues that irregular plurals in Amharic merge at nP. They give rise to special interpretations, like lexical plurals. (She bases her analysis on arguments by Arad (2003; 2005) and Marantz (2001; 1997) that word formation at the level of the root in combination with a category-defining head such as nP is more susceptible to phonological, and in this case, semantic irregularities). Kramer’s main piece of distributional evidence comes from the phenomenon of double pluralization, which she reports is
common in Amharic, as in (90) which has an irregular plural and a regular plural co-occurring.

(90) k’al-at-otsts
    word-IRREG.PL-REG.PL
    ‘words’

Kramer argues that the irregular plural must combine with n, while the regular plural must combine with Num, since the opposite order of plural morphemes is ungrammatical, shown in (91).

(91) *k’al-otsts-at
    word-REG.PL-IRREG.PL
    ‘words’

These proposals present evidence for plural marking which occurs at the nP, in addition to NumP. In the next section, I review evidence for QP, quantificational, plurals.

2.8.2 QP plurals

In this section, I review some proposals for QP plurals and show that Yucatec does not share the same properties as a language with the plural in the QP. Park (2008) argues that the plural marker -tul in Korean requires a distributive reading. The sentences in (92) and (93) show that the plural marker -tul is optional in collective
predicates with a distributive sub-entailment. When -tul is present, however, as in
(93) the reading is that all of the professors participate.

(92) Swuhakkwa kyoswu-ka kyosil-ey moyessta
    Math-department professor-NOM classroom-LOC gather-PST
    ‘Professors of a math department gathered in the classroom.’ (Park, 2008)
    (data from Kwak (2003))

(93) Swuhak-kwa kyoswu-\texttt{tul}-i kyosil-ey moyessta
    Math-department professor-\texttt{tul}-NOM classroom-LOC gather-PST
    ‘(All) The professors of a math department gathered in the classroom.’ (Park,
    2008) (data from Kwak (2003))

The examples in (94) and (95) show that in truly collective predicates (with no
distributive sub-entailment), the plural marker -\texttt{tul} is infelicitous.

(94) Swuhak-kwa-nun kyoswu-ka ney myeng-ita
    Math-department-TOP professor-NOM four CL-CPL.DC
    ‘The professors of a math department are a group of four.’

(95) ??Swuhak-kwa-nun kyoswu-\texttt{tul}-i ney myeng-ita
    Math-department-TOP professor-\texttt{tul}-NOM four CL-CPL.DC
    ‘The professors of a math department are a group of four.’

The plural marker in Korean could, based on this interpretational evidence, be
a candidate for a plural that adjoins to QP, but more conclusive evidence for this
possibility is left for further studies. The plural in Yucatec Maya does not adjoin
to the QP. It does not result in the distributive sub-entailment reading. Unlike
in Korean, in Yucatec, the plural marker -\texttt{o’ob} is felicitous with truly collective
predicates, as in the example in (96). The plural is also felicitous with predicates which have distributive sub-entailments, as in (97).\footnote{Thanks to Andy Barss for originally posing this question to me.}

(96) Le xoknal-o’ob ti’ maaya-o’ ya’ab-o’ob
    DEF student-PL PREP Maya-d2 many-B3PL
    ‘The students of Maya are many.’

(97) In kiik-o’ob-e’ chowak-tak u pool-o’ob
    A1SG sister-PL-TOP long-ADJ.PL A3 hair-PL
    ‘My sisters have long hair.’

Ghomeshi (2003) argues for an analysis of the plural marker -ha in Persian as merging at the level of the DP or QP. Her main argument is that the presence of the plural marker triggers definiteness effects. The example in (98) shows the indefinite reading, while the example in (99) shows a definite interpretation with plural marking.

(98) ketab xund-æm.
    book read.PST-IND
    ‘I read books.’

(99) ketab-ha-(ro) xund-æm.
    book-PL-OM read.PST-IND
    ‘I read the books.’

Though the example in (99) also requires the object marker -ro, the example in (100) with a plural subject does not, and plural marking still results in a definite interpretation, according to Ghomeshi.
There are a number of problems with these arguments, however. The definite interpretation is still possible without the plural marker, as shown in (101). Thus, it is not the plural marker, per se, which is responsible for the definite interpretation.

(101) ketab-ro xund-æm.
    book-OM read.PST-IND
    ‘I read the books.’ (Karimi, pc.)

Also, there is evidence that the interpretation of bare plurals is quite different for subjects and objects, as shown by Carlson (1977) and Diesing (1992). Ghomeshi’s examples in (99) and (100) compare an object and a subject: It could be the case that the different placement of the plural in (99) and (100) accounts for the definiteness effects she observes.\textsuperscript{16} Another puzzling aspect of the proposal that the plural marker resides in the D/QP in Persian is that number agreement is obligatory in the language (assuming that NumP is required for number agreement\textsuperscript{17} (but see (Wiltschko, 2009) for a proposal in which it is not).

The tree in (102) summarizes the cross-linguistic evidence reviewed here in the typology of the syntax of plural marking.

\textsuperscript{16}Thanks to Heidi Harley for making this point.
\textsuperscript{17}Thanks to Simin Karimi for pointing this out to me, along with the example in (101).
(102) Language types that show where plurals can merge

This tree, however, does not show the full predictions of the typology. Leaving aside the QP, there should be eight different language types predicted: 1) plural adjoined to DP, 2) plural head of DP, 3) plural adjoined to NumP, 4) plural head of NumP, 5) plural adjoined to nP, 6) plural head of nP, 7) plural adjoined to \( \sqrt{P} \) and 8) plural head of \( \sqrt{P} \). If we include the possibility of QP plurals, there would be ten logically possible language types.\(^{18}\)

2.9 Conclusions

In this chapter, I have presented distributional and interpretational evidence that the nominal plural marker in Yucatec Maya is adjoined to the DP. Plural marking is not necessary for a noun phrase to be interpreted as referring to a plurality. Plural marking cannot occur on a prenominal adjective. Plural marking can occur in the final position of a conjoined noun phrase. Plural marking occurs outside of

\(^{18}\)Thanks to Heidi Harley for this discussion. It remains to be seen if all of these types are attested.
agreement morphology. Additionally, plural marking results in a specific interpretation. This analysis represents an important piece of evidence for DP plurals and represents an expansion of the empirical coverage of the syntactic typology of plural marking (Wiltschko, 2008). In the next chapter, I present an analysis of plural marking and constituent order in the clausal domain in Yucatec Maya. In the two remaining chapters, I present a number of experiments which test the predictions of the DP-joined nominal plural hypothesis of this chapter as well as the hypothesis presented in the following chapter.
3.1 Introduction

In this chapter, I examine the properties of plural marking in the verbal domain focusing on verb-initial and DP-initial intransitive clauses in the imperfective aspects in Yucatec Maya. In Chapter 2, I argued that the plural morpheme -o’ob is adjoined to the DP. In this chapter, I examine the phenomenon of plural marking in the verbal complex with the third person plural cross reference marker -o’ob, homophonous with the nominal plural marker -o’ob examined in Chapter 2. I examine the properties of third person plural agreement and the relationship to constituent order in a Minimalist framework.

First, I argue that in Yucatec, the Aspect-Mood (AM) particle, which precedes the lexical verb and cross-reference markers in the verbal core, is the main predicate of the clause, following Bricker (1981), Lehmann (1993), Bohnemeyer (2002), and Tonhauser (2009). The AM marker resides in T^0, but this T^0 is \( \phi \)-deficient. Due to its \( \phi \)-deficiency, it takes a nominalized clausal complement, in which agreement with person- and number-beraing cross-reference markers is carried out phrase-internally. Thus, for verb-initial clauses in Yucatec Maya, there is no Agree operation for num-
ber features between a probe on T⁰ and a goal in its c-command domain, i.e. the ϕ-feature-bearing pronominal cross-reference markers affixed to the lexical verb.

For DP-initial clauses with plural morphology, the DP moves to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on C⁰ is then inherited by T⁰ and probes for a matching valued number feature in its domain (Chomsky, 2001). This proposal predicts that number agreement is asymmetric in Yucatec Maya. It is mediated by Agree for number in subject-initial clauses but not for verb-initial clauses, due to the presence or absence of C⁰ which, as a phase, is responsible for introducing uninterpretable features of the clause (Chomsky, 2007, 2008).

In Section 3.2, I present the arguments that in Yucatec, the Aspect-Mood particle is the main predicate of the clause, and it selects a nominalized clausal complement. In Section 3.3, I discuss movement phenomena, such as topic, focus and wh-movement in Yucatec Maya. In Section 3.4. I discuss how agreement is carried out in verb-initial and subject-initial clauses. Then, in Chapter 5, I present the results of an experiment which tests the predictions of the C-to-T inheritance hypothesis for clauses with a fronted full DP in Yucatec Maya.

3.2 Predication and complementation

The order of constituents for a basic intransitive clause in the imperfective aspect is shown in (103) below. It consists of the progressive aspect-mood (AM) marker tán,
followed by the third person Set A cross reference marker \( u \), followed by the lexical verb \( \acute{a}lkalab \), followed by the second part of the discontinuous Set A cross reference morpheme \(-o’ob\) (which is homophonous with the Set B third person plural cross reference marker and the nominal plural marker). The basic order of constituents below can be summarized as: AM-CR\(_A\)-V-CR\(_B\).

(103) Táan \( u \) ýáalkab-o’ob
\[ \text{PROG A3 run-B3.PL} \]
‘They are running.’

Yucatec Maya is argued to be a predicate-initial language (Bricker, 1981; Lehmann, 1993; Bohnemeyer, 2002; Tonhauser, 2009). And, Yucatec is typically assumed to be a canonically VOS language with SVO sentences being quite common due to fronting of the agent argument. In fact, some consider Yucatec to be a canonically SVO language (in addition to VOS) due to the frequency of SVO sentences Durbin and Ojeda (1978); Hoffling (1984); Gutierrez-Bravo and Monforte (2009). VOS order, along with VSO order is also possible, and Skopeteas and Verhoeven (2005) show that there is a lot of variation in the interpretation of VOS versus VSO sentences, based on experimental translation tasks with speakers of Yucatec. In their study, postverbal DPs were variably interpreted as agents or patients, and these sentences were occasionally interpreted as having a single argument (with a modifier). Given these observations, I will assume that post-verbal full DPs do not occupy argument positions, but rather they are adjoined to the vP or TP (Jelinek,
1984; Baker, 1996). The exact position of postverbal adjoined full DPs will not make a difference for the analysis presented here. Baker (1996) outlines a number of possibilities for the positions of adjoined full DPs. The most important observation for the analysis presented in this chapter is that full DPs are commonly fronted to preverbal positions, as I will discuss in Section 3.3. In the remainder of this section, I will describe the basics of predicates and arguments in Yucatec.

In Yucatec Maya, I assume that the main predicate of the clause is the aspect or mood (AM) marker, following a number of scholars of Yucatec Maya (Bricker, 1981; Lehmann, 1993; Bohnemeyer, 2002; Tonhauser, 2009). The AM marker always precedes the cross-reference markers and the main verb. I assume that the aspect-mood marker takes as its argument a nominalized clause, just as has been shown for Chol (Coon, 2010). The Yucatec sentence in (104) shows this configuration for Yucatec. The AM marker táan takes the nominal clausal complement u-yáalkab-o’ob. The AM marker as the main predicate with a nominalized clausal complement might be more literally translated as “Their running is happening” rather than “They are running.”

(104) \[ \text{Pred} \ Táan \ [\text{Comp} \ u \ yáalkab-o’ob \ ] \]
\[ \text{PROG} \ A3 \ \text{run-b3.pl} \]
‘They are running.’ Lit. Their running is happening

---

1 I will only treat intransitive clauses in the imperfective aspects in this chapter. An analysis of agreement for objects in transitive clauses and an analysis of perfective aspects is beyond the scope of this chapter.
In fact, Bohnemeyer (2002) includes literal translations of such clauses in Yucatec. In the example in (105) below, he provides the literal translation “Your waking me up again is achieved” for the terminative AM main predicate ts’o’ok and nominalized clausal complement a-ka’a-ah-s-ik-en.

(105) **Ts’o’ok a ka’a-ah-s-ik-en**
    
    **TERM** A2 **REP**-wake.up-**CAUS**-**INC**-B1
    
    ‘You woke me up again.’ Lit. Your waking me up again is achieved. (Bohнемeyer, 2002, 82)

It is possible that the aspect-mood marker takes a third person singular set B marker as its subject, as shown in (106). The third person singular set B marker is phonologically null. For all other set B markers, which are not phonologically null, the set B marker can function as the argument of a copular predication, as in the question in (107) with a second person singular set B marker and the copular sentence in (108) with the first person singular set B marker.

(106) **Táan-∅ a wil-ik-o’ob**

    **PROG**-B3.SG A2 **see**-**INC**-B3.PL

    ‘You see them.’ Lit. Your seeing them is happening.

(107) **Máax-ech**

    who-B2.SG

    ‘Who are you?’ (Tonhauser 2009: 12, from Andrade and Maas Colli 1999: 62)

(108) **Xoknal-en**

    student-B1.SG

    ‘I am a student.’
Bricker presents evidence from older forms of Yucatec Maya that the aspect-mood markers were formerly fully inflected verb forms. The example in (109), which is from a letter written by indigenous Maya officials of Chunhuhub in 1784, shows that the verbal predicate *ts’ok* was inflected for aspect and status, just like main verbs in modern Yucatec.

(109) **K-u-**<sup>ts’ok</sup>-ol k-meyah trapich  
IMPF.A3-finish-INC A1.PL-work grinding.machine  
‘We finish working on the grinding machine.’ (Bricker, 1981, 85)

The verb *ts’ok* “finish” is inflected with the imperfective aspect marker *k*, the third person singular set A marker *-u* and an incompletive status marker *-ol*. The idea is that this form, presumably through attenuation, became grammaticalized as what Bohnemeyer calls the terminative aspect marker *ts’o’ok* shown in (110) below, in which *ts’o’ok* no longer carries aspect and status inflection but functions as an aspectual marker.

(110) **Ts’o’ok** a ka’a-ah-s-ik-en  
TERM A2 REP-wake.up-CAUS-INC-B1  
“You woke me up again.” Lit. Your waking me up again is achieved. (Bohнемeyer, 2002, 82)

According to Bohnemeyer (2002), an argument that the preverbal aspect-mood marker *ts’o’ok* is the main predicate of the clause is that it determines the form of the status suffix *-ah* in the embedded main verb. For example, the sentence in (111)
with the perfective aspect marker $t$ takes the completive status suffix -$_{ah}$, like the terminative AM marker in the example in (110) above. With an imperfective aspect marker, however, like $k$ in (112), the incompletive status suffix -$_{ik}$ is used.

(111) t-u hats'-ah-en
PRV-A3 hit-CMP-B1SG
‘He hit me.’

(112) k-u hats'-ik-en
IMPF-A3 hit-INC-B1SG
‘He hits me.’ (Bohnemeyer, 2004, 76)

Essentially, what I am arguing is that the verbal core in Yucatec Maya is an event nominalization. If this is correct, then the embedded nominalization with the main verb can be analyzed as having a structure parallel to the structure of an event nominalization in English. The nominalized clause in English John’s criticizing the book in (113) has the same structure as the Yucatec clause a wilik-e’ex-o’ob ‘Your seeing them’ in (114)\(^2\).

(113) It is happening, John’s criticizing the book.

(114) Táan-∅ a wil-ik-e’ex-o’ob
PROG-B3.SG A2 see-INC-B3.PL
‘It is happening, your (plural) seeing them.’

\(^2\)The morpheme -textito’ob here is the third person plural Set B cross-reference marker. It is homophonous with the nominal plural marker, but has a different function here
The parallel structures that I assume, following the structure of nominalized clauses in English outlined in Harley (2006) are diagrammed in (115). In English, the lower DP in Spec-vP, which is co-indexed with the DP *John’s* in Spec-DP, is empty, but in Yucatec, this lower DP in Spec-vP is realized by an overt morpheme -e’ex which co-refers to the subject of the nominalized clause.

(115) Parallel structure of event nominalizations in English and Yucatec

For Yucatec Maya nominalized clauses, I assume that the genitive subject resides in the specifier of the DP. Evidence for this proposal is that it precedes the adverbial modifier *ka’a* in (110) repeated in (116) below with the adverbial modifier in bold-faced type.

