PRONOUNS IN CATALAN: INFORMATION, DISCOURSE AND STRATEGY

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________________________
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ABSTRACT

PRONOUNS IN CATALAN: INFORMATION, DISCOURSE AND STRATEGY

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This thesis investigates the variation between null and overt pronouns in subject position in Catalan, a null subject language. I argue that null and overt subject pronouns are two resources that speakers efficiently deploy to signal their intended interpretation regarding antecedent choice or semantic meaning, and that communicative agents interact strategically in order to communicate the desired meaning with the most economical form possible. The mathematical framework of Game Theory is used to analyze this variation, since it is particularly suitable for modeling strategic interaction and choices.

The Position of Antecedent Hypothesis, proposed by Carminati (2002) for Italian, states that null pronouns have a subject preference, while overt pronouns have a non-subject preference. I show that Catalan intersentential data conforms to the PAH whenever the subject is the link of the sentence. However, the PAH needs to be redefined once the topic-focus articulation of the sentence is taken into account: null pronouns have a subject preference regardless of whether the subject is acting as link of the sentence or not, while overt pronouns have a preference for low salience (non-subject, non-link) antecedents. These results point to a model in which salience is composed of several factors and different forms are sensitive to different factors. This data is modeled using games of partial information, in which information states represent different levels of salience. This model makes the prediction that the biases emerging from the PAH should be overridden if there are powerful enough contextual cues, which is borne out.

The relative rates of null and overt pronouns vary greatly in different Romance varieties. I present two hypotheses to deal with this variation: one based on priming effects and the
other on a grammatical change in progress. Finally, the relationship between contrastivity
and overt pronouns is addressed. I argue that all instances of contrastive pronouns are
Contrastive Topic markers, which trigger an uncertainty contrast interpretation, which can
be coerced into an exhaustive contrast if there is a salient alternative in the discourse or in
the context. I offer a game theoretical analysis of the pairing between forms and contrastive
meanings.
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List of Abbreviations

CB  Backward-looking center
CF  Forward-looking center
CL  Clitic pronoun
CP  Preferred center
DD  Definite description
GT  Game theory
IO-CL Indirect object clitic pronoun
IS  Information state
NSL Null subject language
NSP Null subject pronoun
OSP Overt subject pronoun
PAH Position of Antecedent Hypothesis
Q   Question marker
Chapter 1

Introduction

1.1 The research question

The goal of this thesis is to investigate which factors regulate the variation between null and overt subject pronouns (NSP and OSP, henceforth) in Catalan and to model this variation as a game theoretical problem, in which there are, in principle, two resources competing for the same position and function.

Catalan, on a par with other Romance languages like Italian or Spanish, is a null subject language (NSL) and has a double system of pronouns (Rigau, 1986). In subject position, there is an alternation between overt pronouns (ell in 1a) and null pronouns (in 1b).

(1) a. Ell estima la Maria.
    he loves the Mary

b. Estima la Maria.
   loves the Mary
   ‘He loves Mary.’

There are cases in which OSPs are ungrammatical, as in 2a, cases in which they are optional, as in 2b, and cases in which they are mandatory, as in 2c (examples from Rigau (1989)).
The goal of this thesis is to investigate what regulates these patterns, to examine which type of referring preferences they exhibit and to give a pragmatic game theoretical analysis of these preferences. In Catalan, NSPs and OSPs are two resources that speakers may deploy to signal their intended interpretation and I argue that in this domain speakers and hearers interact strategically in order to communicate the desired meaning with the most economical form possible. That is, this extra resource that NSIs have at their disposal is efficiently used by speakers to communicate particular decisions regarding antecedent choice or semantic meaning, specifically as it relates to contrastivity.

Game theory, which provides a mathematical framework to deal with strategic choice, will be the tool used in order to analyze this variation. Rationality plays a key role in pragmatic choices: the speaker makes a choice taking into account how the hearer will interpret this choice. The hearer interprets the speaker’s choice taking into account that the speaker took the hearer into account, etc. Game theory is equipped to handle precisely these situations, in which two agents take each other into account in order to choose the action which should turn out to be optimal for them. In this thesis, I propose a game theoretical model of how participants in a conversation interpret null and overt pronouns in a discourse; that is, I specify the necessary ingredients of the model: the information states and their probabilities, the possible actions in each information state and their payoffs.

The main questions I aim to solve in this thesis are the following:

• Question 1: What is the relationship between syntactic function and pronouns in
Catalan? Do different pronouns have biases towards antecedents in particular syntactic positions?

- **Question 2:** What is the relationship between information structure and pronouns in Catalan? Do different pronouns have biases towards antecedents playing different roles in the information structure of a sentence? Can the syntactic preferences of pronouns be understood as a by-product of their pragmatic preferences? What does this tell us about the notion of salience?

- **Question 3:** It is well known that different NSLs present different overall rates of OSPs. How should we deal with this cross-linguistic variation in our game theoretical approach?

- **Question 4:** How should contrastive pronouns be analyzed? Is there only one type of contrastive pronoun? Are they always mandatory?

The main thesis defended in this work is that the variation between NSPs and OSPs in Catalan allows participants engaged in a communicative exchange to interact strategically and behave rationally in generating and interpreting anaphoric expressions. I will also argue for a model of salience, in which both syntactic and pragmatic factors play a role and different pronouns are sensitive to different factors.

### 1.2 Structure of the thesis

This thesis is structured as follows:

- Chapter 2 gives some background information about different models of referring expressions, information structure, Catalan syntactic and pragmatic structure and previous claims in the literature regarding about overt pronouns in Romance.
Chapter 3 presents Experiments 1 and 2, which test the relationship between subject-hood and subject pronouns with a questionnaire study and a self-paced reading study. These experiments show that NSPs and OSPs have different types of biases: NSPs have a subject preference and OSPs have an object preference.

Chapter 4 gives an overview of game theory and its application to linguistics as it pertains to the issue of referring expression choice and anaphora resolution, and the application of these ideas to the Catalan data. I model the empirical data from Chapter 3 as a game of partial information in which speaker and hearer interact to choose a form and a meaning. I also present Experiment 3, which provides further evidence for the game theoretical analysis previously offered. This experiment shows that NSPs can go against their bias and refer to the object if contextual information has been appropriately manipulated.

Chapter 5 presents how pragmatic notions, such as topic and focus, interact with the choice and interpretation of pronouns. Experiments 4 and 5 provide some insight into this relationship. Experiment 4 shows that NSPs are sensitive to syntactic factors (they have a subject preference) and that OSPs are sensitive to both syntactic and pragmatic factors (they have an object preference only when the object is not the topic). Experiment 5 shows that the referring preferences of OSPs change when the pronoun acts as focus and that, in this situation, they are fully ambiguous.

Chapter 6 investigates the differences between different null-subject Romance varieties. I review the main differences reported in sociolinguistic studies and present two hypotheses about how to approach cross-dialectal differences. The first hypothesis derives the different rates of overt pronouns from priming effects. The second hypothesis derives the different rates of overt pronouns from the idea that some varieties (Brazilian Portuguese and Caribbean Spanish) are undergoing a language
change process from being a NSL to being a non-NSL.

- Chapter 7 deals with the relationship between contrastivity and OSPs in Romance. I argue that contrastive OSPs in Romance should be treated as Contrastive Topics. I present an analysis of Contrastive Topics which combines insights from Büring (2003), Hara and van Rooij (2007) and Tomioka (2008): contrastive OSPs convey an ‘uncertainty contrast’, which can be strengthened into an ‘exhaustive contrast’, under certain circumstances. I argue that contrastive pronouns are not always mandatory, but rather only when the utterance must be interpreted as answering a sub-question of the Question Under Discussion.

- Chapter 8 concludes by reviewing the main findings reported in this thesis and exploring open questions and venues for future work.
Chapter 2

Background

This section presents some background information on the topics relevant to this thesis. Section 2.1 gives an overview of linguistic and psycholinguistic proposals regarding choice and processing of referring expressions. Section 2.2 reviews some information-theoretical notions and Section 2.3 briefly presents the syntactic and pragmatic structure of Catalan. Section 2.4 discusses several hypotheses regarding what triggers the presence of overt pronouns, which I test or reformulate in Chapters 3, 5 and 7. Finally Section 2.5 presents a corpus of Catalan narrations that will be used at several points in this thesis mainly to estimate the probability of the different information states in our game theoretical models.

2.1 Choice of referring expressions and their processing

The choice and interpretation of referring expressions and the processing of pronouns has been a topic of interest in linguistics for a long time. I do not intend to present a complete review of the different proposals in this section, but to give an overview of some influential ideas, which are relevant for my data and my analysis. I review the basic ideas behind Accessibility Theory (Ariel, 2001), the Givenness Hierarchy (Gundel et al., 1993) and Cen-
tering Theory (Grosz et al., 1995). All these proposals share the idea that some notion of salience or accessibility drives the choice and interpretation of referring expressions, but differ in the mechanisms invoked.

2.1.1 Accessibility Theory (Ariel, 2001)

Accessibility Theory (Ariel, 2001) claims that referring expressions encode a specific degree of mental accessibility. Thus, anaphoric expressions are seen as ‘accessibility markers’ in the following hierarchy:

(3) Low Accessibility ................................................................. High Accessibility

   Full name + modifier > full name > long definite description > short definite description > last name > first name > distal demonstrative + modifier > proximate demonstrative + modifier > distal demonstrative + N > proximate demonstrative + NP > distal demonstrative (-NP) > proximate demonstrative (-NP) > stressed pronoun + gesture > stressed pronoun > unstressed pronoun > cliticized pronoun > verbal inflection > zero

According to this hierarchy, names and definite descriptions are low accessibility markers and, thus, can retrieve referents not salient in memory, while, for instance, pronouns are high accessibility markers and thus, retrieve antecedents in the current focus of attention. Ariel argues that three different criteria determine the association of a particular anaphoric expression with a degree of accessibility: informativity, rigidity and degree of attenuation. The more informative and rigid an anaphoric expression, the better it is at referring to a less accessible referent; while the less informative and flexible, the better it is at retrieving a highly accessible referent. Degree of attenuation refers to the amount of phonological material a marker has. Ariel’s approach makes the prediction that there is an asymmetry between NSPs and OSPs: NSPs are predicted to refer to more accessible referents than the
OSPs, since they are higher in the hierarchy.

In order to determine the degree of accessibility of a discourse referent Ariel proposes that different factors interact: (1) salience (determined by many other factors: grammatical function, high vs. low physical salience in the context, order of mention, definiteness and quantificational status of the DPs), (2) competition (if there is competition between potential antecedents for an anaphoric expression, these antecedents are less accessible than if there is no competition), (3) distance (recently mentioned entities are more accessible than remotely mentioned ones) and (4) unity (the greater degree of cohesion between the clause which contains the antecedent and the clause that contains the anaphor, the greater the accessibility of the anaphor).

Ariel (1990) shows how her approach yields good predictions for corpus studies on English and Hebrew. However, it is not clear how the criteria that she identifies for determining the degree of accessibility of a discourse referent interact. Does competition completely override salience? If so, we would expect the overt pronouns to be the preferred choice in cases of competition. However, experimental results show that this is not always the case (see the experiments reported in Chapter 3). Also, some contexts require an OSP (and do not allow for an NSP) regardless of the accessibility of the antecedent (see Chapter 7).