(116) Ts’o’ok a **ka’a**-ah-s-ik-en
TERM A2 REP-wake.up-CAUS-INC-B1
‘You woke me up again.’ Lit. Your waking me up again is achieved. (Bohne-meyer, 2002, 82)
There are another possible explanation, other than base generation, for the position of the genitive subject in Spec-DP. It is possible that it undergoes overt movement from its base-generated position in the specifier of vP (where it originates along with its counterpart in the discontinuous morpheme that cross-references a second person plural argument a...-e’ex). The observation that the AM marker selects for the form of the status suffix supports the analysis of the Set A marker in the specifier of nP (and that there is no DP between the T (or Aspect) phrase and the nP which it selects, given that selection is a maximally local operation.\(^3\) Another possibility is that the relationship between the AM marker and the status suffix is an agreement relationship, in which case, the non-local selection would not be problematic. I leave the issue for future research.

In the English nominalization, the root √CRITIC moves via successive cyclic head movement, picking up verbalizing and nominalizing morphology -ize and -ing along the way. Similarly, in Yucatec, the root √/(W)IL moves via successive cyclic head movement to the categorizing head v^0, then to the nominalizing head n^0, picking up the status suffix -ik along the way. The suffix -ik is an incompletive status suffix, which is determined by the aspect-mood marker (Bohnemeyer, 2002). This marker could be a verbalizing head, and the nominalizing head would then have null morphology, or the opposite could be true. The exact function of the status suffix in the nominalized clause is quite curious (see Radkevich (2011) for a discussion)\(^3\)

\(^3\)I think Heidi Harley for this discussion.
but beyond the scope of this chapter.

I take these observations as evidence that the aspect marker is the main predicate which selects a nominal complement with a genitive subject. The embedded nominalization analysis may be expected, given that other Mayan languages show very similar properties. Coon (2010) argues that in Chol, a Tzeltalan Mayan language spoken in the southern Mexican state of Chiapas, the progressive and imperfective aspects markers are the main predicates of the clause, and they select a nominalized embedded clause. Coon argues that the perfective aspect marker is not a main predicate, and in the perfective sentences are monoclausal and that this difference explains the split ergative pattern of the language. And, Larsen and Norman (1979) and Bricker (1981) similarly argue that embedding of a nominalized clause is potential explanation for the ergative split in Yucatec Maya.

Now that I have provided arguments that in Yucatec Maya the aspect-mood marker is the main predicate which takes a nominalized clausal complement, I turn to a discussion of the syntax of pre-verbal DPs.

3.3 Movement

There are many arguments for Yucatec Maya, as well as for other Mayan languages, that full DPs which occur pre-verbally are focused or topicalized (England, 1991; Aissen, 1992). For Yucatec, this claim has been made, and is generally accepted (Durbin and Ojeda, 1978; Bricker, 1979; Hoffling, 1984; Bohnemeyer, 2009a; Ton-
hauser, 2009; Norcliffe, 2009; Gutierrez-Bravo and Monforte, 2009). Though there is debate as to which surface order is basic or underlying, VOS or SVO, there is little disagreement that focus and topic are relevant triggers for the alternative constituent orders. Bohnemeyer (2009a) argues that fronted full nominal phrase are not arguments of the main predicate, the aspect-mood marker. He argues that the full DP moves to a topicalized or focused position (or construction). Bohnemeyer argues that full noun phrases occur pre-verbally in order to avoid a violation of the prominence hierarchy, in (117).

(117) topicality > definiteness > humanness > animacy

In addition, there is evidence for conceptual factors motivating pre-verbal noun phrase positions. For example, in a video description experiment, Butler et al. (2010) found that human patient arguments were more likely to be fronted when the agent arguments were animals and even more so when agent arguments were inanimate objects. They also found definite DPs occurred more frequently in pre-verbal positions compared to indefinite DPs.

Tonhauser (2009) analyzes the syntax and semantics of focus constructions in Yucatec Maya to conclude that when full noun phrases are post-verbal, the aspect-mood marker is the main predicate of the clause and that there is a dedicated focus position which precedes the verbal core. Gutierrez-Bravo and Monforte (2009) argue that an EPP requirement is what triggers pre-verbal full noun phrases and explains the frequency of SVO sentences in the language. The particular motivation for the
movement of pre-verbal noun phrases is not central to this analysis, nor is the exact landing site of these preverbal full DPs, so I will place preverbal full DPs in the Specifier position of the CP, though if one were to assume that the fronted full DPs move to the Focus Phrase or Topic Phrase (cf. Rizzi (1997)), it would not be incompatible with the analysis presented here.

The important generalization for this analysis is that a pre-verbal full noun phrase is not the subject of the aspect-mood main predicate. I assume that the aspect-mood marker heads TP but T⁰ is deficient. However, it is also possible that this marker heads an aspectual phrase, AspP, which Hale (2002) argues is agree-deficient. This is certainly compatible with my hypothesis here. The defective TP (or AspP) must select a nominal clause argument as shown in (118).

(118) \[ TP \ Táan\ [DP \ uy \ áalkab \ le \ xi’ipal ]\ ]
       PROG  A3 run  DEF boy
‘The boy is running.’ Lit. The boy’s running is happening.

In a Yucatec sentence with a fronted full DP, this means that the landing site of the DP is not Spec-TP, a position which normally hosts subjects. I assume, instead, that the full DP lands somewhere in the CP domain. This is consistent with the analysis of fronted constituents in Yucatec as topicalized or focused. Assuming an expanded left periphery (Rizzi, 1997), it is possible that the landing site of a fronted DP is Spec-FocusP or Spec-TopicP. At this point, I will use CP to refer to the landing site for simplicity. I leave the exact issue for further research.
Fronted full DPs differ from postverbal full DPs in that they must be morphologically marked to be interpreted as co-referential with an argument of the nominalized clause. Fronted full DPs can be marked with the topic marker -\( e' \) or the distal or proximate decitic markers -\( o' \) and -\( a' \), respectively. In the sentence in (119), the fronted DP is marked with the distal deictic particle and occurs in pre-verbal position. It is interpreted as co-referential with the subject of the event of seeing.

\[(119) [CP \text{ Le xi'ipal-o'} [TP \text{ táan } [DP \text{ u yil-ik le p'éek'-o'} ] ] ]
\]

\text{def boy-d2 prog a3.sg see-inc def dog-d2}

‘The boy sees the dog.’ Lit. The boy, his seeing of the dog is happening.

When a fronted DP does not have a morphological topic marker or deictic particle, it cannot be interpreted as co-referential with an argument of the nominalized clause. I refer to what is called by Mayanists the Agent-focus construction or voice. In Yucatec, when the focused DP does not have a topic marker or deictic particle, it is interpreted as being a noun with a relative clause modifier, rather than co-referential with an argument of the nominalized clause. The example in (120) shows a sentence with the DP ‘the boy’ taking the distal deictic particle and co-referential with the agent argument of the kissing event. If no distal deictic particle is present on the fronted full DP, however, as in example (121), the DP ‘the boy’ is interpreted as being in the Agent Focus form. It is interpreted as a DP with a relative clause modifier ‘The boy who...’ In Yucatec, the Agent-focus construction is indicated by optionally dropping the TAM and person marker. When the TAM and person
marker \textit{k-u} is present, as in (121), the resulting sentence is ambiguous between that of subject and object extraction.

(120) \textit{Le chan xi’ipal-o’ k-u-ts’uts’-ik le ko’olel-o’}
\hfill\textit{DEF small boy-d2 IMPF-A3-kiss-INC DEF woman-d2}
\hfill
‘The little boy is kissing the woman’

(121) \textit{Le chan xi’ipal \textbf{k-u}-ts’uts’-ik le ko’olel-o’}
\hfill\textit{DEF small boy IMPF-A3-kiss-INC DEF woman-d2}
\hfill
‘The little boy who is kissing the woman’ / ‘The little boy who the woman is kissing.’ (Norcliffe, 2009, 50)

If, however, the TAM and person marker \textit{k-u} is dropped, in the Agent Focus construction, the interpretation is unambiguously that of subject extraction.

(122) \textit{Le chan xi’ipal ts’uts’-ik le ko’olel-o’}
\hfill\textit{DEF small boy kiss-INC DEF woman-d2}
\hfill
‘The little boy who is kissing the woman’ / \textit{NOT}: ‘The little boy who the woman is kissing.’ (Norcliffe, 2009, 51)

Tonhauser (2009) argues that focused elements are predicates and that there is a dedicated pre-verbal focus position in the syntax. I don’t take up the issue here of the exact nature of pre-verbal DPs, whether they are focused or topics, predicates or arguments, but I argue, along with Tonahuser that there is a preverbal focus position in the language. I restrict this analysis to DPs that are marked with the definite determiner and distal deictic particle, which may behave differently from the focus constructions that Tonhauser discusses, compare (123) and the acceptability of the possible answer in (124) to that in (125).
(123) Máax il le x-ch’úup-o’?
    who see DEF FEM-woman-D2
    ‘Who saw the woman?’ (Tonhauser, 2009, 5)

(124) Juan il le x-ch’úup-o’
    Juan see DEF FEM-woman-D2
    ‘It was Juan who saw the woman.’ (Tonhauser, 2009, 5)

(125) *Le x-ch’úup-o’ il Jwaan
    DEF FEM-woman-D2 see Juan
    ‘It was the woman who saw Juan’ (Tonhauser, 2009, 15)

It is possible that this means that in Yucatec Maya, the Focus Phrase is lower than the Topic Phrase. That would certainly be compatible with the expanded CP proposal of Rizzi (1997), but I don’t provide further discussion of these issues here. I take these observations for evidence that Yucatec Maya has an expanded left periphery, which may include CP, FocusP and TopicP. Thus, there are ample landing sites for pre-verbal noun phrases, which leaves open a number of possibilities.

In Yucatec Maya, there is an overt topic marker -e’ which occurs on topicalized pre-verbal DPs. In (126) below, Miguel, the topic, is marked with the topic marker -e’ and is an answer to the question “What is Miguel doing?”

(126) Miguel-e’ k-u kanán-t-ik in chiib-o’ob
    Miguel-TOP IMPF-A3 take-care.of-APPL-INC A1 goat-B3.PL
    ‘As for Miguel, he takes care of my goats.’ (Tonhauser, 2009, 4)

Another piece of evidence for the phenomenon of preverbal fronting is that Yucatec Maya allows fronting of multiple constituents to pre-verbal positions. The example in (127) shows that the agent/subject Pedro and the patient/object áanalte
can be fronted in the same clause. Both fronted constituents take the topic marker -e‘.

(127) Áanalte-e’ Pedro-e’ ts’o’ok u xok-ik jun-p’éel jach ma’alob-i’
book-TOP Pedro-TOP TERM A3 read-INC one-CL.IN very good-D4
‘Books, Pedro, he just finished reading a very good one.’ (Fanselow and Fery, to appear, 47)

An additional observation which supports the phenomenon of preverbal fronting in Yucatec Maya is that wh-movement is obligatory. Compare the question in (128) with a fronted wh-word to the wh-in-situ question in (129), which is ungrammatical.

(128) Ba’ax k-a jaant-ik?
what IMPF.A2 eat-INC
‘What are you eating?’

(129) *K-a jaant-ik ba’ax?
IMPF.A2 eat-INC what
‘You are eating what?’

I have shown that there are multiple pre-verbal landing sites which are available to host focussed and topicalized DPs and which require wh-movement. The goal of this chapter is to present an analysis of constituent order and number agreement in Yucatec Maya. The structure of so-called verb-initial intransitive clauses in the imperfective that I have argued for can be summarized in (130). The aspect-mood particle is the main predicate, which I assume heads the TP. It selects a nominalized clause complement which contains the lexical verb and cross reference
markers. The postverbal full DP is an adjunct along the DP. The structure of so-called subject-initial intransitive clauses in the imperfective that I have argued for can be summarized in (131). A fronted full DP has moved into Spec-CP. Like in the so-called verb-initial sentence, the aspect-mood particle is the main predicate, which heads the TP. It selects a nominalized clause complement containing lexical verb and cross reference markers.

(130) VS: $\left[ TP \text{ AM } \left[ DP \left[ DP \text{ CR}_A-V-CR_B \right] \text{ full DP } \right] \right]$

(131) SV: $\left[ CP \text{ full DP}_i \left[ TP \text{ AM } \left[ DP \left[ DP \text{ CR}_A-V-CR_B \right] t_i \right] \right] \right]$

In the next section, I discuss the mechanisms of agreement and the relationship to movement in verb-initial and DP-initial intransitive imperfective clauses in Yucatec.

3.4 Agreement

I have outlined some arguments that the aspect-mood marker is the main predicate of the clause which takes a nominal complement and that there are landing sites above the main predicate for pre-verbal (or pre-aspect-mood marker) order. I have argued that the structure of surface verb-initial (VS for short) and DP-initial (SV for short) sentences in Yucatec differ. Now, I will provide the details of $\phi$-feature agreement for person and number in surface VS and SV intransitive imperfective sentences.
3.4.1 Agreement in VS sentences

The structure that I adopt for surface VS sentences in Yucatec is shown again in (132). I assume that the AM particle is the main predicate which selects a nominalized clausal complement. I assume that the AM particle is the head of the TP.

(132) VS: $[_{TP} \text{AM} [_{DP} CR_{A-V} \text{-} CR_{B} ] \text{ full DP } ]$

I assume that the AM marker in $T^0$ is $\phi$-deficient. The AM particle may, in fact, take a third person singular Set B cross-reference marker, but since the third person singular Set B marker is phonologically null, as shown in (133), it is difficult to say with certainty. It is a fact that the $\phi$-deficient AM marker cannot take any other cross reference markers. The example in (134) shows that a third person plural Set B marker with the progressive AM marker is ungrammatical. In this case, we can definitively say that the AM marker in $T^0$ is $\phi$-feature deficient, because it cannot take number marking (even though person marking, for third person, is a possibility that we cannot rule out because the third person Set B marker is phonologically null).

(133) Táan-∅ uy-áalkab-o’ob

PROG-B3 A3-run-B3.PL

‘They are running.’ Lit. Their running is happening.

(134) *Táan-o’ob uy-áalkab-o’ob

PROG-B3.PL A3-run-B3.PL

‘They are running.’ Lit. Their runnings are happening.
It is possible that the AM marker is part of a predicational structure or an unaccusative verb. If it is a predicational structure (taking a third person Set B marker as the Pred head), then we would assume the structure in (135) below.

(135) Predicational structure for VS sentences

We could also assume that the AM marker is an unaccusative verb which takes one non-agentive subject, its DP complement. In this case, we could assume the structure in (136) below in which the AM marker is an unaccusative verb ‘happen’ that undergoes head movement into an aspect head to yield the verb-aspect compound ‘is happening.’

(136) Unaccusative structure for VS sentences
One argument against the predicational and unaccusative verb approaches is that some of the AM markers can form contractions with the genitive subject in Spec-DP of the nominalized clause. The example in (137) below shows that the progressive AM marker t\'aan can form a contraction with the Set A third person marker u to yield tun. When it does, the epenthetic glide y no longer occurs before the vowel-initial verb áalkab. If linear adjacency is a condition for contraction, then we have a reason to favor the AM marker-in-T\(^0\) analysis. The important generalization here is that this T\(^0\) is \(\phi\)-deficient.

(137) T\’aan uy-áalkab-o’ob / Tun áalkab-o’ob

\[
\text{PROG A3-run-B3.PL} / \text{PROG.A3 run-B3.PL}
\]

‘They are running.’ Lit Their running is happening.

In the structure proposed for intransitive imperfective VS sentences in Yucatec, a full DP with plural marking is adjoined to the DP. Inside the DP, the cross-reference markers mark the arguments of the nominalized clause. Since the T\(^0\) with the aspect marker, Táan, is \(\phi\)-deficient, there is no uninterpretable number feature which triggers a probe to search its domain for a matching interpretable feature with a value, such as the interpretable number feature on the CR marker of the possessor subject or the full adjoined DP. Since there is no requirement for interpretable features to be deleted by LF, plural morphology can occur both on the CR marker and the full adjoined DP, but there is no Agree relationship which matches the two features. The tree in (139) shows the syntax of the intransitive
imperfective VS sentence with a full DP in (138) below.