The approach defended in this thesis uses Ariel’s idea that different referring expressions have different degrees of accessibility, but derives this fact in a less stipulative way by relating informativity and rigidity of a particular form to its corpus frequency in a particular situation (cf. chapters 4 and 5). In addition, my experiments support a view of salience as a non-monolithic concept in which both syntactic and pragmatic factors play a role.
2.1.2 The Givenness Hierarchy (Gundel et al., 1993)

According to the Givenness Hierarchy proposed by Gundel et al. (1993), the choice of a referring expression depends on the assumed cognitive status of the referent, on “assumptions that a cooperative speaker can reasonably make regarding the addressee’s knowledge and attention state in the particular context in which the expression is used” (Gundel, 1883, page 275). Thus, this proposal highlights the role of the speaker as a rational agent, which acts strategically and takes into account the addressee’s knowledge. The game theoretical approach I present in this thesis also uses this idea but views both agents, speaker and hearer, as rational agents, which interact strategically taking into account the other agent to make their own decisions.

Gundel et al. (1993) develop a hierarchy of cognitive states which correspond to different degrees of ‘givenness’. They propose the following hierarchy (the types of linguistic referring expressions that correspond to each cognitive status in English are shown in parentheses).

(4) In focus (it) > activated (that, this, this N) > familiar (that N) > uniquely identifiable (the N) > referential (indefinite this N) > type identifiable (a N).

The main difference between this approach and Ariel’s approach is that while Ariel’s accessibility statuses are seen as mutually exclusive, Gundel et. al.’s proposal is that they are implicationally related, so that each cognitive status entails all that are below it on the scale (to the right in 4). Thus, in principle, this predicts that a referent of a particular givenness status may be referred to with a linguistic form associated with a status lower on the scale: for example, a referent ‘in focus’ can be referred to with a definite article because ‘in focus’ entails ‘uniquely identifiable’. A corpus study of different languages shows that this is sometimes the case: for instance, the definite article in English appears mostly in the uniquely identifiable status, but also appears frequently in the statuses at the left, as
predicted. However, the indefinite article only appears with the two rightmost statuses and not all the way to the left, as Gundel et al. would predict. They explain this data by proposing that the correlation between linguistic form and givenness status is regulated by the two opposing Gricean Quantity Maxims:

(5)  
\begin{enumerate}
  \item Q1. Make your contribution as informative as required
  \item Q2. Do not make your contribution more informative than is required
\end{enumerate}

Q1 explains why the indefinite article is not used for statuses above referential or why the in-focus referents are encoded mostly by the most restrictive forms (zero or unstressed pronouns) depending on the language. Q2 explains why a definite article appears in statuses above uniquely identifiable (familiar or activated, for instance). However, such an explanation could be applied to almost any distribution of the data and there does not seem to be any principled reason why Q1 and Q2 should affect different referring expressions.

Gundel et al. (1993) apply their proposal to one Romance null-subject language, Spanish. They include both pronouns (NSPs and OSPs) in the ‘in focus’ status. In their corpus study, all NSPs refer to ‘in focus referents’, while this is also the case for almost all OSPs, except for three instances which are ‘activated’. As I show in the next chapters, Catalan data does not seem to follow this pattern: NSPs and OSPs tend to select antecedents with different degrees of accessibility; however, NSPs can select referents which are not ‘in focus’, but just ‘activated’ if there is enough contextual information (see Chapters 3 and 4). Also, I argue in Chapter 7 that the use of an OSP to refer to the most activated referent conveys an additional meaning, associated with Contrastive Topics, and it is not used in a purely referential way.
2.1.3 Centering Theory

Centering Theory (Grosz et al., 1995) is a way of modeling attention during discourse processing, a framework to theorize about local coherence, salience and choice of referring expressions. Centering Theory (CT, henceforth) claims that some entities are more central than others in a discourse and this affects the referring expressions speakers use to refer to these entities. The basic units of analysis in CT are utterances. Every utterance evokes a set of entities, called the forward-looking center (CF), which is partially ordered according to some language-dependent ranking.

There are two special members in the CF of an utterance $U_i$:

- the preferred center (CP) of some utterance $U_i$ is the highest ranked center of the CF of $U_i$. It is predicted that $U_{i+1}$ will be about this entity.

- the backward looking center (CB) of some utterance $U$ is the highest ranked center of the CF of the previous utterance $U_{i-1}$ which is realized in $U_i$. That is, it is the most central entity in the utterance, which connects the previous sentence with the current sentence. Each utterance may have at most one CB, and it may be the case that an utterance does not have a CB; this will happen if none of the entities of the CF of $U_{i-1}$ are present in $U_i$.

Between any two utterances $U_i$ and $U_{i+1}$, there will be a transition, which can be classified into four types depending on the interaction between the CB and the CP of both utterances. These transitions are illustrated in Table 2.1.

| $CB(U_i) = CB(U_{i-1})$ | $CB(U_i) = CP(U_i)$ | $CB(U_i) 
eq CP(U_i)$ |
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<td>Retain</td>
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| $CB(U_i) 
eq CB(U_{i-1})$ | Smooth-Shift        | Rough-Shift              |

Table 2.1: Transitions in Centering Theory

Centering proposes two rules, which make the theory empirically testable. The first one
is a constraint on center realization and the second one is on center movement:

- Rule 1: If there is a pronoun in an utterance, its CB must be also realized as a pronoun. This rule encodes the idea that, since the CB is the most salient entity, it can be referred to in the most minimal way. Therefore, this rule predicts that if only one pronoun is used in any utterance, it will refer to the CB.

- Rule 2: (Sequences of) Continues are preferred over retains, which are preferred over smooth-shifts, which are preferred over rough-shifts.

Centering Theory as it stands does not make predictions about the variation between NSPs and OSPs. However, CT has been applied to null subject languages, such as Turkish, Japanese, Italian and Greek. These proposals are summarized and examined in Section 2.4.

2.2 Information structure

The choice of referring expressions and, thus, the use of pronouns contributes to the construction of a certain information structure in discourse. In this section, I review some of the main concepts in relation to this topic.

It has been noted for a long time that there is a distinction between the grammatical subject and predicate of a sentence and the subject-predicate structure of the meaning conveyed by the sentence. The latter is the Information Structure or the Information Packaging of the sentence. In 6a the grammatical subject and predicate coincide with the ‘logical’ subject and predicate: it is predicated about Mary that she ate beans. However, they do not need to coincide as 6b shows. In this case, the grammatical direct object is the ‘logical’ subject: it is predicated about the beans, that Mary ate them.

(6)  a. What did Mary eat?  
    Mary ate BEANS.
b. Who ate beans?

MARY ate beans.

The term *information packaging* was introduced by Chafe (1976) to refer to the level of linguistic analysis that has “to do primarily with how the message is sent and only secondarily with the message itself” (Chafe, 1976, page 28). In Prince’s words (Prince, 1981, pg. 224), “information-packaging in natural language reflects the sender’s hypothesis about the receiver’s assumptions and beliefs and strategies”. Thus, in modeling the information structure of a discourse, it is crucial to be able to talk about the common knowledge shared by the speaker and the hearer and about the mutual assumptions about each other’s beliefs.

A traditional approach in information structure is to divide the sentence into topic, what the sentence is about, and focus, what is predicated about the topic. This partition is often associated with the division between given and old information in a sentence. However, there is a great deal of terminological confusion regarding what it means for information to be ‘new’ or ‘old’. Different terms have been used to refer to the same phenomena or the same terms have been used to describe different facts. For instance, the partition between new and old/given information has also been called focus-ground, focus-topic, rheme-theme, etc. Section 2.2.1 discusses what it means for information to be new or to be old. Section 2.2.2 presents Vallduví’s (1992) approach to information structure, which explains how informational roles are mapped into syntactic positions in Catalan and makes some predictions about the use of overt pronouns in discourse (see Section 2.4.2).

### 2.2.1 The Old and the New

Gundel and Fretheim (2001) distinguish between two types of givenness-newness: referential givenness-newness and relational givenness-newness. Referential givenness-newness is a relationship between a linguistic expression and a corresponding non-linguistic en-
tity in the speaker or hearer’s discourse model. Some examples of referential givenness concepts are the hearer-old/new and discourse-old/new statuses of Prince (1992) and the cognitive statuses of Gundel et al. (1993). Relational givenness-newness is a partition of the semantic representation of a sentence into two complementary parts, X and Y, where X is what the sentence is about and Y is what is predicated about X. X is given in relation to Y, and Y is new in relation to X. Thus, information structure is associated with relational givenness-newness.

The two types of givenness-newness partitions are logically independent, as can be seen in 7.

(7) Who called?
    Pat said SHE called.

The pronoun in 7 is referentially given, since the intended referent is activated, hearer-old, discourse-old, etc. At the same time, it is relationally new: it is the new information of 7. However, there seems to be a connection between topicality (relational givenness) and some degree of referential givenness. For example, the phrase marked by a topic marker in Japanese and Korean has a definite interpretation. However, the exact nature of this association remains unclear. For example, Gundel (1985, 1988) proposes that the referents of topics must already be familiar (the addressee must have an existing representation in memory), but there appear to be counterexamples to this claims: Reinhart (1981) notes that specific indefinites can appear in dislocated topic positions in certain contexts.

2.2.2 Vallduví’s (1992) tripartite approach

Vallduví (1992) views information packaging as the “structuring of sentences by syntactic, prosodic or morphological means that arises from the need to meet the communicative demands of a particular context or discourse” (Vallduví and Engdahl, 1996).
He argues that the different bipartite articulations found in the literature (namely the ‘topic-comment’ approaches and the ‘ground-focus’ approaches) cannot capture all the information distinctions present in a sentence.

Vallduví’s (1992) proposal is that sentences are divided into focus and ground, where the ground is further divided into link and tail. Information packaging is seen as instructions for the update of information. The focus is the actual update potential of the sentence, while the ground indicates how the information update must take place. The link indicates where the focus should go (in which file, following File Change Semantics (Heim, 1983)), and the tail how the information must be updated. All sentences have a focus, while both elements of the ground are optional. Thus, a sentence may present one of the following structures: link-focus, link-focus tail, all-focus and focus-tail. The four types are illustrated in 8.

(8) a. Link-focus

Tell me about the people in the White House. Is there anything I should know?
(The president \textit{Link} (hates \textit{CHOCOLATE} \textit{Focus}).

b. Link-focus-tail

And what about the president? How does he feel about chocolate?
(The president \textit{Link} (HATES \textit{Focus}) (chocolate \textit{Tail}).

c. All-focus

The president has a weakness.
(He hates \textit{CHOCOLATE} \textit{Focus}).

d. Focus-tail

You shouldn’t have brought chocolates for the president.
(He HATES \textit{Focus}) (chocolate \textit{Tail}).

Note that while a DP subject, such as \textit{the president}, constitutes a link, a subject pronoun in English does not and, according to Vallduví (1992), both 8c and 8d are linkless sentences.
In English, the different ground-focus partitions are usually encoded through stress. The focus is associated with a pitch accent (H*, in Pierrehumbert (1980)). Links may be marked syntactically (as in 9, where it is fronted) or intonationally (with a characteristic L+H* accent). Subject links may be unmarked (without the L+H* accent), while contrastive links are always B accented (a combination of pitch accent plus a high boundary tone, H*L-H%). Finally, tails are not marked in a particular way in English, apart from being de-accented.

(9) Where can I find the cutlery?

The forks are in the CUPBOARD but the knives I left in the DRAWER.

In this thesis, I follow Vallduví’s approach and terminology: focus and link refer to linguistic material that plays a particular informational structure role: they indicate the update potential and the file where this update should be located, respectively. I use s-topic to refer to the abstract file where the information is entered. Thus, a link is the linguistic material that points to an abstract s-topic (see McNally (1998) for discussion about these two notions). I depart from this terminology in Chapter 7: I use the term Contrastive Topic (CT) to refer to a contrastive link because CT is the term mostly used in the current literature. Finally, I use d-topic to refer to Discourse Topics: what the discourse or the discourse segment is about (see Asher (2004)). It has been argued that d-topics are crucial in explaining some discourse relations: for example, Asher and Lascarides (2003) require that all elements belonging to the the discourse relation Narration have a common d-topic.

As mentioned, links are an optional part of the information structure of a sentence and, thus, linkless sentences do occur. Vallduví (1992) distinguished two types of linkless sentences: (i) sentences in which no particular file is relevant (such as presentational or existential sentences, which are topicless) and (ii) sentences in which there is a relevant file/topic, but it is not necessary that there be a linguistic link pointing to it, because it can
be inferred from context. Section 2.4.2 elaborates on the relationship between links and subject pronouns.

The next section discusses how the information structure instructions identified by Vall-duví are mapped onto syntactic positions in Catalan.

2.3 Catalan syntactic and pragmatic structure

This section contains a brief review of Catalan syntactic and pragmatic structure. Catalan, as other Romance null-subject languages, has a relatively free word order: the subject can either be preverbal (10a) or postverbal (10b) and the arguments of the verb may be dislocated to the left or to the right (10c and 10d). By contrast, the direct object must precede any oblique or locative arguments (11).

(10)  a. Els nens diuen moltes mentides.
    the children say many lies

    b. Diuen moltes mentides els nens.
       say many lies the children

    c. De mentides, els nens en diuen moltes.
       of lies, the children part-pr say many

    d. Els nens en diuen moltes, de mentides.
       the children part-pr say many, of lies
       ‘Children lie a lot.’

(11)  * Els nens figuen al calaix la roba.
      The children put in the drawer the clothes
      ‘Children put clothes in the drawer.’

Romance null-subject languages have received different analyses. These analyses differ mainly in how postverbal subjects are treated and in which order is considered to be the base-generated one. It is beyond the scope of this thesis to provide a full review of proposals, but I will briefly present some of them.
Catalan has been traditionally analyzed as an SVO language, together with other Romance NSLs. For Italian, Rizzi (1982) argues that postverbal subjects are generated through a postposition rule, a rightward NP movement, by which the subject is adjoined to the VP (see also Belletti and Rizzi (1981) and Burzio (1986) for similar views).

There is another line of analysis, in which postverbal subjects are analyzed as staying low in the clause, while the verb raises higher up. For instance, for Italian, Belletti (2000) argues that postverbal subjects move from their VP-internal position to a higher Focus Phrase immediately above the VP, while the verb raises higher up to the IP. This analysis captures the fact that a postverbal subject conveys new, focal information. Barbosa (2000) analyzes subjects in European Portuguese as having a thematic position to the right of a raised V, while preverbal subjects are left-dislocated constituents (Alexiadou and Anagnostopoulou (1998) present a very similar analysis for Romance NSLs).

Catalan has also been analyzed as a VOS language. Under this approach, all preverbal subjects (including all preverbal pronoun subjects) are taken to be instances of left-dislocations. For example, Bonet (1990) proposes that all subjects in Catalan are base-generated in the specifier of the VP to the right of its head and, thus, VOS is the base-generated order, as shown in Figure 2.1 for the sentence in 12.

(12) Llegeix un llibre la Maria.
    reads a book Mary
    ‘Mary reads a book.’

Vallduví (1993) gives evidence for a VOS structure from an information packaging point of view. His thesis is that, in Catalan, information packaging is conveyed by syntactic means: i.e. there is a mapping between syntactic position and information-structure roles. For verbal complements, there is a clear one-to-one mapping since there are three possible information-packaging roles in his approach (link, focus and tail, as explained in 2.2.2) and three possible surface syntactic slots in which verbal complements may appear: left-
Vallduví’s proposal is that focus stays in situ, while links are left-dislocated and tails are right-dislocate.1

Example 13 shows the three positions in which an object may appear: in situ, left-dislocated or right-dislocated. Left and right-dislocations trigger the appearance of a coinedexed clitic attached to the verb.

\begin{align*}
\text{(13) a. } & \text{ Ficarem el ganivet al calaix.} \\
& \text{ put the knife in the drawer} \\
\text{ b. } & \text{ El ganivet, el ficarem al calaix.} \\
& \text{ the knife, CL put in the drawer} \\
\text{ c. } & \text{ El ficarem al calaix, el ganivet.} \\
& \text{ CL put in the drawer, the knife} \\
\end{align*}

If we maintain an SVO analysis, this one-to-one mapping cannot be maintained for subjects. The reason is that, while there are three information-packaging roles, there would potentially be four syntactic positions: left-detached, right-detached, preverbal and postverbal. By contrast, with a VOS analysis, the one-to-one mapping can be maintained, adding

1Although Vallduví supports a VOS analysis, the evidence he presents would also be compatible with other analyses, such Barbosa’s or Alexiadou and Anagnostopoulou’s analyses, in which preverbal subjects are treated as left-dislocations and the subject is base-generated in some position low in the clause.
the idea that all preverbal subjects are in fact left-detached subjects and that, therefore, there are only three syntactic positions for subjects as well.

As mentioned, subjects may appear right-detached, outside the main clause, or postverbally, inside the main clause. It is not possible to use the appearance of a clitic to distinguish these positions because Catalan does not have subject clitics. However, the two structures show different intonation patterns: while postverbal subjects are within the scope of intonational prominence, right-detached subjects are placed to the right of prominence (this is often indicated in writing by placing a comma before the right-dislocated subject). Moreover, while postverbal subjects must appear to the left of VP adjuncts and vocatives, right-dislocated subjects may appear to their right. Thus, if a subject appears to the right of an adjunct, it will be a right-dislocated subject and cannot be prominent, as the contrast between 14a and 14b shows.

(14)  a. Ha trucat a les VUIT, l’amo.
       has called at eight, the boss

       b. * Ha trucat a les vuit l’AMO.
          has called at eight the boss

The contrast in 14 also shows that intonation in Catalan has a fixed invariable contour, in which the intonational prominence falls on the clause-final position. If linguistic material occurs to the right of the intonational peak, it must be clause-external, dislocated material.

Vallduvi (1993) shows that all preverbal subjects may be reanalyzed as left-detached arguments, based on the following evidence: (1) preverbal Catalan subjects and left-detached subjects are pragmatically interpreted in the same way, as links, and (2) preverbal subjects, like left-detached complements, must appear to the left of wh-phrases and yes/no morphemes as 15 shows. There is just one position for preverbal subjects in questions and this is the position of left-detached constituents.

(15)  a. L’amo que ha trucat?
       the boss Q has called?
b. *Que l’amo ha trucat?

Q the boss has called?

‘Has the boss called?’

Thus, it is possible to maintain that subjects are base-generated in a postverbal position and that all preverbal subjects are left-detached subjects. The greater frequency of the SVO is due to the fact that subjects usually serve as links, and not as focal information and, therefore, are typically left-dislocated. If this is correct, the mapping Vallduví (1992, 1993) proposes can be maintained for all constituents: in Catalan, the focus remains in its canonical position, while the ground is detached; links are left-detached and tails are right-detached. In 16, the four informational structures are shown: in 16a link-focus, in 16b link-focus-tail, in 16c all-focus and in 16d focus-tail. Note how all links are left-detached (appear before the verb), while tails are right-detached.

(16) a. El president odia la xocolata.
the president hates the chocolate

b. El president, l’odia, la xocolata.
the president CL hates the chocolate

c. Odia la xocolata el president.
hates the chocolate the president

d. L’odia, la xocolata.
CL hates, the chocolate

2.4 Some claims about overt pronouns in Romance Languages

In this section, I present the main proposals found in the literature regarding which factors trigger the appearance of overt pronouns.
2.4.1 The Position of Antecedent Hypothesis (PAH)

Carminati (2002) proposes that the variation between NSPs and OSPs is regulated by the Position of Antecedent Hypothesis (PAH). According to the PAH, within a sentence, null and overt pronouns have different antecedent biases: null pronouns prefer to retrieve an antecedent in the (highest) Spec IP, whereas overt pronouns prefer an antecedent in a lower syntactic position. This hypothesis is in accordance with Ariel’s proposal that more marked, informative forms tend to retrieve less salient antecedents, while unmarked, less informative forms tend to retrieve more salient antecedents. In Chapter 3, I discuss several experiments that test the PAH in different languages, including my own experiments for Catalan.

Other studies that consider switch/same reference (that is, reference to the previous subject or not) as an important factor in the appearance of OSPs are a number of variationist studies of several languages, including Cameron (1992) and Silva-Corvalán (1977) for Spanish.

2.4.2 S-topic change

Vallduví (1992) observes that weak and null proforms do not participate in the construction of Information Packaging instructions (see Section 2.2.2), while overt pronouns do participate. Thus, his general hypothesis is that OSPs work towards constructing the information structure of the text. More specifically, preverbal subject pronouns are links, which designate a specific file card where the information update is to be carried out. As mentioned before, links are an optional part of the information structure of a sentence and, thus, linkless sentences occur when (i) no particular file is relevant (such as presentational or existential sentences) and (ii) when there is a relevant file/s-topic, but it need not be mentioned, because it can be inferred from context.
The second case includes those pairs of sentences in which a sentence $S_n$ shares its abstract s-topic with $S_{n-1}$. In this situation, $S_n$ need not have a link, it may have an NSP. In contrast, the use of a link in two adjacent sentences will imply a change of locus of update from $S_{n-1}$ to $S_n$.

The second sentence in 17a is an example of a linkless sentence, which inherits the s-topic (the update file card) from the previous sentence and, thus, the NSP is coreferential with the previous subject. In contrast, the sentences in 17b are an example of links in two adjacent sentences, which implies that there is a change of a locus of update, from Maria in $S_1$ to Anna in $S_2$. Therefore, the overt pronoun is coreferential with the previous object and indicates a change of locus of update, or s-topic.

(17)  

a. La Maria va insultar l’Anna i li va fotre una hòstia.

‘Mary insulted Anna and [null] hit her.’

b. La Maria va insultar l’Anna i ella li va fotre una hòstia.

‘Mary insulted Anna and she hit her.’