(138) Táan uy-áalkab-o’ob le xi’ipal-o’ob
         PROG A3-run-B3.PL  DEF boy-PL
         ‘The boys are running.’

(139) No number agreement in intransitive imperfective VS sentences

This structure with a lack of Agree relation predicts that number agreement is not obligatory in VS sentences. This is in fact the case. The sentences in (140) through (142) shows that covariation of plural form on the verb and adjoined full DP is not obligatory in verb-initial sentences. In fact, either the noun or verb can have the plural form without the other also showing plural form, as shown in (141) and (142).
(140) Táan uy-áalkab-o’ob le xi’ipal-o’ob-o’

PROG A3-run-B3.PL  DEF boy-PL-D2

‘The boys are running.’ Lit. The boys’ running is happening.

(141) Táan uy-áalkab le xi’ipal-o’ob-o’

PROG A3-run  DEF boy-PL-D2

‘The boys are running.’ Lit. The boys’ running is happening.

(142) Táan uy-áalkab-o’ob le xi’ipal-o’

PROG A3-run-B3.PL  DEF boy-D2

‘The boys are running.’ Lit. The boys’ running is happening.

Now, I turn to the syntax of DP-initial sentences and the mechanism of number agreement in DP-initial sentences in Yucatec.

3.4.2 Agreement in SV sentences

In this section, I discuss the mechanics of Agree for number feature in DP-initial sentences. First, I will repeat the bracketed structure for intransitive imperfective SV sentences in Yucatec that I proposed in the last section in (143) below.


When a full DP is fronted, I assume that it undergoes A-movement to the CP domain. It is likely that fronting of a DP is for topic or focus, and these DPs could be landing in Topic or Focus Phrases, but I assign them to Spec-CP for simplicity. Following Miyagawa (2010), I assume that movement serves to establish a functional relation between a subject and predicate, a topic and comment, or a theme and rheme, which he calls probe-goal union. In the case of Yucatec, this
movement is triggered by a topic or focus feature. If $\phi$-feature agreement is a phase level phenomenon (Chomsky, 2005; Boeckx, 2003), then we predict $C^0$ to be the bearer of uninterpretable features. Thus, when $C^0$ is present, as indicated by the topic or focus-triggered movement of a full DP to the CP domain, we expect $C^0$ to have an uninterpretable, unvalued number feature, $[u\#: _]$. $T^0$ then inherits this uninterpretable, unvalued number feature $[u\#: _]$ from $C^0$ (Chomsky, 2008). Since uninterpretable features must be deleted before LF, $T^0$ probes its c-command domain for a matching interpretable, valued number feature, $[i\#: \text{pl}]$. It finds a goal with this matching interpretable, valued number feature $[i\#: \text{pl}]$ on the Set B plural cross reference marker (CR) in Spec-vP. Then, the uninterpretable feature is deleted and the derivation will not crash due to the existence of uninterpretable features at LF, in line with the mechanics of the \textit{Agree} operation (Chomsky, 2001).

The tree in (145) shows the syntax of the intransitive imperfective VS sentence and \textit{Agree} for number features with a fronted topialized full DP in (144) below.

(144) Le \textit{xi’ipal-o’ob-e’ t\textacutes\textacute{\textipa{a}lkab-o’ob}

\hline
DEF & boy-PL-TOP & PROG & A3-run-B3.PL

\textquote{The boys are running.} / \textquote{As for the boys, they are running.}
This analysis predicts number agreement to be obligatory when a fronted DP confirms the presence of number features on $C^0$. In fact, speakers of Yucatec readily accept intransitive SV sentences with both the fronted DP and lexical verb inside the nominalized clause marked for plural, as in (146). They are quite reluctant, however, to accept mismatching plural marking on the fronted DP and lexical verb. The example in (147) shows that plural marking on the fronted DP but not the verb is ungrammatical, and the example in (148) shows that plural marking on the verb but not the fronted DP is also ungrammatical.
This analysis sheds light on the surface observation that agreement in Yucatec looks similar to the English-type subject-verb agreement even though the structures of clauses in English and Yucatec clauses are remarkably different. What this analysis suggests is that agreement is carried out in the same way across all languages, via probe-goal $Agree$, but it still allows for variation in morphosyntactic particulars of a language like Yucatec Maya. This analysis is sympathetic to the one presented in Miyagawa (2010) in which agreement is proposed to exist in order to establish a functional relation, whether between a subject and predicate, a theme and rheme or a topic and presupposition. This analysis also supports Miyagawa (2010)’s claim that languages can have mixed agreement properties, using $\phi$-feature-based agreement in some cases, resulting in morphological agreement, and using topic/focus-feature agreement in other cases.

In Chapter 5, I present the results of an experiment in which the predictions of this C-to-T inheritance proposal for number agreement are tested in a translation
task that varies the order of full DP and the verb in intransitive imperfective sentences. First, I turn to the question of why the analysis of plural marking in the nominal domain is not parallel to that of plural marking in the verbal core (which we now analyze as an event nominalization).

3.5 Why is the syntax of the plural -o’ob in the verbal domain different from the nominal domain?

In Chapter 2, I presented distributional, interpretational and experimental evidence that the plural marker in the nominal domain is adjoined to the DP, as shown in (149). In this chapter, I have taken the position that the plural marker in the verbal core (the nominalized clausal DP) is Spec-vP and in combination with the Set A marker in DP, refers to the person and number features of the possessor of the nominalized clause. Naturally the question arises as to why the morphosyntax of the plural marker in these two domains is not the same.

(149) Plural adjoined to DP
There is one major semantic argument to support the idea that the third person Set B plural cross reference marker in the nominalized clausal DP is not adjoined to the DP. First, if the plural marker -o’ob were adjoined to the DP, we would expect it to modify the entire DP and result in a pluractional reading of the event in the nominalized clause. This is not the case in Yucatec, however. As we saw in Chapter 2, when the plural marker -o’ob attaches to a verb, it does not result in a pluractional reading, as shown again in (150).

(150) T´aan u y´aalkab-o’ob
   PROG A3 run-B3.PL
   ‘They are running’ / NOT: ‘Running repeatedly’

3.6 Summary

In this chapter, I presented arguments for the analysis of verb-initial (AM-initial) clauses as being a $\phi$-deficient $T^0$ and selecting a nominalized clausal DP complement. In verb-initial sentences, there is no Agree operation for number features between the full DP subject and verb due to the absence of $C^0$ (Chomsky, 2008). For DP-initial clauses, a DP with plural morphology moves to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on $C^0$ is then inherited by $T^0$. $T^0$ then probes its domain for a matching interpretable valued number feature (Chomsky, 2001). In Chapter 5, I present the results of an experiment which test the asymmetric number agreement prediction of the C-to-T inheritance analysis
presented in this chapter.
4.1 Introduction

In this chapter, I present the results of two experiments which test the use of plural marking on nouns and verbs by speakers of Yucatec Maya. I investigate whether plural marking on nouns is less likely when the semantic number information is explicitly marked, for example, when a numeral is used. This would support the analysis of the plural marker in the nominal domain as a modificational adjunct because its use would be redundant in combination with the numeral. Also, I investigate whether plural marking is truly optional on nouns and verbs or if plural marking on one predicts plural marking on the other. Experiment 1 is a translation task that presents Spanish sentences with intransitive verbs and subject DPs in three conditions, singular, “two” and plural. Experiment 2 is a picture-description task, similar to Experiment 1, which presented stimulus sentences in Spanish in one, two, and many (seven) conditions. Experiment 2 was designed to rule out the potential influence of morphosyntactic persistence from the Spanish stimuli to the Yucatec translations. The predictions that can be made for both experiments are: 1) if plural marking is a modificational adjunct, it should be used less frequently in
conditions in which a numeral is used (because the semantic number information is available from the numeral) and 2) if plural marking is truly optional on nouns and verbs, plural marking on the verb should not be conditioned by plural marking on the noun, and visa versa.

4.2 Experiment 1: Singular, “two” and plural nouns

4.2.1 Methods and predictions

Experiment 1 is a translation task in which Yucatec Maya speaking participants heard sentences in Spanish and were asked to translate those sentences into Yucatec Maya under time pressure. The items varied in terms of whether the number marking on the agent/subject noun phrase of an intransitive sentence was singular (e.g. the girl), “two” (e.g. two girls) or plural (e.g. the girls) in number. If plural marking is a modificational adjunct, we expect it to be used less frequently on nouns in conditions in which a numeral is used (because the semantic number information is available from the numeral and the presence of the plural modifier would be redundant). The second prediction is that if plural marking is truly optional on nouns and verbs, plural marking on verbs should not be dependent upon plural marking on nouns and visa versa.
4.2.2 Participants

Thirty-two bilingual speakers of Yucatec Maya and Spanish participated in the experiment in May of 2010. The experiment was carried out at the University of the Orient (La Universidad del Oriente) in Valladolid, Yucatán, México. Participants were compensated 25 Mexican pesos (about two dollars, a fair rate adjusted for average income) for their participation. Most of the participants were undergraduate students at the University of the Orient. The few participants who were not students were staff at the university or friends or relatives who had heard about the studies and asked to participate. There were fourteen female and eighteen male participants between the ages of eighteen and forty-two. The experiment was carried out in a sound-proof recording room or in a vacant classroom at the University of the Orient.

4.2.3 Materials

The Spanish stimuli were speech synthesized sentences from the voice of Alberto, a synthesized male Latin American Spanish voice from AT&T Labs Natural Voices® text-to-speech project. There were 30 items of which 16 referred to humans and 14 to animals. There were 32 fillers. Half of the fillers were transitive sentences in which the object varied in number or sentences. The other half of the fillers were sentences with predicate adjectives. The items and fillers were arranged in a Latin Squares design into three pseudo-randomized lists. Table 4.1 provides example items for each of the three conditions, listing both the Spanish stimulus and potential responses in
Table 4.1: Experiment 1 conditions and potential responses

<table>
<thead>
<tr>
<th>Condition</th>
<th>Spanish stimulus</th>
<th>Yucatec response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singular</td>
<td>El muchacho&lt;sub&gt;SG&lt;/sub&gt;</td>
<td>Le xi'ipal-o' tun baxal (The boy-prog.a3 play)</td>
</tr>
<tr>
<td></td>
<td>'The boy is playing.'</td>
<td></td>
</tr>
<tr>
<td>“Two”</td>
<td>Dos mujeres&lt;sub&gt;PL&lt;/sub&gt;</td>
<td>Ka'a-túul ko'olel(-o'ob) tun k'aay(-o'ob) (Two-cl.an sing(-PL))</td>
</tr>
<tr>
<td></td>
<td>‘Two women are singing.’</td>
<td></td>
</tr>
<tr>
<td>Plural</td>
<td>Las muchachas&lt;sub&gt;PL&lt;/sub&gt;</td>
<td>Le ch’úupal(-o’ob)-o’ tun wenel(-o’ob) (The girl(-PL)-d2 prog.a3 sleep(-PL))</td>
</tr>
<tr>
<td></td>
<td>‘The girls are sleeping.’</td>
<td></td>
</tr>
</tbody>
</table>

4.2.4 Procedure

Participants completed a language background survey answering questions about their experiences with Yucatec Maya and Spanish growing up and about their current usage of both languages. Participants were seated in a comfortable chair at a table in front of a MacBook Pro laptop with a 15 inch screen. They wore a Siemens headset with a unidirectional microphone that delivered the the Spanish stimuli and recorded their responses. The experiment was delivered with the ExBuilder experimental software, developed at the University of Rochester. The participants were given oral instructions from the experimenter, and they also were able to read

A full list of the stimuli used in Experiment 1 are available in Appendix A.
a set of instructions in Spanish before beginning the experiment. The experiment included four practice trials before the experimental procedure, and the participants were prompted on screen to ask the experimenter if they had any questions before proceeding. In the experiment, the Spanish stimulus was first delivered then repeated two times. The stimulus could be heard a total of three times. After the participant heard the stimulus one time, the participant was allowed to press the spacebar to begin recording their translated response. The participant was given the option to listen to the sentence repeated up to two times. The participant could press the spacebar at any point after the stimulus was played the first time to begin the recording of the translation. The participant was given 15 seconds to record their translated sentence in Yucatec Maya. On the screen, there was a timebar to indicate how much of the 15 seconds was left before the experiment would automatically proceed to the next trial. Once the participant had uttered his or her sentence in Yucatec, he or she was allowed to press the spacebar to proceed to the next trial, rather than waiting for the full 15 seconds to be up. The experiment took no longer than 30 minutes to complete.

4.2.5 Results

Coding and inclusion criteria

In total, there were 900 sentences produced by all subjects in Experiment 1. All responses were coded by the author and checked against transcriptions, with anno-
tation and coding for plural markers completed by two native speakers of Yucatec Maya. The annotators were students in the Maya Culture and Linguistics program at the University of the Orient in Valladolid, Mexico who are trained in the Yucatec Maya orthography and in basic linguistic concepts. Inter-annotator agreement, and agreement between the author’s coding and the annotators’ coding was over 85 percent, for all potential instances of plural marking (i.e. two for every item). The responses in Experiment 1 were coded for the plural morpheme -o’ob on the subject and on the verb. Responses were also coded for the use of a classifier on the subject noun. The responses were also coded for verb transitivity and order of the constituents S and V. If a response was transitive, whether the object was marked with the plural morpheme -o’ob was noted as well. It was also coded whether the subject noun and verb (and object, where relevant) were original Maya words or borrowings from Spanish.

There were 799 out of 901 responses that were included in the analyses (102 total exclusions). Responses were excluded if the participant gave no response (46 excluded), if the author or annotator was unsure if there was plural marking on either the noun or verb (26 excluded), if there was no verb mentioned (25 excluded) or no subject mentioned (1 excluded). Responses that involved Spanish borrowings, either subject noun or verb or both, were not excluded if they were borrowed with a Yucatec determiner or other Yucatec morphology. Borrowings from Spanish into Yucatec are common, so borrowings in the experimental responses were expected.
A noun with Spanish plural morphology but no Yucatec plural morpheme was not included in the counts of plural marking with the Yucatec plural -o’ob.

Statistical analyses

Chi-squared tests revealed significantly more plural marking in the “two” condition compared to the singular condition for both nouns ($X^2(1) = 253.2, p < 0.0001$) and verbs ($X^2(1) = 355.5, p < 0.0001$). There was significantly more plural marking on nouns in the plural condition compared to the “two” condition ($X^2(1) = 48.8, p < 0.0001$), but the effect did not hold for verbs ($X^2(1) = 2.8, p < 0.1$). Though there was significantly more plural marking on nouns in the plural versus the “two” condition, the difference between plural marking on verbs in the “two” versus the plural condition was just marginal.

Over 98 percent of the responses in Experiment 1 were verb-final. Even after excluding cases that were verb-initial (out of 15 total verb-initial responses, 11 had no plural marker on verbs in the “two” and plural conditions) and cases in which there was no classifier used in the “two” condition (19 excluded) and cases in which verbs were transitive (and the plural could have been marked on an object nominal) (76 excluded), the effect for verbs was still not significant ($X^2(1) = 0.2, p < 0.1$). The difference between plural marking on verbs in the “two” and plural conditions was not significant (or marginally significant). The chart in (151) shows the proportion of plural marking on nouns and verbs in Experiment 1.
A Spearman’s rank correlation coefficient revealed a significant preference for covariation of plural form across conditions ($R^2(1) = 0.53, p < 0.001$). Participants significantly preferred to mark both the subject noun and verb in the same way. Participants marked both the subject noun and the verb with the plural morpheme, or they marked neither. Plural marking on the DP and VP were significantly dependent on one another ($X^2(1) = 418, p < 0.001$), as the Spearman’s rank suggests. The chart in 152 shows the proportion of covariant plural marking across conditions. Additionally, human versus animal agent-subjects did not show a significant difference in being plural marked on DPs ($X^2(1) = 0.005, p < 1$) or VPs ($X^2(1) = 0.003, p < 1$).
4.2.6 Discussion

Number and numerals

In Experiment 1 plural marking on subject nouns was more likely in the “two” condition compared to the singular condition. Also, plural marking on nouns was more likely in the plural condition compared to the “two” condition. This result confirms the prediction that due to the modificational adjunct status of nominal plural marker, it should be less likely to appear in conditions in which the semantic number information is already marked, such as in the “two” condition compared to the plural condition.