Note that, for the examples in 17, this approach and the PAH make the same predictions. However, this is not always the case. The cases covered by the PAH do not completely overlap with the cases covered by Vallduví’s approach. The former in principle only covers intrasentential cases, while the latter covers both within- and across-sentence cases (see experiments 1 and 2 for evidence that the PAH also holds intersententially). Moreover, these two approaches also yield different predictions when the subject does not act as a link. In Chapter 5, I show that the pragmatic structure of the sentence has an effect on the interpretation of some pronouns, but not in the straightforward manner proposed by Vallduví.

Applications of Centering Theory (Grosz et al., 1995) to null-subject languages implement a similar idea to Vallduví’s (see Turan (1995) for Turkish, Kameyama (1985) for
Japanese and DiEugenio (1998) for Italian). For example, DiEugenio (1998) claims that NSPs are used when the center transition between the two sentences is a continue and OSPs are used when the center transition is a retain or a shift (that is, when the center of attention is not the one expected, given the previous sentence). Analyzing data from Turkish, Turan (1995) concludes that the salience of referents should be computed according to their thematic role, based on the observation that the objects of some psychological verbs rank higher than the subjects and are the preferred antecedent for NSPs. Following the same line as Di Eugenio, Turan also reports a connection between continue transitions and zero subjects in Turkish.

Dimitriadis (1996) accounts for the overt/null pronoun variation in Greek in a slightly different way: his proposal is that an OSP in Greek should not be construed as the CP of the previous utterance. Thus, the overt pronoun will ‘skip’ the first element in the CF list of the previous utterance. Since the CP is the subject of the utterance\(^2\), this proposal amounts to claiming that an overt subject cannot refer to a previous subject. Therefore, this proposal may be more in line with Carminati’s proposal, although it is hard to say so conclusively because he does not explicitly discuss the role of s-topics and links.

Samek-Lodovici (1996) also argues that s-Topic Continuation/Change is responsible for the distribution of null and overt pronouns in Italian. He models this situation using Optimality Theory, by positing a higher-ranked DropTopic constraint, which outranks Subject and Parse constraints (see 5.1.1 for more details on Samek-Lodovici’s work).

### 2.4.3 Contrast

Several researchers have pursued the idea that the appearance of OSPs in null-subject languages is related to the expression of contrast. This is actually a recurrent idea in traditional

\(^2\)The ranking Dimitriadis (1996) assumes is SUBJECT > OBJECT2 > OBJECT > OTHER.
grammars of Spanish and Catalan. However, although the role of contrast is recognized, these grammars do not attempt to define what contrast means and remain quite vague about the contrastive import of pronouns. For instance, the official Spanish grammar by the Real Academia Española (Alarcos Llorach, 1994) says that overt pronouns “tienen marcado carácter enfático y expresivo y trata de contrapoe la persona aludida a las otras” (“have a marked emphatic and expressive character and [they] contrast the alluded person to the others”), without exactly defining what exactly ‘contrast’ means or who the referent is contrasted with. Similarly vague claims are found in Catalan grammars: “subject pronouns may be left unexpressed. In fact, they are usually left unexpressed, except for emphasis or contrast” (Hualde, 1992) or “Catalan is characterized, like Spanish, Italian, and Portuguese, but unlike French, by the way in which subject pronouns accompany verbs only for particular emphasis.” (Wheeler, 1988).

Luján (1985, 1999) argues that OSPs in Spanish convey emphasis and are contrastive in those contexts in which they are optional (subject and object positions). The contrast can be understood with respect to the pronoun alone or it can be wider, with respect to both the pronoun and the predication.

(18) a. Tu trabajas demasiado, no otro.

You work too much, not someone else.

b. Tu trabajas demasiado, ellos te pagan poco.

You work too much, they pay you little.

Luján (1985) argues that OSPs in Romance correspond to stressed pronouns in English and proposes the following generalization:

(19) null pronoun in Italian/Spanish → unstressed pronoun in English

3In fact, this example illustrates a focal subject pronoun, rather than a purely contrastive pronoun. See section 2.4.4 for comments on the relationship between focus and subject pronouns.
Her evidence for establishing this correspondence is that OSPs in Spanish and stressed pronouns in English cannot precede their antecedents, as in 20, and do not allow for a sloppy reading in elliptical contexts, as in 21, while the opposite is true with NSPs in Spanish and unstressed pronouns in English.\footnote{See Hirschberg and Ward (1991) for an experimental study that casts doubts on these intuitions.}

(20)  
\begin{enumerate}  
\item Cuando él/\textit{he} come, Pedro\textsubscript{j} no fuma. 
\item When HE\textit{he} eats, Pedro\textsubscript{j} does not smoke. 
\end{enumerate}

(21)  
\begin{enumerate}  
\item Marcos cree que él ha aprobado el examen y Ana también. 
\item Mark thinks HE has passed the exam, and so does Anne. 
\end{enumerate}

However, as Carminati (2002) argues, this proposal cannot be complete, since there are also stressed pronouns in Romance and there are cases in which overt pronouns in Romance are not contrastive and would not be translated by a stressed pronoun in English. Furthermore, sentences with a double contrast, which do require OSPs in Romance, do not require stressed pronouns in English (see 22).

(22)  
\begin{enumerate}  
\item Jo vaig anar a la festa i tu vas quedar-te a casa. 
\item I went to the party and you stayed at home. 
\end{enumerate}

Brunetti (2006) also argues that subjects may trigger a contrastive interpretation in some contexts. She follows Vallduví’s account of information structure and agrees that the presence of a link is used to indicate an s-topic shift, while an NSP represents a continuous s-topic. However, she also notes that in some cases a link appears to refer to a continuous s-topic, as example 23 shows for Italian. However, a special contrastive interpretation arises
in these cases: the hearer expects the speaker to say something about other friends/relatives to whom he will give (or not give) presents.\(^5\)

(23)  a. A Dante, che cosa (gli) regalerai?
      To Dante, what thing (IO-CL) give?
      ‘What will you give to Dante (as a present)更要?'

   b. A Dante (gli) regalerò un LIBRO.
      ‘To Dante, I’ll give a book.’

Brunetti’s (2006) proposal is that this unexpected use of a link legitimates a contrastive interpretation. The question in 23 is about Dante. Thus, one expects an answer about Dante with a continuous s-topic and, thus, an NSP. So, if the speaker decides to utter a sentence with a link, he/she does so to evoke the alternatives to that link and this is how the contrastive interpretation arises.

Her proposal is that a link implies the existence of alternatives: selecting an address from the knowledge store always implies choosing among potentially different addresses that may be relevant in the context. But the relevance of alternatives varies according to the context. If there is a change of s-topic, the alternatives are not relevant, and not evoked. In cases like 23b, the speaker wants to contrast the current s-topic with other entities, and does so by once again using a link to refer to that s-topic. The s-topic is sorted again, this makes the alternatives relevant and a contrastive interpretation is triggered. Summarizing Brunetti (2006), we may expect to find pronoun links in two contexts: (1) to introduce a shift and (2) to introduce a contrastive interpretation (if there is link repetition).

Cameron (1992) conducted a variationist study of the expression of subject in different Spanish dialects. He did not argue for contrast as the main factor which affects the presence/absence of OSPs, but it is interesting to note that he excluded from the envelope

\(^5\)Brunetti (2006) deals with left-dislocated verbal constituents. If we stick to the hypothesis that preverbal subjects are left-dislocations, the same effect should hold for subjects.
of variation cases which he counted as contrast, given that there was no variation in such cases; that is, the OSP is taken to be obligatory (see Todolí (2002) for the same insights regarding Catalan data). He distinguished three different types of contrast.

- Contrast of Negation: the same predicate (or two similar predicates) occurs in two sentences, but it is negated in the second one:

  (24) Ellos fueron pero yo no fui.

  They went but I did not go.

- Contrast of Scalar Opposition: there are two similar predicates, which are modified by adjuncts which are construable as elements of a scalar set, such that the two adjuncts differ by degree.

  (25) Mi señora habla bien inglés pero yo lo hablo bastante mal.

  My wife speaks English well but I speak it very brokenly.

- Contrast of Alternatives: this type occurs when object arguments of the first and second sentences are construable as elements of a set and understood as alternatives to one another.

  (26) Yo fui a una escuela y él fue a otra.

  I went to a school and he went to another one.

In Chapter 7, I review several approaches to contrast and argue for a unitary analysis of all pronouns conveying contrast as marking a Contrastive Topic. I also argue that not all contrastive pronouns are obligatory, but only when they appear in an utterance which is an answer to a subquestion to the Question Under Discussion.

This is not always the case. See Section 7.1 for more discussion regarding this issue.
2.4.4 Focal information

Vallduví (2002) notes that OSPs are mandatory in cases in which they represent focal information (in clefts, answers to wh-questions, comparative constructions, focus constructions, constructions with an elliptical verb, etc.). This naturally follows from the fact that focal information is always placed at the end of the main clause in Catalan, which is where the main pitch of the sentence is located. Thus, focal information in Catalan always receives the main pitch of the utterance. Since null pronouns cannot be stressed, an overt pronoun is required to express the focus and receive the main pitch. This can clearly be seen in 27: the subject pronoun, which represents focal information and in accordance is accordingly postverbal, cannot be omitted, although the verb contains all the necessary agreement information to retrieve the antecedent of the pronoun. The main stress needs to fall on the focus and that’s why the pronoun must be pronounced. The answer in 27b is not appropriate in this context because the predicate receives the main pitch and, thus, is marked as focus.

(27) a. Qui et va veure?
    Who saw you?

    b. * Em vas veure.
        me  past see

    c. Em vas veure tu.
        me  past see  you
        ‘You saw me.’

Brucart (1987) has a similar insight and proposes the Principle of Lexicalization of Pronouns, which says that those pronouns which contribute new information to the discourse must have phonetic realization.

Chapter 5 shows that focal pronouns and overt non-focal pronouns do not share the same referring preferences and it derives the contrast in 27 from a game theoretical perspective.
2.4.5 Rigau’s (1989) approach

Rigau (1989) has a more complex account of the distribution of NSPs and OSPs in Catalan, which combines several of the factors mentioned so far. She distinguishes between two types of OSPs in Catalan: a plain overt pronoun and a stressed overt pronoun.

(28) a. Jo vull venir.
    b. JO vull venir.

‘I want to come.’

Following Kuno (1972), her proposal is that an unstressed OSP triggers an exhaustive listing interpretation, while stressed ones trigger a contrastive focus interpretation. Rigau (1989) assumes that the two readings are variants of the same emphatic operator. The exhaustive listing interpretation could be paraphrased as ‘Among the people under discussion, only A wants to come’. The contrastive focus interpretation conveys the negation of some alternative and can be paraphrased as ‘as for A (A = 1st person in 28), but not for X, A wants to come’.  

(29) a. Qui vol venir, tu o en Joan?
    ‘Who wants to come, you or John?’
    b. *JO vull venir.. en Joan, no ho sé.
    c. Jo vull venir... en Joan, no ho sé.

‘I want to come.. John, I don’t know’

According to Rigau, the contrastive focus interpretation is not possible in 29b because it amounts to saying ‘It is not John who wants to come’, which is contradictory with the second part of the utterance. However, I don’t see why answer 29c should be acceptable if Rigau ignores the possibility of placing the pronoun in a postverbal position.

\[\text{30}\]
it conveys an exhaustive listing interpretation, given the fact that this interpretation amounts to saying ‘only I want to come’ and thus should also be in contradiction with the second part of the utterance. See Chapter 7 for a review of several notions of contrast found in the literature and for arguments that the readings Rigau identified should be relabeled.

Apart from noting the contrastive nature of pronouns, Rigau’s attempts to offer an account of the distribution of Catalan pronouns in discourse. Her proposal is that once a discourse element becomes a discourse-topic, it is represented by a pronoun in Catalan. If the discourse topic is the subject of a sentence, an NSP must appear except under the following circumstances:

1. When there is another possible antecedent for the subject pronoun. Thus, she claims that whenever there is some ambiguity an overt pronoun is always preferred.

2. When the subject of the sentence is used to recover a discourse-topic, which has been abandoned.

3. When the position occupied by the empty pronoun receives an emphatic interpretation (either exhaustive listing or contrastive topic interpretation).

Chapters 3 and 5 show that it is not the case that OSPs are always preferred whenever there is some ambiguity and Chapter 7 argues for a simpler approach to the so-called emphatic interpretation of pronouns.

### 2.4.6 Summary of proposals

Below is a summary of the main claims presented in this section, accompanied by an example showing how each accounts for the presence of OSPs.

- **PAH**: NSPs prefer an antecedent in the highest Spec IP, whereas OSPs prefer an antecedent in a lower syntactic position.
(30) La Marta escrivia sovint a la Raquel, quan ella era als Estats Units.

“Marta wrote frequently to Piera when she was in the United States.”

• Topic Change: OSPs are used to change the locus of update of information of a sentence.

(31) La Maria va insultar l’Anna, Ella li va frotre una hòstia.

‘Maria insulted Anna. She hit her.’

• Contrast:

  – Contrastive focus: a stressed OSP has a contrastive focus interpretation.

    (32) a. Qui vol venir, tu o en Joan?

        ‘Who wants to come, you or John?’

    b. JO vull venir.

        ‘I want to come.’

  – Exhaustive listing: an unstressed OSP has an exhaustive listing interpretation.

    (33) a. Qui vol venir, tu o en Joan?

        ‘Who wants to come, you or John?’

    b. Jo vull venir... en Joan, no ho sé.

        ‘I want to come.. John, I don’t know.’

  – Implicit contrast: an unexpected repetition of a previous link triggers an implicit contrast with other alternatives. (This example has been adapted from Brunetti (2006), so that a pronoun appears in subject position.)
(34)  a. El Dante t’ha regalat alguna cosa?

‘Did Dante gave you anything (as a present)?’

b. Sí, ell m’ha regalat un llibre.

‘Yes, he gave me a book.’

• Focus information: the overt pronoun is necessary when it represents focal information.

(35)  a. Qui et va veure?

‘Who saw you?’

b. Em vas veure tu.

Me saw you

‘You saw me.’

2.5 Corpus data

Most examples I use in this thesis are naturally-occurring examples taken from a corpus of oral narrations. This corpus was collected within the Nocando Project (2004), which aimed to study noncanonical constructions in different languages. As part of this project, Catalan speakers were asked to narrate stories presented to them with illustrations only. There were three different stories and each story was told by nineteen speakers. The narrations were recorded and transcribed.

The game theoretical approach I will present in Chapter 4 makes crucial use of probabilities that speaker and listener estimate about different situations (for instance, the probability that the current subject refers to the previous subject, etc.). In this thesis, probabilities are approximated by means of corpus counts. That is, the counts we can find in a corpus are taken to be an approximation of the probabilities speakers and hearers assign to different
situations. In this section, I present several counts that will be used later in the analysis. All the counts were counted manually from the transcriptions of the narrations. I present one example of each type, the relevant subject indicated in boldface. The corpus consisted of 5473 clauses with a finite verb. The counts mostly refer to the behavior of the subjects in the corpus.

- Subject of the current utterance refers to:
  - The subject of the previous utterance: 41%
    
    (36) Llavors el gat, salta i, doncs, [null], vol caçar la granota.
    
    Then, the cat, jumps and, well, [null], wants to hunt the frog
  
  - Some other antecedent (not in subject position) of the previous utterance: 11%
    
    (37) Llavors el gat salta i, doncs, vol caçar la granota, però la granota, s’agafa al biberó.
    
    Then, the cat jumps and, well, [null] wants to hunt the frog, but the frog holds on to the baby bottle.
  
  - Antecedent not present in the previous utterance: 48%
    
    (38) El gat estava asseguda en un banc i el nen s’estava mirant un vaixell.
    
    The cat was seating on a bench and the child was looking at a boat.

- Out of the subjects whose antecedent is in the previous sentence, they refer to:
  
  - Previous subject: 79%
    
  - Other: 21%

- In utterances in which the subject is not the link of the sentence, this non-link subject is a:
Focused subject (in a cleft or with a focal particle): 27 instances, 4 of which refer to a previous subject, 2 to a referent in a different position and 21 to an antecedent not mentioned in the previous utterance.

(39) La granota i s’ha posat al davant i és ella, qui està a punt de prendre’s el biberó.

The frog is now at the front and she is the one who’s drinking from the bottle.

Postverbal subject\(^8\): 64 instances, 8 of which refer to a previous subject, 9 to a referent in a different position and 47 to an antecedent not mentioned in the previous utterance.

(40) Les granotes i miren el gat de reüll. I mentre estan pujades les dues granotetes a sobre de la tortuga, (...)

The frogs are sneaking a look at the cat. And while the two little frogs are on top of the turttle, (...)

- I consider again utterances in which the subject is not the link of the sentence. In particular, three different constructions are considered (left-dislocations, focused subjects and postverbal subjects) and the counts indicate what the subject of the next utterance refers to. That is, it is examined what are the effects of non-link subjects in subsequent discourse.

- Left-dislocations: 10 instances, in 2 of which the next subject refers to the previous link, 2 to the previous non-link subject, 2 to another non-link constituent, 4 to an antecedent not mentioned in the previous utterance.

\(^8\) I exclude subjects of unaccusative verbs, which tend to appear postverbally by default.
The salad, he served it to a lady, very beautiful, very elegant and the lady started eating.

– Focused subjects (in a cleft or with a focal particle): 27 instances, in 9 of which the next subject refers to a previous subject, 3 to a referent in a different position and 15 to an antecedent not mentioned in the previous utterance.

The frog is now at the front and she is the one who’s drinking from the bottle. In contrast, the cat did see her.

– Postverbal subjects: 64 instances, in 22 of which the next subject refers to a previous subject, 4 to a referent in a different position and 38 to an antecedent not mentioned in the previous utterance.

And while the two little frogs are on top of the turtle, so that (it) carries them, (...)
Chapter 3

Subjecthood and pronouns: The Position of Antecedent Hypothesis

This Chapter investigates the relationship between pronouns in Catalan and syntactic position. This relationship was first studied experimentally by Carminati (2002) to explain the variation between NSPs and OSPs in Italian. Her proposal is that this variation is regulated by the Position of Antecedent Hypothesis:

(44) Position of Antecedent Hypothesis: NSPs prefer to retrieve an antecedent in the (highest) Spec(IP), whereas OSPs prefer an antecedent in a lower syntactic position.

Thus, for Carminati (2002) NSPs and OSPs have different functions, given that they have different antecedent biases, based on syntactic position. Subject position is thought to host more salient antecedents than object position. If this is so, the PAH is compatible with Ariel’s Accessibility Theory: more reduced forms tend to refer to more accessible antecedents (salience being one of the factors that compose accessibility) than less reduced forms. In her work, Carminati is concerned with intrasentential anaphora and her hypothesis is that this kind of anaphor has access to the syntactic representation. As for intersen-
tentative anaphora, she basically remains agnostic about whether this hypothesis also holds. My goal is to show that it does indeed hold for Catalan across sentences.

In this chapter, I first review Carminati’s experiments in some detail in Section 3.1. I also report results for intersentential anaphora in Spanish (Section 3.2), which show partial support for the PAH. Finally, I present my own experiments for Catalan in Section 3.3, which show that PAH holds in Catalan even across sentences.

3.1 Italian pronouns: Carminati (2002)

Carminati (2002) tested the PAH in a series of off-line and on-line experiments investigating a variety of antecedents standardly assumed to occupy the subject position in the syntactic structure. Overall, her findings supported the Position of Antecedent Hypothesis, as opposed to other hypotheses, such as hypotheses based on an economy principle (generally favoring NSPs), or those based on avoidance of ambiguity (favoring OSPs, since they carry gender information and, therefore, could disambiguate some cases). Carminati (2002) used different methods in her work: self-paced reading tasks, questionnaires, and correction tasks. I summarize here two of her experiments, which I replicate for Catalan:¹

3.1.1 Experiment 1: questionnaire with non-biased sentences

This experiment tested the PAH with regard to intra-sentential coreference, in complex sentences consisting of a main clause followed by a subordinate clause. The main clause introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The subordinate clause, which starts

¹For ease of reference and presentation I have changed Carminati’s original experiment numbers: what I call Carminati’s Experiment 1 is her Experiment 2, and what I call Carminati’s Experiment 2 is her Experiment 1.
with either a NSP or an OSP, is not pragmatically biased and, in principle, can refer either to the previous subject or the previous object. This study involved a questionnaire, in which after reading sentences with NSPs or OSPs (such as 45a and 45b respectively), subjects had to choose their preferred interpretation for the pronoun, by answering a question like the one in 45c:

(45)  a. Null Pronoun

Marta scrivera frequentemente a Piera quando $\emptyset$ era negli Stati Uniti.

“Marta wrote frequently to Piera when $\emptyset$ was in the United States.”

b. Overt Pronoun

Marta scrivera frequentemente a Piera quando lei era negli Stati Uniti.

“Marta wrote frequently to Piera when she was in the United States.”

c. Who was in the States?

The materials of the experiment consisted of eighteen experimental items which were counterbalanced and randomized across two presentation lists. Forty-four participants took part in this experiment. The results in raw percentages can be seen in Table 3.1.

<table>
<thead>
<tr>
<th></th>
<th>subject antecedent</th>
<th>object antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>null pronoun</td>
<td>80.7</td>
<td>19.3</td>
</tr>
<tr>
<td>overt pronoun</td>
<td>16.7</td>
<td>83.3</td>
</tr>
</tbody>
</table>

Table 3.1: Results for Experiment 1 in Carminati (2002)

Thus, there was a strong preference to interpret null pronouns as having subject antecedents and overt pronouns as having object antecedents.

A one-way ANOVA of the difference in choosing the subject antecedent between the null vs. overt pronoun conditions was performed with subjects and items as random effects. The difference of choosing the subject antecedent in the two conditions (80% vs 16%)

2I use the empty set to represent the null pronoun in examples.
was statistically significant ($F_1(1,43)= 161.64, p<.001; F_2(1,17) = 286.14, p<.001$). The difference between the preferred antecedent choices of the null and overt pronoun (80% vs 83%) was not significant.

The results of this experiment speak in favor of the PAH. However, the experiment crucially hinges on the assumption that the sentences are neutral (i.e. it must be equally plausible that the pronouns refer to the previous object or to the previous subject). This assumption is dropped in Experiment 2, where the sentences are biased and what is measured are reading times. In addition, participants are not directly asked for their judgments, rather, reading times provide a way to estimate ease or difficulty of processing.