These results parallel the results of Eberhard (1997) who found that number agreement attraction errors were less likely to occur when a numeral was used to modify the head noun. Agreement attraction is normally a robust effect. A plural
local distractor noun like “cabinets” in “The key to the cabinets” will result in responses with number agreement errors, such as “The key to the cabinets are on the table” (Bock and Miller, 1991). When the head noun contains a numeral, however, such as “One key to the cabinets…” Eberhard found no agreement attraction effect. The results from this experiment are similar. Based on the theoretical proposal presented in Chapter 2, I claim that the nominal plural marker is not obligatory but optionally adjoined. Though plural marking and number agreement are obligatory in English, we see a similar effect of a numeral on plural marking. There is some aspect of number marking involving a numeral which apparently makes the semantic number content stronger or clearer so that there are fewer attraction errors by English speakers and fewer modificational plurals used by speakers of Yucatec. Given that English and Yucatec differ quite a lot in terms of number marking properties, this is an interesting cross-linguistic finding which is promising for future research.

Optionality of number agreement

The second prediction we entertained was that if plural marking is optional on nouns and verbs, we would not necessarily expect a significant preference for covariation of form. Plural marking on verbs should not be dependent upon plural marking on nouns and visa versa. There was, however, a significant preference for covariation of form. Participants preferred to either mark both the subject noun and the verb with plural morphology, or to leave both unmarked, except for a small proportion
of sentences with numerals in the DP which did not have nominal plural marking but did have plural marking on the verb. The fact that participants largely preferred covariation of form, supports the proposal in Chapter 3 that number feature agreement is determined by $C^0$, given that over 98 percent of the responses were subject-initial and verb-final. Another possibility for the preference for covariation is the morphosyntactic priming, or persistence, effect, which I discuss in the following paragraphs.

Translation and morphosyntactic persistence

The translation method employed in this experiment was chosen due to its simplicity and naturalness for the participants who may not be as experienced with psycholinguistic experiments and testing paradigms in general as are university students in more developed nations (cf. Henrich et al. (2010)). There are, however, many potential drawbacks of the translation method. The high rate of usage of plural morphology in the Yucatec responses could have been affected by the obligatory number marking in the Spanish stimuli. The results we see in Experiment 1 could have been affected by morpho-syntactic priming (or persistence) from Spanish to the Yucatec responses.²

²Thanks to Janet Nicol for formulating this question.

There are two separate phenomena that go under the name “syntactic priming.” One is the facilitated processing of a word due to congruence with a prior syntactic context. The other is the facilitatory effect of processing a full sentence
structure based on a previous congruent syntactic structure (Nicol, 1996). These different areas of research have in common the idea that a larger syntactic context can influence the course of subsequent word and sentence production. For example, Gurjanov et al. (1985) showed that in Serbo-Croatian, adjectives inflected for gender and case facilitated lexical access of nouns with the same gender and case specifications. In addition, Bock (1986) showed that ditransitive and passive sentences would prime the use of the same structures in unrelated sentences for speakers of English. Though these studies were not across two languages, there is independent evidence that syntactic priming in sentence production (if not also in lexical decision) has an effect across languages. Loebell and Bock (2003) found that ditransitives and prepositional datives primed the same structures between German and English. Similarly, Hartsuiker et al. (2004) found passives sentences primed other passives between English and Spanish. There are some limits on the extent of the effect of syntactic priming, however, Loebell and Bock (2003) did not find syntactic priming for passives between German and English, presumably because the German passive sentences were verb-final, while the English passives were not. In addition, Bock and Griffin (2003) found that syntactic priming did not affect high frequency or highly preferred structures.\(^3\)

Thus, in the case of this translation experiment, it is possible that the processing of words with plural morphology in Yucatec Maya was facilitated by the previous

\(^3\text{see Branigan (2007) for an overview of syntactic priming at the sentence level.}\)
context in which a Spanish sentence with plural morphology was presented. Experiment 2 was designed to address this potential confound. Experiment 2 is a picture description task with very similar stimuli to those presented in Experiment 1 but in picture form. There are three conditions depicting one, two or seven (many) of the human or animal depicting an intransitive action.

4.3 Experiment 2: One, Two and Many

Since Experiment 1 was a translation task in which the participant was given a sentence in Spanish and asked to translate that sentence into Yucatec Maya, there is a strong possibility of morpho-syntactic priming from the Spanish stimuli. Since number in Spanish is obligatorily marked on nouns and as agreement inflection on verbs, this marking could have influenced the occurrence of and domains in which plural marking in the Yucatec translations appeared. Experiment 2 addresses this potential confound by using a picture description task rather than a translation task to test the effects of number on the occurrence of optional plural marking in sentence production in Yucatec Maya.

4.3.1 Methods and predictions

Experiment 2 is a picture description task with three conditions, one, two and many (seven). The one condition has pictures which depict one character, human or animal, doing an intransitive action. The two condition has pictures which show
two of the same characters doing an intransitive action, and the many condition has pictures which show seven of the same characters doing an intransitive action. The prediction of Experiment 2 is that if plural marking was affected by morphosyntactic persistence from the Spanish stimuli in Experiment 1, then we expect to see lower proportions of plural marking in Experiment 2 compared to Experiment 1. Also, we can re-examine the same predictions that we tested in Experiment 1 to see if they still hold. If plural marking is a modificational adjunct, we expect it to be used less frequently when a numeral provides the semantic number information. The second prediction is that if plural marking is optionally marked on nouns and verbs, we would not expect that covariation of form is significantly more likely than not. In other words, plural marking on verbs should not be dependent upon plural marking on nouns and visa versa.

4.3.2 Participants

Twenty-seven participants, fourteen females and thirteen males between the ages of 19 and 26 participated in February of 2011 and were compensated twenty-five Mexican pesos (just over two dollars) for their participation. All participants were undergraduate students at the University of the Orient (La Universidad del Oriente) in Valladolid, Yucatán, México. All participants were bilingual in Yucatec Maya and Spanish. This experiment was carried out in a sound proof recording room at the university. Two of the participants were run separately in an unoccupied computer
lab, because the recording room was unavailable. Some of the participants who participated in Experiment 1 also participated in Experiment 2, but Experiment 2 was conducted more than 8 months after Experiment 1, so it would not be likely to influence the responses in Experiment 2.

4.3.3 Materials

Participants were shown pictures in three conditions, one, two and many (seven). The one condition had one person or animal depicting an intransitive action, such as a woman singing, a frog jumping or a boy writing, shown in (153).\(^4\)

\[(153) \text{ One condition} \]

\[\text{\includegraphics[width=0.2\textwidth]{image1.png}}\]

The two condition depicts two of the same character, person or animal, engaged in an intransitive action, such as two girls drinking, two monkeys eating or two chickens running, shown in (154).

\[(154) \text{ Two condition} \]

\(^4\)A full list of the stimuli in Experiment 2 are available in Appendix B.
The many category depicts seven of the same character, person or animal, in an intransitive event, such as babies crying, dogs barking, or young women dancing shown in (155).

(155) Many condition

All of the pictures were “clipart” style, simple but clear depictions of people and animals in black and white or greyscale. There were 24 items (12 human and 12 animal) and 48 fillers. The fillers depicted transitive actions with one two, three or seven objects (e.g. a man eating two sandwiches). The items were counterbalanced as best as possible for the direction in which the character was facing (left, right, or forward). Three lists were arranged into a Latin Squares design and randomized with the fillers into three lists.
4.3.4 Procedure

Participants first completed a language background survey about their language use, how many hours per day and where they speak each language. Then, participants were seated in a chair at a table facing a Mac Book Pro laptop with a 15 inch screen or a Lenovo laptop with a 13 inch screen. Participants wore a Siemens headset with a unidirectional microphone that recorded their responses. The experiment was delivered with the ExBuilder experimental software, developed at the University of Rochester. The participant was given oral followed by written instructions in Spanish. There were four practice trials. The participant was shown a picture. Below the picture appeared a timebar that indicated to the participant how much time remained in the trial. Participants were given 15 seconds to say their response to each picture. The participant could optionally press the spacebar when she or he was finished saying their sentence. Upon pressing the spacebar, the experiment would proceed to the next trial rather than waiting for the 15 seconds to be up. The experiment took no longer than 30 minutes to complete.

4.3.5 Results

Coding and inclusion criteria

Responses were excluded if there was no utterance made (28 excluded), if the utterance was unintelligible (2 excluded), if it was unclear whether plural marking was present or not (potentially due to fast or unclear speech) (23 excluded), if the
participant used no verb or a predicate adjective rather than a verb (38 excluded) or if the utterance was completely in Spanish (1 excluded). After exclusions, there were 556 out of 648 total responses that were included. Included responses were coded for plural marking on the noun and verb, use of numeral and classifier, and order of constituents in the sentence.

Statistical analyses

There was significantly more plural marking in the two condition than the one condition for subject nouns ($X^2(1) = 101.5$, $p < 0.001$) and verbs ($X^2(1) = 139.7$, $p < 0.001$). And, there was significantly more plural marking in the many condition than the two condition, for nouns ($X^2(1) = 33.5$, $p < 0.001$) and verbs ($X^2(1) = 11$, $p < 0.001$). The chart in (156) shows the proportion of plural marking on nouns and verbs in the three conditions, one, two and many.

(156) Proportion of plural marking in Experiment 2

![Proportion of plural marking in Experiment 2](chart.png)
A Spearman’s rank correlation coefficient revealed a significant preference for covariation of plural form across conditions ($R^2(1) = 0.61, p < 0.001$). This statistic even includes cases in which a numeral and classifier was used. With the use of a numeral and classifier, there were slightly more cases of nouns without plural marking and verbs with plural marking, but the test was still significant (see Table 4.2 for the proportion of covariant plural marking for those noun phrases that had a numeral and classifier and those that did not).

Table 4.2: Experiment 2 proportion of covariant and non-covariant plural marking on numeral-classifier- and numeral-classifier-less nouns

<table>
<thead>
<tr>
<th>Plural marking</th>
<th>Numeral-classifier DPs</th>
<th>Non-numeral-classifier DPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-V</td>
<td>0.35</td>
<td>0.56</td>
</tr>
<tr>
<td>SPL-V</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>S-VPL</td>
<td>0.28</td>
<td>0.03</td>
</tr>
<tr>
<td>SPL-VPL</td>
<td>0.35</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Plural marking on the DP and VP were significantly dependent on one another ($X^2(1) = 299, p < 0.001$), confirming the results of the Spearman’s rank statistic. The chart in (157) shows the proportion of covariant plural marking across conditions.
Numeral and classifier use in Experiment 2 was common. In the two condition, a numeral and classifier were used in 41 percent of responses. Even in the many condition, some subjects counted the seven objects and used the numeral seven and the appropriate classifier in their response. In the many (seven) condition, numeral and classifier were used in 17 percent of the responses. In addition, there was some use of numeral and classifier in the one condition. The numeral one plus the relevant classifier is also the make-up of the indefinite determiner in Yucatec. The chart in (158) shows the proportions of plural morphology and numeral-classifier use in Experiment 2 (PL representing plural and CL representing numeral and classifier).
Over 96 percent of the responses in Experiment 2 were verb-final, even though there was no potential of syntactic priming from a Spanish stimulus, delivered verb-initially, as in Experiment 1. There were too few verb-initial responses for a reliable statistical comparison between verb-initial and subject-initial clauses, but I address the issue of word order and number agreement in Experiment 4 in Chapter 5.

I also tested the effect of humanness on the likelihood of plural marking, since again, half of the items depicted humans and the other half animals. Chi-squared tests revealed that humanness, however, did not significantly affect the use of plural marking on nouns \((X^2(1) = 0.78, p < 0.5)\) or verbs \((X^2(1) = 0.05, p < 0.5)\) in the descriptions of the pictured items.
4.3.6 Comparing plural usage in Experiments 1 and 2

At this point, we can compare the occurrence of plural marking across the different experimental results in Experiments 1 and 2. The task in Experiment 1 was a translation task, from Spanish to Yucatec Maya. Since plural marking is obligatory, it appeared in the stimuli in the two and plural conditions (but not in the singular condition), and could have influenced the occurrence of plural marking in the Yucatec responses. Experiment 2 was a picture description task with one object, two or many (seven) objects so that there was no potential direct influence from a Spanish stimulus sentence on the occurrence of plural marking in the Yucatec responses. In Experiment 1, there was significantly more plural marking in the “two” condition compared to the singular condition and in the plural condition compared to the “two” condition for nouns. For plural marking on verb, there was significantly more plural marking in the “two” condition compared to the singular condition, but not (or marginally significant) in the plural condition compared to the “two” condition. In Experiment 2, the picture description task, there was significantly more plural use in the two condition than the one condition and in the many condition than the two condition for both nouns and verbs.

The chart in (159) shows the proportion of plurals used on nouns and verbs in Experiment 1, the translation task, was overall higher than in Experiment 2, the picture description task. The chart also reveals, interestingly, that the patterns across experiments remained the same despite the higher proportion of plural marking in
the two and plural/many conditions in Experiment 1. There was somewhat less plural marking on nouns than verbs in the two conditions of both experiments, but in the plural/many conditions, plural marking was closer to equally proportioned on nouns and verbs for both experiments.

(159) Proportion of plural marking in Experiments 1 and 2

In both Experiments 1 and 2, participants significantly preferred covariation of form. The chart in (160) shows the proportions of covariant plural marking in Experiments 1 and 2. Even though there was no direct influence from a Spanish stimulus sentence in Experiment 2, participants still preferred the subject noun and verb to have matching form, either both plural or both unmarked.

(160) Proportion of plural marking in Experiment 2
4.3.7 General Discussion

Experiment 2 was designed to rule out the effect of morphosyntactic persistence from a Spanish stimulus, which was a potential confound in Experiment 1. There was some influence from Spanish because in Experiment 2 the overall rate of plural marking was lower than in Experiment 1. The distribution of plural marking in Experiment 2, however, was very similar to that found in Experiment 1. Experiment 2, like Experiment 1, revealed that participants marked plurals significantly more when there was no numeral that provided the semantic number information. In Experiment 2, this effect was significant for nouns as well as verbs, whereas in Experiment 1 the effect was only marginal for verbs. Thus, the results of Experiment 2 are parallel to those of Experiment 1 and those reported in Eberhard (1997) that the presence of a numeral appears to strengthen the representation of number, making a head noun less susceptible to agreement attraction in English and less
likely to receive modificational plural marking in Yucatec.

In Experiment 2, like Experiment 1, participants significantly preferred covariation of plural form, even though there was no influence from preceding sentences in Spanish with obligatory number agreement, as was true of Experiment 1. Participants either marked both the subject noun and the verb with plural morphology, or they marked neither. Responses in which the subject noun but not the verb was marked for plural, or visa versa, were uncommon. Thus, we can conclude without the confound of morphosyntactic persistence, that there is a preference for covariation of form, a result that has the appearance of obligatory number agreement, at least for verb-final sentences from these participants in these experiments. In the next chapter, I present the results of Experiments 3 and 4. Experiment 3 tests the predictions of the DP-adjoined nominal plural hypothesis presented in Chapter 2. Experiment 4 tests the predictions of the C-to-T hypothesis of number agreement for SV clauses and the lack of number agreement in VS clauses presented in Chapter 3.
CHAPTER 5

EXPERIMENTS 3 AND 4: CONSTITUENCY

5.1 Introduction

Chapter 4 presented the results of Experiments 1 and 2. We found evidence for analyzing the nominal plural as a modificational adjunct. It was less likely to be used in a noun phrase which contained a numeral in both translation and picture description tasks. In this chapter, I first present the results of a mini-acceptability judgment task for plural marking in conjoined DPs. Then, I present the results of Experiment 3, which tests the constituency of the DP-joined nominal plural hypothesis in a translation task. Experiment 3 presented an intransitive verb with a conjoined DP subject in which the number marking of each noun varied. The results of Experiments 1 and 2 raised some other interesting issues such the question of whether number agreement is obligatory. Covariation of plural form was significantly preferred in the responses to Experiments 1 and 2. And, in Chapter 3, I presented an analysis of number agreement as C-to-T inheritance in Yucatec which predicts asymmetric number agreement. In other words, which number agreement is absent for verb-initial clauses but operational for DP-initial clauses in which a DP has been fronted for topic or focus. Experiment 4 tests the predictions of the C-to-T
inheritance hypothesis of number agreement.