3.1.2 Experiment 2: self-paced reading experiment

This experiment tested the PAH with regard to intra-sentential coreference in complex sentences consisting of a subordinate clause followed by a main clause. The subordinate clause introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The main clause, which starts with either an NSP or an OSP, is pragmatically biased to refer to one of the two referents in the preceding subordinate clause.

(46) a. Condition 1: Subject Bias + Null Pronoun

Dopo che Giovanni ha messo in imbarazzo Giorgio di fronte a tutti, ∅ si è scusato ripetutamente.

“After G. embarrassed G. in front of everyone, ∅ apologized repeatedly.”

b. Condition 2: Subject Bias + Overt Pronoun

Dopo che Giovanni ha messo in imbarazzo Giorgio di fronte a tutti, lui si è scusato ripetutamente.

“After G. embarrassed G. in front of everyone, he apologized repeatedly.”
c. Condition 3: Object Bias + Null Pronoun

Dopo che Giovanni ha messo in imbarazzo Giorgio di fronte a tutti, ∅ si è offeso tremendamente.

“After G. embarrassed G. in front of everyone, ∅ was very offended.”

d. Condition 4: Object Bias + Overt Pronoun

Dopo che Giovanni ha messo in imbarazzo Giorgio di fronte a tutti, lui si è offeso tremendamente.

“After G. embarrassed G. in front of everyone, he was very offended.”

The materials of the experiment consisted of sixteen experimental items which were counterbalanced and randomized across two presentation lists. Forty participants took part in this experiment. Comprehension questions probing the resolution of the pronoun were asked after seven of the items. The results can be seen in Table 3.2, where the ‘% correct’ column contains the percentage of answers in which subjects understood the pronoun as referring to the pragmatically-biased antecedent.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Main clause Reading Time</th>
<th>Difference (Observed - Expected)</th>
<th>% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 1: subj + null</td>
<td>1844</td>
<td>-162</td>
<td>88.7</td>
</tr>
<tr>
<td>Condition 2: subj + pron</td>
<td>2666</td>
<td>499</td>
<td>80.4</td>
</tr>
<tr>
<td>Condition 3: obj + null</td>
<td>2352</td>
<td>349</td>
<td>70.4</td>
</tr>
<tr>
<td>Condition 4: obj + pron</td>
<td>2236</td>
<td>41</td>
<td>89.1</td>
</tr>
</tbody>
</table>

Table 3.2: Results for Experiment 2 in Carminati (2002)

The average reading times for the main clause were computed after eliminating times that were longer than 6000 ms and shorter than 200 ms (about 4% of the total number of trials).

Also, since there were small length differences between the conditions, deviations from regressions were also computed. These are the numbers in the Difference column. They were calculated as follows. The predicted reading time for each segment was computed by
a regression equation, calculated on a subject by subject basis by correlating the reading
time and segment length over all times and conditions of the experiment. Expected times
were then calculated for each segment and each subject and subtracted from the observed
reading times. Positive numbers mean reading times were slower than expected, negative
numbers reading times faster than expected.

Reading times were significantly faster for main clauses with NSPs than clauses with
OSPs, which is expected because clauses with NSPs are always shorter than clauses with
OSPs. The effect of bias was not significant. In addition, there was a significant antecedent
by pronoun interaction, both using both raw Reading Times and Difference times (the
ANOVA results for raw RT are: F1(1,39) = 28.16, p < .001; F2(1,15) = 23.68, p < .001).
NSPs in main clauses biased towards a subject antecedent were read faster than sentences
biased towards the object, while the opposite was true for sentences with OSPs.

As mentioned earlier, Carminati’s (2002) study is mainly concerned with intrasentential
anaphora. She herself insists on the fact that intra and intersentential anaphora must be
studied separately and that it cannot be assumed that both types of anaphora are processed
in the same way. She suggests that, while her studies show that intra-sentential anaphora
involve accessing syntactic representations, this may not be the case for inter-sentential
anaphora. This type of anaphor was tested for Spanish and Catalan in experiments that are
presented in the next two sections.

3.2 The PAH in Spanish

Alonso-Ovalle et al. (2002) tested the Position of Antecedent Hypothesis for Spanish in
several contexts. Especially interesting for the purposes of this proposal is the fact that they
replicated Carminati’s Experiment 1 in intersentential contexts: that is, they constructed a
questionnaire which contained two-sentence discourses and questions about the interpreta-
tion of pronouns in the second sentence. They found that, if the second sentence contained an NSP, it was mostly interpreted as referring to the previous subject (73.2%), while, if it contained an OSP, this percentage dropped to 50.2%, the difference being significant (F1(1,79) = 65.28; F2(1,11) = 43.38, p < .001).

Thus, this data seems to support the idea that the Position of Antecedent Hypothesis holds for Spanish too. However, there are some intriguing differences regarding the overt pronoun in the Italian and the Spanish experiments: in Italian, the OSP was interpreted as referring to the previous subject in only 16.67% of the cases, while in Spanish it was 50.2%. Thus, the Spanish experiments seem to indicate that, while the NSP is clearly biased towards the previous subject, the OSP does not show a clear preference. Thus, although the PAH seems to also be in effect also for Spanish in intersentential cases, its effects seem to be milder. This could be due to the change of language (Italian versus Spanish) or to the change of type of anaphora tested (intersentential versus intrasentential). Given that the results obtained for Spanish and Italian do not exactly match and show interesting differences, it is worth exploring further this hypothesis further and replicating these experiments in other Romance languages, in order to get a better grasp of the phenomenon we are dealing with. In the next section, I present my experiments for intersentential anaphora in Catalan.

### 3.3 Experiments on Catalan pronouns

As reported in the previous sections, Carminati (2002) showed that the PAH holds for Italian intrasententially. By contrast, the results for intersentential contexts in Spanish look more puzzling, in particular with respect to the behavior of OSPs. In this Section, I present the two experiments I carried out for Catalan in cross-sentential contexts.
3.3.1 Experiment 1: questionnaire study

Experiment 1 replicates Carminati’s (2002) and Alonso Ovalle et al.’s (2002) experiment 1. It tests the PAH in two-sentence discourses without semantic bias.

**Materials:** the materials consisted of sixteen two-sentence discourses with two conditions. The first sentence introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The content of the second sentence is not pragmatically biased to refer to one of the two referents. The subject of the second clause is either an NSP or an OSP. Thus, the two conditions are:

(47)  

\[ \text{a. Condition 1: Null Pronoun} \]

La Marta escrivia sovint a la Raquel. ∅ Vivia als Estats Units.

“Marta wrote frequently to Raquel. ∅ Lived in the United States.”

\[ \text{b. Condition 2: Overt Pronoun} \]

La Marta escrivia sovint a la Raquel. Ella vivia als Estats Units.

“Marta wrote frequently to Raquel. She lived in the United States.”

The conditions for each item set were counterbalanced and incorporated into a questionnaire experiment together with 24 filler items and 5 practice items. Four counterbalanced lists were constructed (the last two lists with the items in reverse order), with a single randomization for all lists. The complete set of experimental items can be seen in Appendix A.

**Procedure:** The experiment was administered using a laptop, equipped with EPrime software. Before starting the experimental session proper, subjects read a set of written instructions, which explained the experimental procedure. Participants went through a practice session, so that they could get familiar with the keyboard and the procedure, and the experiment subsequently began. The discourses were presented on the computer screen. Subjects were asked to indicate which interpretation of the second sentence they preferred,
i.e., whether they thought it was a statement about the subject of the first sentence, or the object of the first sentence. Therefore, under each experimental sentence, two paraphrases of the second sentence were given, such as the following, corresponding to the example items presented above.

(48)  

a. Marta lived in the United States  

b. Raquel lived in the United States

Participants: Thirty-two participants from Universitat Pompeu Fabra in Barcelona took part in this experiment. They also participated in Experiment 2 and did not participate in any of the other experiments.

Results: The results can be seen in Table 3.3.

<table>
<thead>
<tr>
<th>Pronoun Type</th>
<th>Subject Antecedent</th>
<th>Object Antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>null pronoun</td>
<td>70.3</td>
<td>29.7</td>
</tr>
<tr>
<td>overt pronoun</td>
<td>35.5</td>
<td>64.5</td>
</tr>
</tbody>
</table>

Table 3.3: Results for Experiment 1

There was quite a strong preference to interpret NSPs as having subject antecedents and OSPs as having object antecedents. The effect was not as strong as in Carminati’s (2002) experiment, but much stronger than Alonso-Ovalle et al.’s (2002). OSPs do not show the mixed behavior reported for Spanish, but rather shows a clear preference for an object antecedent.

To test the statistical significance of these patterns, an analysis of variance (ANOVA) of the frequency with which the subject antecedent was chosen in the null vs. overt pronoun conditions was performed with subjects and items as random effects. The difference in choosing the subject antecedent (70% vs 35%) was significant ($F_{1}(1,31) = 64.23, p < 0.001; F_{2}(1,15) = 26.153, p < 0.001$). The difference between the preferred antecedent choices for the two conditions (70% vs 64%) was not significant ($F_{1}(1,31) = 1.5573, p = 0.22$; $F_{2}(1,15) = 0.153, p = 0.70$).
F2(1,15) = 0.353, p = 0.56). This analysis confirms that the type of pronoun has an effect on its interpretation: NSPs display a subject preference and OSPs an object preference.

### 3.3.2 Experiment 2: self-paced reading test

Experiment 2 replicates Carminati’s (2002) Experiment 2 for intersentential anaphora. The goal of this experiment was to test the Position of Antecedent Hypothesis in two-sentence discourses with semantic bias using self-paced reading. As explained above, this kind of design has the advantage of not assuming that the sentences are neutral\(^3\) (that is, pragmatically non-biased); furthermore, participants are less aware of the goal of the experiment, since their judgments are not explicitly asked.

It has been shown widely in the psycholinguistic literature that readers make use of all the available linguistic cues to arrive at a coherent interpretation. If they encounter explicit information which goes against some of the linguistic cues they have encountered before, this does not result in an acceptable or anomalous sentence, but they do need more time to read the sentence (see Caramazza et al. (1977)). For instance, Koornneef and Berkum (2006) investigated some verbs conveying implicit causality, such as *apologize*, which has a bias towards a continuation that makes reference to the first NP. They tested sentences such as example 49 in which the pronoun was either consistent or inconsistent with the bias of the verb. Although both discourses are coherent, they found that the bias-consistent sentence was read faster than the bias-inconsistent one.

(49) a. Bias-consistent pronoun.

Linda and David had an accident. David apologized to Linda because he was the one to blame.

---

\(^3\)I consider dropping the assumption of neutrality to be an advantage in the sense that the neutrality of a sentence is much more subjective and disputable than its non-neutrality.
b. Bias-inconsistent pronoun.

Linda and David had an accident. Linda apologized to David because he was not the one to blame.

These results suggest that sentences which obey the biases predicted by the PAH should be read faster than sentences which do not obey them. The goal of experiment 2 is to test this claim.

Materials: the materials consisted of sixteen two-sentence discourses with four conditions. In these discourses, the first sentence introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The second sentence contains either an NSP or an OSP and is semantically biased so that the pronoun refers either to the previous subject or previous object. Thus, the four conditions are:

(50) a. Condition 1: Null pronoun + bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. ∅ Es va excusar repetidament.

“John made fun of Dani in front of everyone. ∅ Apologized many times.”

b. Condition 2: Overt pronoun + bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Ell es va excusar repetidament.

“John made fun of Dani in front of everyone. He apologized many times.”

c. Condition 3: Null pronoun + bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. ∅ Es va ofendre molt.

“John made fun of Dani in front of everyone. ∅ Was very offended.”

d. Condition 4: Overt pronoun + bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Ell es va ofendre molt.
“John made fun of Dani in front of everyone. He was very offended.”

The conditions for each item set were counterbalanced and incorporated into a self-paced reading experiment together with 24 filler items and 5 practice items. Eight counterbalanced lists were constructed (the last four lists with the items in reverse order), with a single randomization for all lists. The complete set of experimental items can be seen in Appendix B.

**Procedure:** The experiment was administered using a laptop, equipped with EPrime software. Before starting the experimental session proper, subjects read a set of written instructions, which explained the experimental procedure. Participants then went through a practice session, so that they could get familiar with the keyboard and the procedure, and the experiment subsequently began. The discourses were presented on the computer screen. Subjects were asked to press the space bar after each sentence and this is how the reading times for each sentence were measured. Comprehension questions, such as the one in 51, probing the resolution of the pronoun, were asked after each item.

(51)  

a. Qui es va ofendre?

“Who was offended?”

b. El Joan.

c. El Dani.

**Participants:** Thirty-two students from Universitat Pompeu Fabra in Barcelona took part in this experiment.

**Results:** Table 3.4 contains the results for this experiment.

The average reading times for the second sentence were computed, after eliminating times that were longer than 6000 ms and shorter than 200 ms (about 3.5% of the total number of trials). The number in the ‘% correct’ column refers to the percentage of answers in which subjects understood the pronoun as referring to the pragmatically-biased antecedent.
For both types of bias (sentences pragmatically biased to the subject and to the object), the sentence with the NSP was read faster than the sentence with the OSP. Thus, the data for the OSP does not follow the pattern found by Carminati (and, therefore, does not confirm the PAH). In fact, an ANOVA analysis gives pronoun type (null vs. overt) as the only significant factor (F1(1,31) = 23.86, p < .001; F2(1,15) = 27.66, p < .001), while the interaction Pronoun by Bias is not significant (F1(1,31) = 3.93, p = .059; F2(1,15) = 3.09, p = .098). However, conditions (2) and (4) are systematically longer because they contain the OSP, and this may be masking the effect of the PAH.\(^4\) Thus, deviations from regressions were computed to account for length differences. These are the numbers in the Difference column. They were calculated following the same method Carminati applied, which I repeat here: The predicted reading time for each segment was computed by a regression equation, calculated on a subject by subject basis by correlating the reading time and segment length over all times and conditions of the experiment. Expected times were then calculated for each segment and each subject and subtracted from the observed reading times. This procedure to adjust for length differences is quite standard in the processing literature (see Ferreira and Clifton (1986) for one of the first papers to use it and Trueswell et al. (1994) for some additional discussion of this technique).

The average differences between observed and expected reading times for each condi-

\(^4\)Although the stimuli were designed so that the length differences would be kept to a minimum for all conditions, the differences did exist. These are the mean lengths (in characters) of the items in each condition are: condition 1 = 59.25; condition 2 = 62.75; condition 3 = 59.56; condition 4 = 63.0.
tion is shown in the Difference column in table 3.4. Positive numbers mean reading times were slower than expected, negative numbers reading times faster than expected. Conditions 1 and 4 were faster than expected, while 2 and 3 were slower, which is consistent with the biases predicted by the PAH.

The data regarding the difference between observed and expected RT was submitted to an ANOVA analysis. As with raw reading times, the effect of the type of pronoun was significant (F1(1,31) = 4.78, p = 0.03; F2(1,15) = 4.58, p < .049). In addition, in this case there was also a significant bias by pronoun interaction (F1(1,31) = 4.68, p = 0.038; F2(1,15) = 11.04, p < .001).

Thus, we can conclude that this experiment also shows that the PAH holds for Catalan intersententially: NSPs tend to refer to subject antecedents and OSPs tend to refer to non-subject antecedents. However, this tendency is milder at a discourse level than at the sentence level. I will have more to say about the PAH and the results of these experiments at the end of Chapter 4 and in Chapter 5.

3.4 Conclusion

In this Chapter, I have shown that the Position of Antecedent Hypothesis, the hypothesis Carminati (2002) tested for Italian, also holds for Catalan. That is, NSPs and OSPs have different biases: NSPs have a subject preference, while OSPs have an object preference. These experiments show that it is not the case that OSPs are preferred whenever there is some ambiguity, contra Rigau. Following Ariel’s (1990) terminology, competition does not override salience. Under the right circumstances, NSPs are preferred even if there is potential ambiguity.

The effect of the PAH in Catalan across sentences is milder than in Italian within a sentence, which could be due to the fact that, at a discourse level, pragmatic notions (such
as topicality) become more prominent than syntactic notions (such as subjecthood). I explore this possibility in Chapter 5 and, although I show that pragmatic structure has some influence on the interpretation of pronouns (and particularly of OSPs), it is not as straightforward as one might believe.

In light of the results for Italian and Catalan, the Spanish data remain puzzling. Although the authors of the Spanish study claim that their data gives support to the PAH, the overt pronoun shows a mixed, random behavior the PAH cannot account for. Alonso-Ovalle et al. (2002) did not do any on-line experiments; therefore, further experiments, using methods other than questionnaires, are needed to establish whether the behavior of overt pronouns in Spanish is qualitatively different from Italian or Catalan.
Chapter 4

Game theory

One of the main goals of this thesis is to show how the psycholinguistic data about the overt/null pronoun variation in Catalan can be analyzed in terms of game theory, as the result of the strategic interaction between participants in a communicative exchange. I argue that game theoretical approaches can account for this type of data more accurately than other approaches and can capture the fact that the judgments are extremely sensitive to the context.

This section contains a brief introduction to game theory (Section 4.1) and explains how it has been applied to linguistics, and in particular to the modeling of anaphora choice and resolution (Section 4.2). In Section 4.3, I propose my own analysis of the psycholinguistic data just presented, which is further supported by experiment 3. Finally, Section 4.4 argues that mixed strategies are not suitable to model the phenomenon studied in this thesis.

4.1 Overview of game theory

Game theory (GT) is the study of the ways in which strategic interaction among rational players produces outcomes with respect to the preferences (or utilities) of those players. In
linguistics, GT has mainly been used in semantics and pragmatics since it provides a good framework to explain why speakers and hearers (that is, rational agents) choose a certain action (i.e. utter a sentence or interpret a sentence with a particular meaning in a particular context). Specifically, game theory has been applied to topics as varied as the semantics of questions (van Rooij, 2003), discourse anaphora (Clark and Parikh, 2007) and implicatures (Parikh, 2001; Ross, 2006).

In what follows, I summarize the basic ideas of GT. An agent is often faced with a decision. He can choose among several different actions; if so, he will choose the one he prefers. It is possible to translate this preference by giving a numerical value (or payoff) to each option. The option with the highest payoff will be the preferred action, since agents seek to maximize their payoffs. However, sometimes payoffs are uncertain, so that every possible outcome has a certain probability associated with it. In this case, the agent will choose the action with the highest expected payoff. When there is more than one agent making decisions, the action one agent decides to make might affect the other agent’s payoff and, thus, the other agent’s decisions. That is, one agent needs to consider the other agents’ actions and payoffs in order to choose the best option. In this sense, there is a strategic interaction among all rational agents and everyone is trying to choose so that their partial influence over the outcome benefits them the most.

When no agent has an incentive to change his action (given all others agents’ actions), an equilibrium (known as a Nash equilibrium) is reached and the game is solved. As I illustrate below with examples, a Nash equilibrium is a strategy profile in which if a player chooses to unilaterally defect and do something different, this player will get a worse payoff. In a given game, there may be several Nash equilibria: the one (or ones) with the highest payoffs (called a Pareto-Nash equilibrium) will be preferred.

In a more technical notation, a strategic game is a structure such that (van Rooij, 2006):

- $N = \{1, \ldots, n\}$ denotes the set of players.
• For each player $i$ there is a set of $A_i$ actions that he can perform. An action profile is an $n$-tuple $(a_1, \ldots, a_n)$ of actions where each $a_i \in A_i$.

• A payoff is a function $U$ that maps each action profile $(a_1, \ldots, a_n) \in A$ to an $n$-tuple of real numbers $(u_1, \ldots, u_n)$. In zero-sum games, the payoffs of the players sum zero for each profile: that is, the winnings of one player entail losses for the other player. The opposite situation is represented by games of pure coordination, in which the payoffs of all players are identical for each action profile.

An action $a_1$ strictly dominates an action $a_2$ if in all possible worlds, the payoffs an agent gets when choosing $a_1$ are better than when choosing $a_2$. I will illustrate the concept of dominant action with an example (from Dixit and Nalebuff (1991)). Suppose that during a certain week there are two major news stories in the news: an impasse between the House and the Senate on the budget and a new drug which is claimed to be effective against AIDS. Two magazines, say Time and Newsweek, have to decide on one of these topics for the cover. The buyers will buy a magazine depending on the story on the cover. Suppose that 70% are interested in the AIDS story and 30% in the budget story. Suppose also that, if the two magazines have the same story on the cover, the group interested in that story splits equally between the two magazines. Table 4.1 represents the situation: the first number of the pair represents Time’s payoff, the second Newsweek’s payoffs; that is, if Times chooses Aids and Newsweek chooses Budget, Times gets 70 and Newsweek gets 30 (as can be see in the right column of the first row).

<table>
<thead>
<tr>
<th>Newsweek’s Choices</th>
<th>Aids</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time’s Choices</strong></td>
<td>Aids</td>
<td>35,35</td>
</tr>
<tr>
<td></td>
<td>Budget</td>
<td>70,30</td>
</tr>
<tr>
<td></td>
<td>Budget</td>
<td>30,70</td>
</tr>
<tr>
<td></td>
<td>Budget</td>
<td>15,15</td>
</tr>
</tbody>
</table>

Table 4.1: Example with a dominant strategy
*Times* has a dominant strategy, namely using the AIDS story, because whatever *Newsweek* decides to do, *Times*’s payoffs are higher if it uses the AIDS story. If *Newsweek* uses the AIDS story, *Times* will get 35 if it also uses the AIDS story or 30 if it uses the budget story. If *Newsweek* uses the budget story, *Times* will get 70 if it uses the AIDS story and 15 if it uses the budget story. Therefore, in all situations, *Times* is better off if it uses the AIDS story: that’s its dominant strategy. The same reasoning applies to *Newsweek*.

However, sometimes, in a game, there is no dominant strategy for any of the players. Consider the following story (cited in van Rooij (2006), originally taken from Luce and Raiffa (1957)): Adam wants to go to a boxing event and Eve to a concert the same night. However, they both prefer to go somewhere together over going alone to the place each one individually prefers. We represent this situation in Table 4.2. Columns represent Adam’s choices and rows Eve’s choices. The first number of the ordered pair represents the payoffs for the row player (*Eve*) and the second number the payoffs for the column player (*Adam*). Payoffs represent the preferences of the players; the particular numbers are not important, but the relationship between the payoffs is crucial to determine the equilibria of the game.