5.2 Acceptability judgments with plural marking

I conducted a mini-acceptability judgment task in order to get Yucatec Maya speakers’ judgments about plural marking with conjoined nouns and intransitive verbs. There were three picture conditions, one-one, many-one and many-many. The picture in (162) shows an example of the one-one condition. The picture in (163) shows an example of the one-many condition. The picture in (164) shows an example of the many-many condition. Each picture was matched with a sentence variant in Yucatec. The sentence variants varied in having plural marking on the first noun, second noun and verb, as in (161a through h).

(161)  a) *Le xi’ipal yéetel le péek’-o’ táan u yaalkab*
        The boy and the dog are running

   b) *Le xi’ipal yéetel le péek’-o’ táan u yaalkab-o’ob*
        The boy and the dog are running-PL

   c) *Le xi’ipal yéetel le péek’-o’ob-o’ táan u yaalkab*
        The boy and the dog-PL are running

   d) *Le xi’ipal yéetel le péek’-o’ob-o’ táan u yaalkab-o’ob*
        The boy and the dog-PL are running-PL

   e) *Le xi’ipl-o’ob yéetel le péek’o’ táan u yaalkab*
        The boy-PL and the dog are running

   f) *Le xi’ipl-o’ob yéetel le péek’-o’ táan u yaalkab-o’ob*
        The boy-PL and the dog are running-PL

   g) *Le xi’ipl-o’ob yéetel le péek’-o’ob-o’ táan u yaalkab*
        The boy-PL and the dog-PL are running

1A full list of picture stimuli are available in Appendix D.
h) *Le xi’ipal-o’ob yéetel le péek’-o’ob-o’ tán u yaalkab-o’ob*

The boy-PL and the dog-PL are running-PL

(162) One-one condition

(163) One-two/many condition

(164) Two/many-two/many condition

There were four native speakers of Yucatec who gave their acceptability judgments on these sentences according to a 3-point scale (acceptable, not acceptable, so-so) via an online webform. The proportion of answers for each acceptability rating for the one-one picture items are reported in Table 5.1. The proportion of answers
for each acceptability rating for the one-two items are in Table 5.2, and the proportion of ratings for the two-two items are in Table 5.3. In the one-one picture condition (Table 5.1) the only sentence for which all four participants shared the same judgment is the one in which both nouns were unmarked for plural and the verb had plural marking (N1-N2-V). In addition, the sentences with plural marking on the first noun but not the second (N1pl-N2-V and N1pl-N2-Vpl) were not rated as acceptable by any of the participants. On the other hand, sentences with plural marking after the second noun (N1-N2-pl-V and N1-N2pl-Vpl) were rated acceptable at a rate of 25 to 50 percent for the one-one picture items.

Table 5.1: Proportion of acceptability ratings for one-one pictures

<table>
<thead>
<tr>
<th>Sentence condition</th>
<th>Acceptable</th>
<th>So-so</th>
<th>Not acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1-N2-V</td>
<td>0.5</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>N1-N2-Vpl</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>N1pl-N2-V</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>N1pl-N2-Vpl</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>N1-N2-pl-V</td>
<td>0.5</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>N1-N2pl-V</td>
<td>0.25</td>
<td>0</td>
<td>0.75</td>
</tr>
<tr>
<td>N1pl-N2pl-V</td>
<td>0</td>
<td>0.25</td>
<td>0.75</td>
</tr>
<tr>
<td>N1pl-N2pl-Vpl</td>
<td>0.25</td>
<td>0</td>
<td>0.75</td>
</tr>
</tbody>
</table>

For the one-two picture condition, shown in Table 5.2, judgments were quite variable again. There was not one item for which all four participants agreed.

In the two-two condition, shown in Table 5.3, all participants reported the same judgment that the sentence with plural marking on all three constituents (N1pl-N2pl-Vpl) was acceptable. Judgments of all other sentence conditions were highly varied.
In all three picture conditions, no participant rated a sentence which had N1pl-N2-V as acceptable. The judgments were extremely variable, however. It is possible that with more participants and a larger rating scale, more highly quantifiable and thus interpretable results may have come through. In addition, this mini-study did not make use of fillers, so that could have affected the outcome as well. I view this variability of acceptability ratings as an excellent reason to look at the use of plural marking in sentence production experiments. Next, I present the results of two addition sentence production experiments on plural marking and number agreement.
5.3 Experiment 3: Conjoined singular and plural nouns

Experiment 3 is a translation task which presented a conjoined noun phrase and intransitive verb for the participant to translate from Spanish to Yucatec under time pressure. The conjoined noun phrases varied in the number marking on either noun (singular and plural). Experiment 3 tests the constituency of the plural marker in the nominal domain. It provides evidence for the DP-joined hypothesis presented in Chapter 2.

5.3.1 Methods and predictions

Experiment 3 is a translation task that presented stimulus sentences in Spanish that consist of an intransitive verb and a conjoined noun phrase with the first and second noun varying in number marking. The prediction that can be made for Experiment 3 is that if the plural marker is adjoined high, to theDeterminer Phrase, the plural morpheme will be more likely to appear after the second linear noun of the conjunct, since one plural marker following the noun conjunct can encode the plurality of either, both, or neither (modifying the conjunct has a whole) of the preceding nouns, as shown in (165) below.

(165) le x-ch’úupal yéetel le xi’ipal-o’ob-o’
    def fem-girl and def boy-PL-D2
    ‘the girl(s) and the boy(s)’

As we saw in Chapter 2, the plural marker can adjoin to the first or second noun,
but it is also possible to adjoin to the highest DP projection, as shown in (166). The DP-adjoined plural proposal predicts that the plural marker should occur after the second linear noun of the conjunct even when the participant hears a sentence in Spanish which has the first noun plural and second noun singular and also for a sentence in Spanish which has two singular nouns. I will take this as evidence that the plural morpheme adjoins to the DP, rather than to a lower projection.

(166) High plural attachment in a conjoined DP

5.3.2 Participants

Twenty-eight native speakers of Yucatec Maya, between the ages of eighteen and forty-two, participated in the experiment and were compensated 25 Mexican pesos (just over 2 U.S. dollars) for their participation in May of 2010. The experiment was carried out in a sound-proof recording room at the University of the Orient (La Universidad del Oriente) in Valladolid, Yucatán México. Most of the participants were undergraduate students at the university. A few of the participants who took part in Experiment 1 also took part in Experiment 3, but they were always separated by one day. That is to say, no person participated in both Experiment 1 and
Experiment 3 in the same day.

5.3.3 Materials

The Spanish stimulus was recorded from the speech synthesized voice of Alberto, a male Latin American Spanish synthesized voice from AT&T Labs Natural Voices® text-to-speech project. Experiment 3 presented intransitive verbs with conjoined noun phrases varying in singular versus plural first and second noun. There were 18 items. Five items had conjoined nouns phrases with both nouns referring to humans, and thirteen items had conjoined noun phrases with both nouns referring to animals. There were 36 fillers which consisted of singular and plural subject noun phrases in transitive sentences with singular objects. Half of the transitive fillers had singular subjects and conjoined DP objects. The remainder of the fillers were sentences with predicate adjectives. The items and fillers were arranged in a Latin Squares design and randomized into four lists. Table 5.4 lists the conditions along with examples of the Spanish stimuli and potential Yucatec responses.²

5.3.4 Procedure

Participants completed a language background survey inquiring about their experiences with Yucatec Maya and Spanish growing up and about their current usage of both languages. Participants were then seated in a comfortable chair at a table in front of a MacBook Pro laptop with a 15 inch screen. They wore a Siemens

²A full list of experimental items in Experiment 3 is available in Appendix C.
Table 5.4: Experiment 3 conditions and potential responses

<table>
<thead>
<tr>
<th>Cond.</th>
<th>Spanish stimulus</th>
<th>Potential Yucatec response</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>El muchachosG y el hombreG</td>
<td>Le xi’ipal yéetel le maak-o’</td>
</tr>
<tr>
<td></td>
<td>‘The boy and the man’</td>
<td>The boy and the person-D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tun ximbal(-o’ob). Prog.A3 walk(-PL)</td>
</tr>
<tr>
<td>SP</td>
<td>La mujersG y las muchachasP</td>
<td>Le ko’olel yéetel le chúpal(-o’ob)-o’</td>
</tr>
<tr>
<td></td>
<td>‘The woman and the girls’</td>
<td>The woman and the girl(-PL)-D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tun k’aay(-o’ob). Prog.A3 sing(-PL)</td>
</tr>
<tr>
<td>PS</td>
<td>Las viejasP y el bebéG</td>
<td>Le chiich(-o’ob) yéetel le champal-o’</td>
</tr>
<tr>
<td></td>
<td>‘The old ladies and the babies’</td>
<td>The old.lady(-PL) and the baby-D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tun wenel(-o’ob). Prog.A3 sleep(-PL)</td>
</tr>
<tr>
<td>PP</td>
<td>Los viejosP y los campesinosP</td>
<td>Le úuchben(-o’ob) yéetel le kolnal(-o’ob)-o’</td>
</tr>
<tr>
<td></td>
<td>‘The old men and the farmers’</td>
<td>The old.man(-PL) and the farmers(-PL)-D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tun janal(-o ob) Prog.A3 sleep(-PL)</td>
</tr>
</tbody>
</table>

headset with a unidirectional microphone which enabled them to hear the stimuli, and it recorded their responses. The experiment was delivered with the ExBuilder experimental software, developed at the University of Rochester. The participants were given oral instructions from the experimenter, and they also were able to read a set of instructions in Spanish before beginning the experiment. The experiment included four practice trials before the experiment began, and the participants were prompted on screen to ask the experimenter if they had any questions before proceeding. Just like in Experiment 1, the Spanish stimulus was first played then repeated two times. The stimulus could be heard a total of three times. After the first first stimulus sentence was presented, the participant was allowed to press the
spacebar to begin recording their translated response if they did not need or want to listen to the two repetitions of the sentence. The participant was given 15 seconds to record their translated sentence in Yucatec Maya. There was a timebar displayed at the bottom of the screen which indicated how much time was remaining. The participant was allowed to press the spacebar to proceed to the next trial, rather than waiting for the 15 seconds to be up, once they had uttered their sentence in Yucatec. The experiment took no longer than 30 minutes to complete.  

5.3.5 Results

Coding and inclusion criteria

The responses to the experimental stimuli were coded by the author for plural on the first noun, second noun and verb. Additionally, responses were coded for the order of the three constituents, N1, N2 and V. Responses were coded for whether the participant used a native Maya word or a borrowing from Spanish. Also, responses were coded for whether there was a phrase-final particle after one or both of the nouns. Additionally the responses were coded for whether there was a transitive verb and an object, and if so, if it was marked with a plural morpheme. In some cases, where verbs were not marked with the plural morpheme, they were transitive verbs with objects which had the plural morpheme (e.g. *make food*-PL versus of

---

3It should be noted here that the PP condition was run as a separate experiment in February of 2011, due to a mistake in the original design. Thus, some of the participants were different from those who participated in the SS, SP and PS conditions. Perhaps this requires a grain of salt in the interpretation of the results of the PP condition.
The responses from two of the participants were transcribed and coded by a native speaker (the same as in Experiment 1) to ensure over 85 percent coding agreement between the author and native speaker, which was met.

There were a total of 504 responses to experimental items. There were 46 responses which were excluded because they were unintelligible to the author or because it was too difficult to determine if there was a plural morpheme or not (mostly due to fast or unclear speech). There were 32 responses excluded because they had missing constituents. In these cases, the participant did not mention all three constituents, noun 1, noun 2 and verb. For example, for a Spanish stimulus sentence such as “The eagle and the crow are flying” a common excluded response in Yucatec was “The birds are flying.” Additionally, there were 10 responses excluded because there was no response at all and 8 responses excluded because verbs were translated as reflexive just in case they were less likely to show plural marking. There were 2 responses excluded because they participant did not finish their sentence before the time limit. After exclusions, there were 406 out of 504 sentences included in the analyses.

Statistical analyses

Overall, the rate of plural marking on verbs was high (over 93 percent) in all conditions. This situation was expected because even a singular-singular conjunct without plural morphology is notionally plural and due to the translation task inducing mor-
phosyntactic persistence. There was significantly more plural marking on the second noun compared to the first ($X^2(1) = 62, p < 0.001$). The figure in (167) shows that in all the responses the first noun was marked with the plural in about 9 percent of cases in all conditions, while the second noun was marked for plural in about 33 percent of cases in all conditions.

(167) Proportion of plural marking on Noun 1 and Noun 2 in Experiment 3

There were significantly more plurals marked on the second noun in the SP and PP conditions, compared to the SS and PS conditions ($X^2(3) = 161, p < 0.001$). Likewise, there were significantly more plurals marked on the first noun in the PS and PP conditions compared to the other two ($X^2(3) = 101, p < 0.001$). The figure in (168) shows the proportion of plural marking on the first noun (N1-Pl) and second noun (N2-Pl).
Over 95 percent of the experimental responses were verb-final. And, there was no significant difference in plural marking on verbs ($X^2(2) = 0.8, p < 1$) by condition.

Table 5.5 shows the numbers and proportions of plural marking co-occurring on the first noun, second noun and verb in the SS (singular-singular) condition of Experiment 3. The row in bold-faced type is the Yucatec translation that would be completely faithful to the Spanish stimulus, with the first noun singular (no plural marker), second noun singular (no plural marker) and verb plural. The Spanish-faithful responses make up over 90 percent of the responses for the SS condition.

In the SP (singular-plural) condition, as shown in Table 5.6, about sixty percent of the responses were faithful to the Spanish stimulus, with the first noun singular (no plural), the second noun plural marked and the verb also marked for plural,
Table 5.5: Plural marking on N1, N2 and V in SS Condition

<table>
<thead>
<tr>
<th>N1</th>
<th>N2</th>
<th>V</th>
<th>(Number)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
<td>(9)</td>
<td>0.064</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>(129)</td>
<td>0.915</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>(1)</td>
<td>0.007</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>(2)</td>
<td>0.014</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>(0)</td>
<td>0.000</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>(0)</td>
<td>0.000</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>(0)</td>
<td>0.000</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>(0)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

shown in the row in bold-faced type. Interestingly, in this condition, participants were less faithful to the Spanish stimulus. About thirty percent of the responses left both nouns unmarked for plural with plural marking on the verb. As discussed earlier, a noun in Yucatec Maya that is not marked with the plural morpheme can still be interpreted as referring to a plurality. A number of the responses in this condition were in what we could call an “underspecification” strategy.

Table 5.6: Plural marking on N1, N2 and V in SP Condition

<table>
<thead>
<tr>
<th>N1</th>
<th>N2</th>
<th>V</th>
<th>(Number)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
<td>(3)</td>
<td>0.023</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>(38)</td>
<td>0.297</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>(4)</td>
<td>0.031</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>(78)</td>
<td>0.609</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>(1)</td>
<td>0.008</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>(2)</td>
<td>0.016</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>(0)</td>
<td>0.000</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>(2)</td>
<td>0.016</td>
</tr>
</tbody>
</table>

In the PS (plural-singular) condition, shown in Table 5.7, the response that was maximally faithful to the Spanish stimulus is first noun plural, second noun singular (no plural morpheme), verb plural. Unlike in the SS and SP conditions, the Spanish-
faithful response comprised under 15 percent of the responses in this condition. In the PS condition, participants were very unlikely to be faithful to the Spanish stimulus. Almost fifty percent of the responses used the “underspecification” strategy, with neither of the two nouns marked for plural, with the verb marked for plural as well. Interestingly, about twenty percent of the responses left the first noun unmarked for plural, while the second noun took the plural morpheme, and the verb also showed plural marking. Finally, close to ten percent of the responses had plural marked on both of the nouns and on the verb as well.

<table>
<thead>
<tr>
<th>N1</th>
<th>N2</th>
<th>V</th>
<th>(Number) Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
<td>(7) 0.053</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>(62) 0.473</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>(2) 0.015</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>(26) 0.198</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>(2) 0.015</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>(19) 0.145</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>(1) 0.008</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>(12) 0.092</td>
</tr>
</tbody>
</table>

I also coded the use of the noun phrase-final distal deictic particle -o’. The use of this particle was common in the experiment, and, based on the data presented in Chapter 2, it is a particle which marks the end of the DP. Thus, the distal deictic particle may have been used as a strategy by participants to demarcate nouns of the conjunct which had differing number values. Out of the 406 responses that were included in the analyses, only 18 of those had no phrase-final -o’ particle (and many of those responses had two nouns that were Spanish borrowings).
shows the numbers and proportions of use of the phrase-final distal deictic particle 
-o' following the first noun and second noun for the SS condition.

Table 5.8: Phrase-final deictic particle use in SS condition

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>(Number)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>(8)</td>
<td>0.057</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>(7)</td>
<td>0.050</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>(101)</td>
<td>0.716</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>(25)</td>
<td>0.177</td>
</tr>
</tbody>
</table>

In the SP condition, shown in Table 5.9, phrase-final deictic particle use is similar to the use of the deictic particle in the SS condition. The use of the phrase-final deictic particle after the second noun but not the first was around seventy percent. The use of the deictic particle on both the first and second nouns was around 18 percent in the SS condition and 24 percent in the SP condition. Other distributions were around 10 percent or less.

Table 5.9: Phrase-final deictic particle use in SP condition

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>(Number)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>(5)</td>
<td>0.039</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>(1)</td>
<td>0.008</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>(91)</td>
<td>0.711</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>(31)</td>
<td>0.242</td>
</tr>
</tbody>
</table>

Table 5.10 shows the proportions of use of the distal deictic phrase-final particle in the PS condition, the condition which was dramatically less faithful to the Spanish stimulus than SS and SP. Unlike in the SS and SP conditions, the proportion of marking of the first noun with the phrase-final particle in the PS was much more frequent (over 35 percent) compared to the SS and SP conditions (around 20 per-
cent). In addition, the use of the phrase-final particle after the second noun but not the first was slightly less in the PS condition compared to the other conditions.

Table 5.10: Phrase-final deictic particle use in PS condition

<table>
<thead>
<tr>
<th></th>
<th>N1</th>
<th>N2</th>
<th>(Number)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
<td>(5)</td>
<td>0.038</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>(4)</td>
<td>0.031</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>(75)</td>
<td>0.573</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td></td>
<td>(47)</td>
<td>0.359</td>
</tr>
</tbody>
</table>

Examining the use of the phrase-final particle has revealed a tendency to mark each noun of the conjunct with the phrase-final marker, presumably as an alternate strategy to marking plural on the first linear noun of the conjunct. This result is somewhat curious and requires additional future research.

5.3.6 Discussion

The results of Experiment 3 confirm the predictions of the DP-adjoined hypothesis presented in Chapter 2. Plural marking was significantly more likely after the second noun of the conjunct across conditions. That is to say that even when hearing a Spanish stimulus sentence in which the first linear noun was plural and the second singular, participants preferred to place the plural morpheme after the second linear noun. This supports the idea that the plural marker in the DP is adjoined high, to the highest DP.

In fact, participants employed a variety of strategies for dealing with PS stimuli. The underspecification strategy was used in the PS condition in about 45 percent of
cases. The strategy in which participants simply marked the plural after the second linear noun was used in about 20 percent of the responses. The strategy in which participants marked both the first and second nouns with the plural appeared in about 10 percent of the responses. Responses which were faithful to the Spanish stimulus make up only about 15 percent of responses here. This means that if there is morphosyntactic persistence in a translation task such as this, as discussed in Chapter 4, then the effect was overridden by some aspect of Yucatec grammar which showed a stronger influence. I argue that participants were not highly affected by morphosyntactic persistence in the relevant conditions due to the representation of the nominal plural morpheme -o’ob as adjoined to the DP.

In addition to finding experimental support for the DP-adjoined hypothesis in Yucatec Maya, there was another strategy that emerged from the data. When the first linear noun in the Spanish stimulus was plural, the participant was more likely to mark the first linear noun with the phrase-final particle, a curious result which requires addition research.

Now that the DP-adjoined nominal plural hypothesis finds support in the results of Experiment 3, I present Experiment 4 which was tests the predictions of the C-to-T number feature inheritance hypothesis for DP-initial versus verb-initial sentences in Yucatec.
5.4 Experiment 4: Constituent order and plural marking

In Experiments 1 and 2, number agreement on the verb appeared to be nearly obligatory, or at least significantly preferred, with the exception of cases in which a DP contained a numeral. And, the analysis presented in Chapter 3 proposes that number agreement is mediated by an Agree relation in SV sentences but not in VS sentences in Yucatec. In this experiment, I manipulate the order of presentation of an intransitive verb and conjoined noun phrase in the Spanish stimuli in a translation task. The C-to-T inheritance analysis of SV intransitive imperfective sentences in Yucatec predicts that number agreement is required by an uninterpretable number feature on \( C^0 \) which is then inherited by \( T^0 \) (Chomsky, 2008). The probe on \( T^0 \) searches its domain for a matching interpretable valued number feature (Chomsky, 2001). The analysis of VS intransitive imperfective sentences in Yucatec, however, involves no probe for number features on \( T^0 \). This analysis predicts that number agreement is obligatory in SV clauses but not in VS. In this experiment, we expect to see significantly less plural marking on verb-initial translations compared to subject-initial ones, unless there is an effect of morphosyntactic priming, which predicts that SV and VS translations will be marked for plural equally as much.

5.4.1 Participants

Twenty-seven native speakers of Yucatec Maya bilingual in Spanish participated in the experiment and were compensated 25 Mexican pesos (about 2 U.S. dollars) for
their participation in February of 2011. There were fourteen females and thirteen males between the ages of 19 and 26 who participated. This experiment was carried out in a sound proof recording room at the University of the Orient in Valladolid, Yucatán, México. Two of the participants were run in an unoccupied computer lab at the university due to the unavailability of the recording room.\(^4\)

5.4.2 Materials

Like Experiments 1 and 3, Experiment 4 was a translation task which presented stimulus sentences in Spanish from the speech synthesized voice of Alberto, a synthesized male Latin American Spanish voice from AT&T Labs Natural Voices\textsuperscript{\textcopyright} text-to-speech project. The stimuli varied as to order of presentation of an intransitive verb and conjoined subject noun phrase. For an abbreviation, I use the convention VS to refer to predicate-initial clauses, while I used the convention SV to refer to predicate-final clauses. A more precise syntactic portrayal of the structures of these different clauses, as outlined in Chapter 3, is shown in (169) and (170) below.

\[(169) \text{SV: } [CP \ S \ [TP \ T-\phi \ [DP \ V ] ] ] \]

\[(170) \text{VS: } [TP \ T \ [DP \ V S ] ] \]

\(^4\)Some of the participants in Experiment 4 also participated in Experiment 2, the picture description experiment. Due to the different tasks, translation versus picture description, I don’t anticipate priming from one experiment to another, though both experiments looked at plural marking.
The Spanish stimuli were presented either as verb-initial with a singular noun followed by a plural noun in a conjoined noun phrase (VSP), as verb-initial with a plural noun followed by a singular noun in a conjoined noun phrase (VPS), as verb-final with a singular noun followed by a plural noun in a conjoined noun phrase (SPV), or as verb-final with a plural noun followed by a singular noun in a conjoined noun phrase (PSV). The stimuli were devised to also test for any effect of closest conjunct agreement in the language. The table in (171) lists the conditions with example stimuli in Spanish and potential responses in Yucatec Maya.5

<table>
<thead>
<tr>
<th>Cond.</th>
<th>Spanish stimulus</th>
<th>Potential Yucatec response</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP</td>
<td>Están&lt;sub&gt;PL&lt;/sub&gt; caminando el muchacho&lt;sub&gt;SG&lt;/sub&gt; y los hombres&lt;sub&gt;PL&lt;/sub&gt;</td>
<td>Tun ximbal(o’ob) PROG.A3 walk(PL) le xi’ipal yéetel le maak(o’ob)-o’ the boy and the person(PL)-d2</td>
</tr>
<tr>
<td></td>
<td>Are walking</td>
<td></td>
</tr>
<tr>
<td>VPS</td>
<td>Están&lt;sub&gt;PL&lt;/sub&gt; cantando las mujeres&lt;sub&gt;PL&lt;/sub&gt; y la muchacha&lt;sub&gt;SG&lt;/sub&gt;</td>
<td>Tun k’aay(o’ob) PROG.A3 sing(-PL) le ko’olel(o’ob) yéetel le chúupal-o’ the woman(-PL) and the girl-d2</td>
</tr>
<tr>
<td></td>
<td>Are singing</td>
<td></td>
</tr>
<tr>
<td>SPV</td>
<td>La vieja&lt;sub&gt;SG&lt;/sub&gt; y los bebés&lt;sub&gt;PL&lt;/sub&gt; están&lt;sub&gt;PL&lt;/sub&gt; durmiendo</td>
<td>Le chiich yéetel le champal(o’ob)-o’ tun wenel(o’ob) the old lady and the baby(-PL)-d2 PROG.A3 sleep(-PL)</td>
</tr>
<tr>
<td></td>
<td>The old lady and the babies</td>
<td></td>
</tr>
<tr>
<td>PSV</td>
<td>Los viejos&lt;sub&gt;PL&lt;/sub&gt; y el campesino&lt;sub&gt;SG&lt;/sub&gt; están&lt;sub&gt;PL&lt;/sub&gt; comiendo</td>
<td>Le úuchben(o’ob) yéetel le kolnal-o’ tun janal(o’ob) the old man(-PL) and the farmer-d2 are eating(-PL)</td>
</tr>
<tr>
<td></td>
<td>The old men and the farmer</td>
<td></td>
</tr>
</tbody>
</table>

5A complete list of the items used in Experiment 4 are available in Appendix D.
5.4.3 Procedure

Just as in the three previous experiments, participants completed a language background survey about their experiences with Yucatec Maya and Spanish growing up and about their current usage of both languages. Participants were then seated in a comfortable chair at a table in front of a MacBook Pro laptop with a 15 inch screen or a Lenovo laptop with a 13 inch screen. They wore a Siemens headset with a unidirectional microphone in order to present the stimuli and to record their responses. The experiment was delivered with the ExBuilder experimental software, developed at the University of Rochester. The participants were given oral instructions from the experimenter, and they also were able to read a set of instructions in Spanish before beginning the experiment. The experiment included four practice trials before the experiment began, and the participants were prompted on screen to ask the experimenter if they had any questions before proceeding. Like the other translation experiments, the Spanish stimuli (speech synthesized) were presented up to three times. The participant could press the spacebar after hearing the stimulus the first time in order to proceed to the recording of the translation. Alternatively, the participant could listen to the stimulus up to a total of three times. The participant had 15 seconds to record their response. There was a timebar indicating to the participant how much time was remaining before the experiment automatically proceeded to the next trial. The participant was allowed to press the spacebar after saying their response but before the 15 seconds were up in order to proceed
more quickly to the next trial. The experiment took no longer than 30 minutes to complete.

5.4.4 Results

Coding and inclusion criteria

Just as in Experiment 3, the responses to the experimental stimuli were coded by the author for plural on the first noun, second noun and verb. Additionally, responses were coded for the order of the three constituents, N1, N2 and V. Responses were coded for whether the participant used a native Yucatec Maya word or a borrowing from Spanish. Also, responses were coded for whether there was a phrase-final particle after one or both of the nouns. Additionally the responses were coded for whether there was a transitive verb with an object, and if so, if it was marked with a plural morpheme. In some cases, where verbs were not marked with the plural morpheme, they were transitive verbs with objects which had the plural morpheme (e.g. make food-PL versus of cook-PL).

Out of 648 responses from all participants to all items, there were 100 responses excluded for a total of 548 responses included in the analyses. Sixteen were excluded because there was no response given. Fifteen were excluded because the author was unsure of some aspect of the response, most likely due to fast or unclear speech. Fourteen responses in which the verb was encoded as reflexive were excluded, just in case these might be less likely to show plural marking. Fifty-five responses were
excluded because they did not include all three constituents, N1, N2 and V, in the Yucatec translation.

Statistical analyses

The four conditions of the Spanish stimuli are summarized again in (171) below.

(171) Conditions in Experiment 4

- Noun 1 singular, Noun 2 plural, Verb plural (SPV)
- Noun 1 plural, Noun 2 singular, Verb plural (PSV)
- Verb plural, Noun 1 singular, Noun 2 plural (VSP)
- Verb plural, Noun 1 plural, Noun 2 singular (VPS)

The chart in (172) shows the overall proportion of plural marking on Noun 1 and Noun 2 not yet taking into consideration the actual order produced in the Yucatec responses, which varied and was not always faithful to the Spanish stimulus.
Table 5.12 shows the most frequent constituent orders, in all responses, collapsing condition. It is interesting that over sixty percent of the responses were verb-final SV (or N1-N2-V), while only fifty percent of the Spanish stimuli were in that order. Likewise, only about thirty percent of all responses were verb-initial, when fifty percent of the Spanish stimuli were presented in verb-initial order.

Table 5.12: Order of constituents in responses in Experiment 4

<table>
<thead>
<tr>
<th>Order</th>
<th>(Number) Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1-N2-V</td>
<td>(333) 0.607</td>
</tr>
<tr>
<td>V-N1-N2</td>
<td>(143) 0.261</td>
</tr>
<tr>
<td>N2-N1-V</td>
<td>(38) 0.069</td>
</tr>
<tr>
<td>V-N2-N1</td>
<td>(18) 0.033</td>
</tr>
<tr>
<td>N1-V-N2</td>
<td>(15) 0.027</td>
</tr>
<tr>
<td>N2-V-N1</td>
<td>(1) 0.002</td>
</tr>
</tbody>
</table>

As just alluded to, the order of constituents in the responses produced was varied and did not always preserve the order of constituents presented in the Spanish
stimulus. The chart in (173) shows the order of the Yucatec responses given in each condition.

(173) Order of constituents in responses to Experiment 4 by condition

The conditions in which the stimulus was verb-final (SPV and PSV) resulted in over eighty percent of verb-final responses in Yucatec. However, the conditions in which the stimulus was verb-initial (VSP and VPS) produced only verb-initial responses at a rate of only about forty to fifty percent. About thirty two to thirty-five percent of the VS stimuli in Spanish were changed to SV responses in Yucatec, as shown in Table 5.13.

For verb-initial clauses of the Yucatec responses, Chi-squared tests revealed that verbs were significantly less likely to be plural-marked ($X^2(1) = 68, p < 0.001$) than in verb-final clauses. The chart in (174) shows that only about 61 percent of verb-initial verb phrases were plural-marked, while about 93 percent of verb-final
verb phrases were plural-marked.

(174) Proportion of plural marking on verbs in Experiment 4

Because the two verb-final conditions of Experiment 4 were the same as two of the conditions of Experiment 3, we can look at how well the results from Experiment 3 were replicated. The chart in (175) shows the proportions of plural marking on the first and second noun of the conjoined noun phrase and on the verb in the SPV and PSV conditions of Experiment 3 and Experiment 4. The results are quite similar. In the SPV condition, plural marking on the first noun was less than 10 percent, plural marking on the second noun was about sixty-five percent, and plural marking

<table>
<thead>
<tr>
<th>Condition</th>
<th>N1-N2-V (Number) Proportion</th>
<th>V-N1-N2 (Number) Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPV</td>
<td>(116) 0.823</td>
<td>(11) 0.078</td>
</tr>
<tr>
<td>PSV</td>
<td>(115) 0.827</td>
<td>(8) 0.058</td>
</tr>
<tr>
<td>VSP</td>
<td>(40) 0.333</td>
<td>(64) 0.533</td>
</tr>
<tr>
<td>VPS</td>
<td>(59) 0.418</td>
<td>(57) 0.404</td>
</tr>
</tbody>
</table>
on the verb was between eighty-five and ninety-five percent in both experiments. In the PSV condition, plural marking on the first noun was between twenty-five and forty percent, on the second noun between thirty and forty percent and on the verb between ninety and ninety-five percent. These are very similar results demonstrating the replicability of the results of these conditions across two experiments.

(175) Proportion of plural marking on Noun 1, Noun 2 and Verb in SPV and PVS conditions of Exps. 3 and 4

5.4.5 Discussion

Experiment 4 showed that plural marking was significantly less likely on verb-initial responses in Yucatec Maya translations from Spanish. The result that verb-initial responses were significantly less likely than DP-initial responses to show covariant plural marking confirms the prediction of the C-to-T inheritance hypothesis
presented in Chapter 3. This analysis proposed that in verb-initial intransitive imperfective clauses, the aspect-mood particle is the main predicate in $T^0$ which is $\phi$-deficient. There is no *Agree* for number between the full DP subject and verb due to the absence of $C^0$ (Chomsky, 2008). For DP-initial clauses, a DP with plural morphology moves to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on $C^0$ then probes for a matching valued feature in its domain (Chomsky, 2001).

In addition, the results of Experiment 4 replicated the results of Experiment 3 which showed the plural marking was preferred after the second linear noun, in other words adjoined high to the DP. This is additional confirmation of the DP-adjoined nominal plural hypothesis for Yucatec Maya. Just like in Experiment 3, the participants in Experiment 4 employed a number of strategies to process PS conjoined noun phrases, showing that again, there was an incompatibility between faithfulness to the Spanish stimulus and the syntax of the nominal plural marker in Yucatec. The list in (176) outlines the strategies employed by participants when faced with PS conditions, and the rates at which participants employed each strategy, which were quite similar to the results of Experiment 3.

(176) Strategies for dealing with PS stimuli:

- 41.07 percent - Mark neither noun for plural (underspecification strategy)
- 21.07 percent - Mark the first noun plural and leave the second noun unmarked for plural (Faithful to the Spanish stimulus)
• 17.14 percent - Mark plural after both nouns
• 14.64 percent - Change the order of the nouns to translate the nouns in SP (singular-plural) linear order
• 6.08 percent - Other responses

Though the number marking asymmetry on verbs was predicted by the C-to-T inheritance hypothesis, there are still a number of questions that remain. For example, why did the Yucatec speakers change the order of VS stimuli in Spanish to SV responses in Yucatec at a high rate? Why did word order not prime? I discuss this question and tie in these results with other literature on agreement and constituent order in the next section.

5.5 General Discussion

Experiment 3 provided experimental support for the DP-adjoined nominal plural hypothesis for Yucatec Maya. The results were very intriguing. Given that morphosyntactic persistence can have such a significant effect on sentence production, even across languages, the cases in which the responses of Yucatec speakers did not look at all like the Spanish stimulus are very interesting. The Yucatec speakers’ responses did not look at all like the Spanish stimulus in conjoined noun phrases in which the first linear noun was plural and the second singular, in both Experiments 3 and 4. In this case, the syntax of the nominal plural marker in Yucatec, being an adjunct to DP rather than the head of the Number Phrase, was very much at odds with a translation that replicated the stimulus, in which the plural marker occurred
on the first noun.

Nor did the Yucatec speakers’ responses look like the Spanish stimulus when the verb was initial. Why did the Yucatec speakers change the order of VS stimuli in Spanish to SV responses in Yucatec at a high rate? Why did word order not prime? Even though Spanish VS sentences and Yucatec VS sentences may look similar on the surface, the syntactic properties are much different. It is possible that the cross-language word order priming effect is more likely to occur when the underlying syntactic structure is similar across the two languages. Verb-initial sentences in Spanish have been argued to be the result of verb raising to T (or INFL) (Zagona, 2002). This analysis is based on the observation that in Spanish adverbs can appear after verbs (e.g. María leyó frecuentemente el libro., lit. Maria read frequently the book.), just like in French, but in English they cannot (*Maria read frequently the book.) (from (Zagona, 2002, 166). VS sentences in Yucatec lack φ-feature agreement between T₀ and the φ-feature bearing cross reference markers in the nominalized complement clause, and neither the subject nor the verb undergo movement under my proposal of the structure of VS intransitive imperfective clauses, shown in (170). In Spanish VS sentences, the verb moves to T, while the subject stays in situ in the Spec of vP, (cf. Zagona (2002)). Thus, Yucatec and Spanish have different structures for VS clauses, offering a potential explanation for the lack of word order priming for VS sentences in translations from Spanish to Yucatec.

(177) Yucatec VS: \([_{TP} T \left[_{DP} V S \right] \] \)
SV sentences in Yucatec are the result of a full DP fronted to Spec-CP, as shown in (179), while in Spanish, SV order is the result of both the subject moving to Spec-TP and the verb moving to $T^0$, as shown in (180) (Zagona, 2002).

Loebell and Bock (2003) found that syntactic priming did not show a significant effect in cross-language priming between German and English passives. Though in the two languages both sentences were passive “structures,” the underlying syntax is not the same (not to mention the surface word order even, since the German passives were verb-initial). The Yucatec results can shed light on the nature of such syntactic priming, in showing that it fails to obtain when the structures of the two languages were quite different. The Yucatec plural is in DP, while the Spanish plural is in NumP. VS sentences in Yucatec are not the result of $\phi$-agreement, nor do they involve movement to $T$. In Spanish, VS clauses involve $\phi$-agreement and are the result of the verb and raising to $T$.

This is not the first experimental study to examine the role of constituent order in number agreement. Franck et al. (2006) in a number of experiments on French and Italian test the prediction that agreement involves two operations, *Agree* and *Move*. They found that postverbal subject modifiers in Italian do not show number
attraction errors in VS order, while in preverbal SV order they do. Additionally, they found that preverbal object clitics showed stronger number attraction than postverbal subject modifiers in French. They take these results as support for the idea that agreement computation may involve one or both of these two steps. In French and Italian VS orders, they argue, agreement computation involves only Agree, but in SV orders, agreement computation involves both Agree and Move. In Yucatec, however, I have proposed that there is no agreement between T⁰ and the φ-feature bearing cross reference markers in the nominalized clausal complement. With the fronting of a full DP for topic or focus to the CP-domain, the relevant uninterpretable φ-features are present on C⁰ and inherited by T⁰, which then probes its domain in the Agree operation for number. This is a potential explanation for the experimental result that number agreement was less likely on verb-initial clauses than DP-initial ones.

The underlying syntactic differences pointed out in this thesis, the DP-adjoined syntax of the nominal plural marker and number agreement relating to movement to the CP domain in Yucatec Maya offer a promising potential explanation for the lack of morphosyntactic persistence in certain conditions and for the lack of word order priming for VS sentences in translations from Spanish to Yucatec. In addition, these observations provide good arguments for pursuing an analysis of the underlying

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⁶Vigliocco and Nicol (1998) found an effect of agreement attraction in English Subject-Auxiliary inverted questions, like Was/were the helicopter for the flights safe? Franck et al. (2006) explain this divergence by positing that an intermediate level of representation is relevant, in which the modifier intervenes between the head noun and the verb, before movement.
syntactic nature of cross-linguistic variation despite what may look like structural similarity on the surface.
In this dissertation, I have argued for an analysis of the nominal plural marker in Yucatec Maya as adjoined to the Determiner Phrase based on distributional, interpretational, and experimental data. I showed that the DP-adjoined plural in Yucatec Maya fits into the typology of the syntax of plural marking proposed by Wiltschko (2008). In Yucatec Maya, the plural marker is not obligatory for plural interpretation, nor is number agreement obligatory inside the DP or in verb-initial clauses. The plural marker cannot occur between nouns of a compound or inside of derivational morphology. It cannot occur on a prenominal adjective, but it can occur on an adjective that is postnominal. Moreover, the presence of the plural marker results in a specific interpretation. Additionally, the plural marker, since it is adjoined to the DP, can modify either or both nouns of a conjoined DP, or the conjunct as a whole. Experiment 3, which was presented in Chapter 5, tested the prediction of the DP-adjoined plural hypothesis against the morphosyntactic persistence hypothesis in an experimental translation task with conjoined nouns and an intransitive verb. In the conditions in which the plural marker was on the first noun of the conjunct in the Spanish stimulus, participants were not as likely to use the morphosyntactic persistence strategy, which would predict the use of plurals
to be used where they occurred in the Spanish stimulus sentences. These otherwise curious results can be explained by the differences between syntax of the plural morphemes in the two languages. The plural marker in Spanish heads a NumP, while the plural marker in Yucatec is adjoined to the DP.

In addition, I presented the results of Experiments 1 and 2 in Chapter 4. These experiments provided support with real-time language production experiments for the proposal that the plural marker is a modificational adjunct to the DP in Yucatec Maya. Experiments 1 and 2 also compared the translation method to the picture description method to reveal a higher overall rate of plural marking in the translation task. In the translation task and the picture description task, however, the same pattern emerged across conditions. Plural marking was less likely when a numeral and classifier was used, which provided the semantic number information rendering plural marking redundant.

In Chapter 3, I presented an analysis of intransitive imperfective sentences in verb-initial and DP-initial orders in Yucatec Maya. I argued that in verb-initial clauses, the aspect-mood particle is the main predicate in T⁰ which is φ-deficient. There is no Agree for number between the full DP and verb due to the absence of C⁰ (Chomsky, 2008). For DP-initial clauses, a DP with plural morphology has moved to the CP domain, triggered by a topic or focus feature. The uninterpretable number feature on C⁰ is then inherited by T⁰ (Chomsky, 2008), and T⁰ probes its domain for a matching interpretable valued feature according to the mechanics of
the Agree operation (Chomsky, 2001). This proposal predicts asymmetric number agreement in Yucatec Maya. The results of Experiment 4 presented in Chapter 5, confirmed this hypothesis. Verb-initial clauses were significantly less likely to be marked with plural morphology than verb-final clauses.

This dissertation has been an in-depth look at number marking in the nominal and verbal domains in Yucatec Maya. It has provided a formal theoretical analysis of plural marking in the nominal domain and of asymmetric number agreement in intransitive imperfective verb-initial and DP-initial clauses. It has extended these analyses to investigate the role of language-particular syntax in the domain of sentence processing. The syntax of the plural marker as adjoined to the DP was reflected in the lack of morphosyntactic persistence effect in the PluralN1-SingularN2 condition of Experiment 3. In addition, the results of Experiment 4 confirmed the predictions of the proposal that C-to-T inheritance of number features is responsible for number agreement in DP-initial clauses, while in verb-initial clauses, T^0 is deficient, and there is no Agree operation for number. I hope to have shown that both of these methodologies are important, and in fact, they are in some ways, flip sides of the same coin...a coin which might be called theoretically-informed field-based psycholinguistic research.
APPENDIX A

EXPERIMENT 1 STIMULI

Experiment 1: Optionality of plural marking in translation

A.1 Singular Condition Items

1. *La mujer está cocinando.* - The woman is cooking.
2. *El hombre está trabajando.* - The man is working.
3. *El bebé está llorando.* - The baby is crying.
4. *El muchacho está jugando.* - The boy is playing.
5. *La muchacha está cosiendo.* - The girl is sewing.
7. *El visitante está llegando.* - The visitor is arriving.
8. *La enfermera está saliendo.* - The nurse is leaving.
10. *El jefe está bebiendo.* - The boss is drinking.
11. *El monja está rogando.* - The monk is praying.
12. *El maestro está hablando.* - The teacher is talking.
13. *El campesino está fumando.* - The farmer is smoking.
15. *La viejita está paseando.* - The old woman is passing by.
17. *La vaca está caminando.* - The cow is walking.

18. *El cochino está sombreado.* - The pig is lying in the shade.

19. *La rana está saltando.* - The frog is jumping.

20. *El mosquito está picando.* - The fly is biting.

21. *La tortuga está buceando.* - The turtle is diving.

22. *El perro está ladrando.* - The dog is barking.

23. *La iguana está soleando.* - The iguana is sun-bathing.

24. *El gato está durmiendo.* - The cat is sleeping.

25. *La gallina está comiendo.* - The chicken is eating.


27. *El pez está nadando.* - The fish is swimming.

28. *El conejo está corriendo.* - The rabbit is running.

29. *El lorito está cantando.* - The parrot is singing.

30. *El caballo está descansando.* - The horse is resting.

A.2 “Two” Condition Items

1. *Dos mujeres están cocinando.* - Two women are cooking.

2. *Dos hombres están trabajando.* - Two men are working.

3. *Dos bebés están llorando.* - Two babies are crying.

4. *Dos muchachos están jugando.* - Two boys are playing.

5. *Dos muchachas están cosiendo.* - Two girls are sewing.

6. *Dos soldados están luchando.* - Two soldiers are fighting.

7. *Dos visitantes están llegando.* - Two visitors are arriving.

8. *Dos enfermeras están saliendo.* - Two nurses are leaving.
9. *Dos estudiantes están leyendo.* - Two students are reading.
10. *Dos jefes están bebiendo.* - Two bosses are drinking.
11. *Dos monjas están rogando.* - Two monks are praying.
12. *Dos maestros están hablando.* - Two teachers are talking.
13. *Dos campesinos están fumando.* - Two farmers are smoking.
14. *Dos viejitos están roncando.* - Two old men are snoring.
15. *Dos viejitas están paseando.* - Two old women are passing by.
16. *Dos doctores están pensando.* - Two doctors are thinking.
17. *Dos vacas están caminando.* - Two cows are walking.
18. *Dos cochinos están sombrando.* - Two pigs are lying in the shade.
19. *Dos ranas están saltando.* - Two frogs are jumping.
20. *Dos mosquitos están picando.* - Two flies are biting.
21. *Dos tortugas están buceando.* - Two turtles are diving.
22. *Dos perros están ladrando.* - Two dogs are barking.
23. *Dos iguanas están soleando.* - Two iguanas are sun-bathing.
24. *Dos gatos están durmiendo.* - Two cats are sleeping.
25. *Dos gallinas están comiendo.* - Two chickens are eating.
26. *Dos jaguares están cazando.* - Two jaguars are hunting.
27. *Dos peces están nadando.* - Two fish are swimming.
28. *Dos conejos están corriendo.* - Two rabbits are running.
29. *Dos loritos están cantando.* - Two parrots are singing.
30. *Dos caballos están descansando.* - Two horses are resting.
A.3 Plural Condition Items

1. Las mujeres están cocinando. - The women are cooking.
2. Los hombres están trabajando. - The men are working.
3. Los bebés están llorando. - The babies are crying.
4. Los muchachos están jugando. - The boys are playing.
5. Las muchachas están cosiendo. - The girls are sewing.
6. Los soldados están luchando. - The soldiers are fighting.
7. Los visitantes están llegando. - The visitors are arriving.
8. Las enfermeras están saliendo. - The nurses are leaving.
9. Los estudiantes están leyendo. - The students are reading.
10. Los jefes están bebiendo. - The bosses are drinking.
11. Los monjas están rogando. - The monks are praying.
12. Los maestros están hablando. - The teachers are talking.
13. Los campesinos están fumando. - The farmers are smoking.
14. Los viejitos están roncando. - The old men are snoring.
15. Las viejitas están paseando. - The old women are passing by.
16. Los doctores están pensando. - The doctors are thinking.
17. Los vacas están caminando. - The cows are walking.
18. Los cochinos están sombrando. - The pigs are lying in the shade.
19. Las ranas están saltando. - The frogs are jumping.
20. Los mosquitos están picando. - The flies are biting.
21. Las tortugas están buceando. - The turtles are diving.
22. Los perros están ladrando. - The dogs are barking.
23. Las iguanas están soleando. - The iguanas are sun-bathing.
24. *Los gatos esán durmiendo.* - The cats are sleeping.

25. *Las gallinas esán comiendo.* - The chickens are eating.

26. *Los jaguares esán cazando.* - The jaguars are hunting.

27. *Los peces esán nadando.* - The fish are swimming.

28. *Los conejos esán corriendo.* - The rabbits are running.

29. *Los loritos esán cantando.* - The parrots are singing.

30. *Los caballos esán descansando.* - The horses are resting.
APPENDIX B

EXPERIMENT 2 STIMULI

Experiment 2: Optionality of plural marking in picture description

B.1 One Condition Items

1. Target: The baby is crying.

2. Target: The boy is swimming.

3. Target: The girl is sweeping.

4. Target: The girl is drinking.
5. Target: The man is diving.

6. Target: The man is yelling.

7. Target: The woman is dancing.

8. Target: The boy is studying.

9. Target: The person is fishing.

10. Target: The woman is talking.
11. Target: The man is smoking.

12. Target: The bird is flying.

13. Target: The cat is sleeping.

14. Target: The chicken is running.

15. Target: The dog is barking.

16. Target: The frog is jumping.

17. Target: The horse is running.
18. Target: The jaguar is growling.

19. Target: The monkey is eating.

20. Target: The mosquito is biting.

21. Target: The rabbit is jumping.

22. Target: The snake is emerging.

23. Target: The spider is hanging.
B.2 Two Condition Items

1. Target: Two babies are crying.

2. Target: Two boys are swimming.

3. Target: Two girls are sweeping.

4. Target: Two girls are drinking.

5. Target: Two men are diving.

6. Target: Two men are yelling.
7. Target: Two women are dancing.

8. Target: Two boys are studying.

9. Target: Two people are fishing.

10. Target: Two women are talking.

11. Target: Two men are smoking.

12. Target: Two birds are flying.
13. Target: Two cats are sleeping.

14. Target: Two chickens are running.

15. Target: Two dogs are barking.

16. Target: Two frogs are jumping.

17. Target: Two horses are running.

18. Target: Two jaguars are growling.
19. Target: Two monkeys are eating.

20. Target: Two mosquitos are biting.

21. Target: Two rabbits are jumping.

22. Target: Two snakes are emerging.

23. Target: Two spiders are hanging.
B.3 Seven (many) Condition Items

1. Target: The babies are crying.

2. Target: The boys are swimming.

3. Target: The girls are sweeping.

4. Target: The girls are drinking.
5. Target: The men are diving.

6. Target: The men are yelling.

7. Target: The women are dancing.

8. Target: The boys are studying.
9. Target: The people are fishing.

10. Target: The women are talking.

11. Target: The men are smoking.

12. Target: The birds are flying.

13. Target: The cats are sleeping.
14. Target: The chickens are running.

15. Target: The dogs are barking.

16. Target: The frogs are jumping.

17. Target: The horses are running.

18. Target: The jaguars are growling.
19. Target: The monkeys are eating.

20. Target: The mosquitos are biting.

21. Target: The rabbits are jumping.

22. Target: The snakes are emerging.
23. Target: The spiders are hanging.
APPENDIX C

EXPERIMENT 3 STIMULI

Experiment 3: Constituency in nominal plural marking

C.1 Singular-Singular Condition Items

1. La mujer y la muchacha están cocinando.  
The woman and the girl are cooking.

2. El hombre y el muchacho están gritando.  
The man and the boy are yelling.

3. El viejo y el campesino están hablando.  
The old man and the farmer are talking.

4. La viejita y el bebé están saliendo.  
The old woman and the baby are leaving.

5. La profesora y el estudiante están leyendo.  
The professor and the student are reading.

6. El gato y el perro están masticando.  
The cat and the dog are chewing.

7. La gallina y el pavo están comiendo.  
The chicken and the turkey are eating.

8. El cochino y el caballo están corriendo.  
The pig and the horse are running.

9. La serpiente y la rana están esperando.  
The snake and the frog are waiting.

10. El águila y el grajo están volando.  
The eagle and the crow are flying.
11. El escarabajo y la hormiga están cavando.
The beetle and the ant are digging.

12. El pez y la tortuga están nadando.
The fish and the turtle are swimming.

13. El jaguar y el zorro están cazando.
The jaguar and the fox are hunting.

14. El lorito y el tucán están cantando.
The parrot and the toucan are singing.

15. El mono y la ardilla están saltando.
The monkey and the squirrel are jumping.

16. La vaca y el burro están caminando.
The cow and the donkey are walking.

17. El venado y el lobo están durmiendo.
The deer and the wolf are sleeping.

18. La mariposa y la mosca están descansando.
The butterfly and the fly are resting.

C.2 Singular-Plural Condition Items

1. La mujer y las muchachas están cocinando.
The woman and the girls are cooking.

2. El hombre y los muchachos están gritando.
The man and the boys are yelling.

3. El viejo y los campesinos están hablando.
The old man and the farmers are talking.

4. La viejita y los bebés están saliendo.
The old woman and the babies are leaving.

5. La profesora y los estudiantes están leyendo.
The professor and the students are reading.

6. El gato y los perros están masticando.
The cat and the dogs are chewing.
7. La gallina y los pavos están comiendo.
The chicken and the turkeys are eating.

8. El cochino y los caballos están corriendo.
The pig and the horses are running.

9. La serpiente y las ranas están esperando.
The snake and the frogs are waiting.

10. El águila y los gruajes están volando.
The eagle and the crows are flying.

11. El escarabajo y las hormigas están cavando.
The beetle and the ants are digging.

12. El pez y las tortugas están nadando.
The fish and the turtles are swimming.

13. El jaguar y los zorros están cazando.
The jaguar and the foxes are hunting.

14. El lorito y los tucanes están cantando.
The parrot and the toucans are singing.

15. El mono y las ardillas están saltando.
The monkey and the squirrels are jumping.

16. La vaca y los burros están caminando.
The cow and the donkeys are walking.

17. El venado y los lobos están durmiendo.
The deer and the wolves are sleeping.

18. La mariposa y las moscas están descansando.
The butterfly and the flies are resting.

C.3 Plural-Singular Condition Items

1. Las mujeres y la muchacha están cocinando.
The women and the girl are cooking.

2. Los hombres y el muchacho están gritando.
The men and the boy are yelling.
3. Los viejos y el campesino están hablando.
The old men and the farmer are talking.

4. Las viejitas y el bebé están saliendo.
The old women and the baby are leaving.

5. Las profesoras y el estudiante están leyendo.
The professors and the student are reading.

6. Los gatos y el perro están masticando.
The cats and the dog are chewing.

7. Las gallinas y el pavo están comiendo.
The chickens and the turkey are eating.

8. Los cochinos y el caballo están corriendo.
The pigs and the horse are running.

9. Las serpientes y la rana están esperando.
The snakes and the frog are waiting.

10. Los águilas y el grano están volando.
The eagles and the crow are flying.

11. Los escarabajos y la hormiga están cavando.
The beetles and the ant are digging.

12. Los peces y la tortuga están nadando.
The fish (plural) and the turtle are swimming.

13. Los jaguares y el zorro están cazando.
The jaguars and the fox are hunting.

14. Los loritos y el tucán están cantando.
The parrots and the toucan are singing.

15. Los monos y la ardilla están saltando.
The monkeys and the squirrel are jumping.

16. Las vacas y el burro están caminando.
The cows and the donkey are walking.

17. Los venados y el lobo están durmiendo.
The deer (plural) and the wolf are sleeping.

18. Las mariposas y la mosca están descansando.
The butterflies and the fly are resting.
C.4 Plural-Plural Condition Items

1. Las mujeres y las muchachas están cocinando.
The women and the girls are cooking.

2. Los hombres y los muchachos están gritando.
The men and the boys are yelling.

3. Los viejos y los campesinos están hablando.
The old men and the farmers are talking.

4. Las viejitas y los bebés están saliendo.
The old women and the babies are leaving.

5. Las profesoras y los estudiantes están leyendo.
The professors and the students are reading.

6. Los gato y los perros están masticando.
The cats and the dogs are chewing.

7. Las gallinas y los pavos están comiendo.
The chickens and the turkeys are eating.

8. Los cochinos y los caballos están corriendo.
The pigs and the horses are running.

9. Las serpientes y las ranas están esperando.
The snakes and the frogs are waiting.

10. Los águilas y los grájos están volando.
The eagles and the crows are flying.

11. Los escarabajos y las hormigas están cavando.
The beetles and the ants are digging.

12. Los peces y las tortugas están nadando.
The fish (plural) and the turtles are swimming.

13. Los jaguares y los zorros están cazando.
The jaguars and the foxes are hunting.

14. Los loritos y los tucanes están cantando.
The parrot sand the toucans are singing.
15. Los monos y las ardillas están saltando. The monkeys and the squirrels are jumping.
16. Las vacas y los burros están caminando. The cows and the donkeys are walking.
17. Los venados y los lobos están durmiendo. The deer (plural) and the wolves are sleeping.
18. Las mariposas y las moscas están descansando. The butterflies and the flies are resting.
Experiment 4: Constituency in verbal plural marking

D.1 Singular-Plural-Verb Condition Items

1. *La mujer y las muchachas están cocinando.*
   The woman and the girls are cooking.

2. *El hombre y los muchachos están gritando.*
   The man and the boys are yelling.

3. *El viejo y los campesinos están hablando.*
   The old man and the farmers are talking.

4. *La profesora y los estudiantes están leyendo.*
   The professor and the students are reading.

5. *La madre y los bebés están durmiendo.*
   The mother and the babies are sleeping.

   The father and the sisters are praying.

7. *El jefe y los obreros están bebiendo.*
   The boss and the workers are drinking.

   The doctor and the nurses are leaving.

9. *La mesera y las viejitas están limpiando.*
   The waitress and the old ladies are cleaning.

10. *El muchacho y las muchachas están silbando.*
    The boy and the girls are whistling.
11. **El cantor y los actores están celebrando.**
   The singer and the actors are celebrating.

12. **El policía y los directores están llegando.**
   The police officer and the directors are arriving.

13. **El perro y los gatos están masticando.**
   The dog and the cats are chewing.

14. **La gallina y los pavos están comiendo.**
   The chicken and the turkeys are eating.

15. **El cochino y los caballos están corriendo.**
   The pig and the horses are running.

16. **El águila y los grajos están volando.**
   The eagle and the crows are flying.

17. **La serpiente y las ranas están esperando.**
   The snake and the frogs are waiting.

18. **El escarabajo y las hormigas están cavando.**
   The beetle and the ants are digging.

19. **El pez y las tortugas están nadando.**
   The fish and the turtles are swimming.

20. **El mono y las ardillas están saltando.**
   The monkey and the squirrels are jumping.

21. **El jaguar y los zorros están cazando.**
   The jaguar and the foxes are hunting.

22. **La mariposa y las moscas están descansando.**
   The butterfly and the flies are resting.

23. **El venado y los ratones están caminando.**
   The deer and the mice are walking.

24. **El buho y las arañas están mirando.**
   The owl and the spiders are watching.
D.2 Plural-Singular-Verb Condition Items

1. Las mujeres y la muchacha están cocinando.
The women and the girl are cooking.

2. Los hombres y el muchacho están gritando.
The men and the boy are yelling.

3. Los viejos y el campesino están hablando.
The old men and the farmer are talking.

4. Las profesoras y el estudiante están leyendo.
The professors and the student are reading.

5. Las madres y el bebé están durmiendo.
The mothers and the baby are sleeping.

The fathers and the sister are praying.

7. Los jefes y el obrero están bebiendo.
The bosses and the worker are drinking.

8. Los doctores y la enfermera están saliendo.
The doctors and the nurse are leaving.

9. Las meseras y la viejita están limpiando.
The waitresses and the old lady are cleaning.

10. Los muchachos y la muchacha están silbando.
The boys and the girl are whistling.

11. Los cantores y el actor están celebrando.
The singers and the actor are celebrating.

12. Los policías y el director están llegando.
The police officers and the director are arriving.

13. Los perros y el gato están masticando.
The dogs and the cat are chewing.

14. Las gallinas y el pavo están comiendo.
The chickens and the turkey are eating.
15. Los cochinos y el caballo están corriendo.  
The pigs and the horse are running.
16. Los águilas y el grujo están volando.  
The eagles and the crow are flying.
17. Las serpientes y la rana están esperando.  
The snakes and the frog are waiting.
18. Los escarabajos y la hormiga están cavando.  
The beetles and the ant are digging.
19. Los peces y la tortuga están nadando.  
The fish (plural) and the turtle are swimming.
20. Los monos y la ardilla están saltando.  
The monkeys and the squirrel are jumping.
21. Los jaguares y el zorro están cazando.  
The jaguars and the fox are hunting.
22. Las mariposas y la mosca están descansando.  
The butterflies and the fly are resting.
23. Los venados y el ratón están caminando.  
The deer and the mouse are walking.
24. Los buhos y la araña están mirando.  
The owl and the spiders are watching.

D.3 Verb-Singular-Plural Condition Items

1. Están cocinando la mujer y las muchachas.  
The woman and the girls are cooking.
2. Están gritando el hombre y los muchachos.  
The man and the boys are yelling.
3. Están hablando el viejo y los campesinos.  
The old man and the farmers are talking.
4. Están leyendo la profesora y los estudiantes.  
The professor and the students are reading.
5. Están durmiendo la madre y los bebés.
   The mother and the babies are sleeping.

6. Están rogando el padre y las hermanas.
   The father and the sisters are praying.

7. Están bebiendo el jefe y los obreros.
   The boss and the workers are drinking.

8. Están saliendo el doctor y las enfermeras.
   The doctor and the nurses are leaving.

9. Están limpiando la mesera y las viejitas.
   The waitress and the old ladies are cleaning.

10. Están silbando el muchacho y las muchachas.
    The boy and the girls are whistling.

11. Están celebrando el cantor y los actores.
    The singer and the actors are celebrating.

12. Están llegando el policía y los directores.
    The police officer and the directors are arriving.

13. Están masticando el perro y los gatos.
    The dog and the cats are chewing.

14. Están comiendo la gallina y los pavos.
    The chicken and the turkeys are eating.

15. Están corriendo el cochino y los caballos.
    The pig and the horses are running.

16. Están volando el águila y los gracios.
    The eagle and the crows are flying.

17. Están esperando la serpiente y las ranas.
    The snake and the frogs are waiting.

18. Están cavando el escarabajo y las hormigas.
    The beetle and the ants are digging.

19. Están nadando el pez y las tortugas.
    The fish and the turtles are swimming.

20. Están saltando el mono y las ardillas.
    The monkey and the squirrels are jumping.
21. Están cazando el jaguar y los zorros.
The jaguar and the foxes are hunting.

22. Están descansando la mariposa y las moscas.
The butterfly and the flies are resting.

23. Están caminando el venado y los ratones.
The deer and the mice are walking.

24. Están mirando el buho y las arañas.
The owl and the spiders are watching.

D.4 Verb-Plural-Singular Condition Items

1. Están cocinando las mujeres y la muchacha.
The women and the girl are cooking.

2. Están gritando los hombres y el muchacho.
The men and the boy are yelling.

3. Están hablando los viejos y el campesino.
The old men and the farmer are talking.

4. Están leyendo las profesoras y el estudiante.
The professors and the student are reading.

5. Están durmiendo las madres y el bebé.
The mothers and the baby are sleeping.

6. Están rogando los padres y la hermana.
The fathers and the sister are praying.

7. Están bebiendo los jefes y el obrero.
The bosses and the worker are drinking.

8. Están saliendo los doctores y la enfermera.
The doctors and the nurse are leaving.

9. Están limpiando las meseras y la viejita.
The waitresses and the old lady are cleaning.

10. Están silbando los muchachos y la muchacha.
The boys and the girl are whistling.
11. Están celebrando los cantores y el actor.
   The singers and the actor are celebrating.

12. Están llegando los policías y el director.
   The police officers and the director are arriving.

13. Están masticando los perros y el gato.
   The dogs and the cat are chewing.

14. Están comiendo las gallinas y el pavo.
   The chickens and the turkey are eating.

15. Están corriendo los cochinos y el caballo.
   The pigs and the horse are running.

16. Están volando los águilas y el grajo.
   The eagles and the crow are flying.

17. Están esperando las serpientes y la rana.
   The snakes and the frog are waiting.

18. Están cavando los escarabajos y la hormiga.
   The beetles and the ant are digging.

19. Están nadando los peces y la tortuga.
   The fish (plural) and the turtle are swimming.

20. Están saltando los monos y la ardilla.
   The monkeys and the squirrel are jumping.

21. Están cazando los jaguares y el zorro.
   The jaguars and the fox are hunting.

22. Están descansando las mariposas y la mosca.
   The butterflies and the fly are resting.

23. Están caminando los venados y el ratón.
   The deer and the mouse are walking.

24. Están mirando los buhos y la araña.
   The owl and the spiders are watching.
Experiment 2: Optionality of plural marking in picture description

E.1 One-One Condition Items

1. The boy and the dog are running.

2. The cat and the bird are sleeping.

3. The farmer and the pig are walking.

4. The girl and the boy are playing.
E.2 One-Two/Many Condition Items

1. The dog and the cats are sleeping.

2. The man and the boys are swimming.

3. The man and the women are dancing.

4. The squirrel and the birds are eating.

E.3 Two/Many-One Condition Items

1. The boys and the girl are studying.

2. The girls and the boy are swimming.
3. The girls and the kitten are playing.

4. The turkeys and the horse are running.

5. The women and the man are talking.

E.4 Two/Many-Two/Many Condition Items

1. The boys and the girls are dancing.

2. The girls and the kittens are playing.
3. The pigs and the chickens are eating.

4. The rabbits and the frogs are jumping.
WORKS CITED


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