<table>
<thead>
<tr>
<th>Adam’s Choices</th>
<th>Boxing</th>
<th>Concert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eve’s Choices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxing</td>
<td>4,2</td>
<td>0,0</td>
</tr>
<tr>
<td>Concert</td>
<td>1,1</td>
<td>2,4</td>
</tr>
</tbody>
</table>

Table 4.2: Game without a dominant strategy

Adam does not have a dominant strategy. If Eve goes to the concert, he prefers going to the concert. If Eve goes to the boxing event, he prefers going to the boxing event. The same is true for Eve. Intuitively, they should avoid strategies (Boxing, Concert) and (Concert, Boxing) and agree on either (Boxing, Boxing) or (Concert, Concert). These last two strategies are the Nash Equilibria of the game. A strategy profile $s$ is called a Nash Equilibrium if none of the players $i$ has an interest in playing a strategy different from $s_i$. 
given what the other players play. In our game above, if Eve plays Concert, Adam has no interest in playing Boxing instead of Concert, since he will be worse off. Similarly, if Adam plays Concert, Eve has no interest in playing Boxing instead of Concert. Therefore, (Concert, Concert) is a Nash Equilibrium. The same reasoning applies to (Boxing, Boxing). This is a coordination game in which both players have a common interest: in this case, meet at some event. Communication can also be seen as a coordination game, in which speaker and hearer also have a common interest: that is, to understand each other.

In the Adam and Eve game, given that there are two Nash Equilibria, what should they do? If they look only at their own payoffs, they will go to the event they prefer but they will never meet and will be limited to a payoff of 1. Since there are two Nash Equilibria with the same payoffs, they cannot use a pure strategy, always playing Boxing or Concert, but should play a mixed strategy choosing each strategy with a certain probability. As we will see in the next sections, this circumstance does not occur in the particular linguistic games we will be examining. It is rarely the case that two strategies yield exactly the same payoff because, for instance, some forms are cheaper to utter than other forms and some meanings are more informative, and thus more valuable, than other meanings.\footnote{Cases of stable sociolinguistic variation are likely to be exceptions. See section 4.4 for more comments.}

Consider now the situation in Table 4.3, in which there are two Nash equilibria (A, a) and (B, b). However, intuitively, both players would prefer (A, a) to (B, b). (A, a) is the Pareto-Nash equilibrium. A Nash equilibrium $s$ is Pareto optimal iff there is no other equilibrium $s'$, such that for all players the payoffs of $s$ are smaller than the payoffs of $s'$.

\begin{center}
\begin{tabular}{ccc}
   a & b \\
   A & 3,3 & 0,0 \\
   B & 0,0 & 1,1 \\
\end{tabular}
\end{center}

Table 4.3: Game with a Pareto-Nash equilibrium

An additional type of game is one involving incomplete information, in which, at some
point, one agent \(i\) does not know which action the other agent is playing. That is, one agent does not know which information state s/he is in: an information state is one state of affairs that can possibly hold. Usually, games of incomplete information are represented not using strategic forms, as we have been doing so far, but using games in extensive forms or game trees. A tree consists of several nodes; each node is identified with a move of one of the players who has to decide between several actions. The set of information states in which a player thinks he may be is called an information set and it is represented by circling the states in the set.

Figure 4.1 represents a game tree for a game of incomplete information. Imagine a game between player A and B, in which player A hides a coin in either his left or his right hand and player B has to guess in which hand the coin is hidden. Since player B does not know whether A has chosen the action \textit{left} (hiding the coin in his left hand) or action \textit{right} (hiding the coin in his right hand), he does not know whether he is in \(t\) or \(t'\); \(\{t, t'\}\) is his information set and that is why these two nodes are circled. Each end node has assigned a pair of payoffs for player A and B, respectively. These are the payoffs the players get from playing the strategy starting at the root node and leading to that end node.

![Game Tree](image)

**Figure 4.1: Game of incomplete information**
Similar, but not equivalent, to the games of incomplete information are the games of partial information, which will be the ones used in my analysis. A game of partial information is a game in which, at some point, one agent \( i \) does not know which state he is in because, although he is sure of which action the other player has chosen, the action may correspond to different information states (different state of affairs in the world). For example, lexical ambiguity can be represented by a game of partial information. Imagine a speaker utters the word ‘pen’. The hearer is sure that the speaker has chosen to utter ‘pen’, but, in principle, in the absence of context, he does not know whether the speaker meant ‘writing instrument’ or ‘enclosure for animals’.

Parikh (2001) has described how games of partial information can be used to model a variety of linguistic problems. The general idea is as follows: speaker and hearer are rational agents; the speaker is trying to convey some information by uttering a proposition (among the several possible propositions she\(^2\) could utter), and the hearer is trying to correctly interpret this proposition (among several interpretations, given the fact that utterances can mean different things depending on the context). Both agents are trying to minimize production and processing costs (for example, by avoiding unambiguous but extremely long sentences), while communicating successfully. Section 4.2 presents an application of games of partial information to discourse anaphora in English.

### 4.1.1 The role of payoffs

Before turning to the analysis of discourse anaphora in English, I would like to make a point about the role of payoffs or utilities in the analysis. Payoffs are used to represent preferences. So if an agent prefers action A to action B, the payoff for the first action must be greater than the payoff for the second one, but the particular values assigned to them are

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\(^2\)I adopt the convention of using the feminine pronoun to refer to the speaker and the masculine pronoun to refer to the hearer.
not important. That is, payoffs are basically indices and their relationship and ordering is what is important, but not their particular value. Assigning a particular value, though, is useful to be able to compute the equilibria of the games and to have a clearer intuitive idea of the expected outcomes of the different strategies. The following quote from Luce and Raiffa (1957) expresses this same idea very clearly, as well as the dangers associated with giving specific values to payoffs:

“One may contend that introducing the numbers does no harm, that they summarize the ordinal data in a compact way and that they are mathematically convenient to manipulate. But, in part, their very manipulative convenience is a source of trouble, for one must develop an almost inhuman self-control not to read into these numbers those properties which numbers usually enjoy. For example, one must keep in mind that it is meaningless to add two together or to compare magnitudes of difference between them. If they are used as indices in the way we have described, then the only meaningful numerical property is order. We may compare two indices and ask which is the larger, but we may not add or multiply them.” (Luce and Raiffa (1957), page 16)

4.2 A game theoretical approach to discourse anaphora

This section reviews Clark and Parikh’s (2007) proposal for discourse anaphora in English. Their approach is the basis of my own analysis of Catalan, which I present in Section 4.3.

Consider the simple text in 52:

(52) A cop saw a hoodlum. He yawned.

There are several issues regarding the choice of referring expression in this small text, both from the speaker’s and hearer’s point of view. How does the hearer know who he
refers to? Why does the speaker choose to utter *he* instead of a definite description? Why is the text judged by most speakers to be unambiguous? Clark and Parikh (2007) view this problem as a game of partial information in which speaker and hearer share some knowledge and in which they try to find the most efficient strategy to solve the game of communicating the utterance.

On the one hand, the speaker uses particular discourse anaphors when she expects the hearer to be able to correctly identify the referent. On the other hand, the hearer chooses antecedents to discourse entities based on how he expects the speaker to refer to each entity. As both agents, speaker and hearer, are aware of this fact (they both know they are playing this game), they can find a maximally efficient solution, that is, they can compute a Pareto-Nash equilibrium as a solution for the game. This equilibrium is maximally efficient in the sense that for the speaker it is the best way to encode the meaning she wants convey and, for the hearer, given the form he has heard, it is the best way to interpret the referring expression. Thus, they cannot do better by deviating from this strategy profile.

Suppose that a speaker utters the first sentence of 52. By doing so, she has introduced two discourse entities. Now, she wants to convey the meaning that the cop yawned. Both agents know that the speaker could refer to either of the two entities by using either a pronoun or a definite description. Once the speaker has uttered a second sentence, the hearer has to decide who the referring expression refers to.

The game tree in Figure 4.2 shows the moves of the hearer and speaker and the payoffs they get in each situation for each option. There are two information states, two possible state of affairs in the world which are relevant to the game. There are two trees for each information state $s_1$ and $s_2$, with probabilities $p_1$ and $p_2$, respectively. The tree rooted in $s_1$ is the one in which the speaker intends to refer to the cop (Subj, henceforth), and $s_2$ is the one in which the speaker intends to refer to the hoodlum (Obj, henceforth). The branches of the main root show the speaker moves, while the sub-branches emanating from
these show the hearer’s moves. At the leaves, there is a set of ordered pairs of payoffs, the first element of which refers to the payoff of the speaker and the second to the payoff of the hearer.

For each tree, the speaker may use a pronoun or a definite description. If a pronoun is used, the hearer may resolve the anaphora correctly or may make a mistake. This is precisely what makes the game a game of partial information: if the speaker utters a pronoun the hearer will not be sure whether the speaker intends to refer to Subj or to Obj, that is, the hearer will not be sure whether he is in information state $s_1$ or in $s_2$ (this is indicated by circling the nodes $t_1$ and $t_2$).

Figure 4.2: Game of partial information for English anaphora

The payoffs for each action are assigned according to the following principles:

- Generally, it is more costly to use longer expressions.
• Generally, it is more costly to use expressions with “high” conventional content, independent of context (thus, names and descriptions are costlier than pronouns, which are context-dependent).

• It is cheaper to refer to more salient entities with pronouns, and to less salient entities with definite descriptions. Prominence is calculated according to the grammatical function of the element in the preceding sentence, following the hierarchy in 53, which is the one assumed in much of Centering Theory.

(53) Subject > Indirect Object > Direct Object > Others

In $s_1$, if the speaker uses a definite description, the hearer will surely resolve the anaphor correctly. However, the payoffs will not very high due to producing and processing costs and due to the assumption that referring to a prominent element (the subject) with a full description rather than a pronoun entails some cost. Therefore, the proposed payoffs are (6,6). If the speaker uses a pronoun in $s_1$ and the hearer correctly resolves the anaphor, the payoffs are higher (10, 10), since the costs are much less. However, if the hearer interprets Obj instead of Subj, the payoffs would be negative (-10, -10) and would lead to an undesirable situation of miscommunication. In $s_2$, the situation is very similar. However, if a definite description is used, the payoffs are (7, 7), and not (6, 6) as in $s_1$, because using a definite description for a less prominent entity (Obj) is assumed to be less costly. Also, if the speaker chooses a pronoun and the hearer correctly chooses Obj, the payoffs are (8,8) and not (10,10), because it is less efficient to pronominalize a less prominent element. If the speaker chooses a pronoun and the hearer incorrectly chooses Subj, the payoffs are again negative (-10, -10). As mentioned in 4.1.1, the particular value of the payoffs is not important or meaningful; what is important and meaningful is the relationship between the payoffs.
In the absence of further information, Clark and Parikh (2007) assume that the two information states are equally likely\(^3\), that is \(p_1 = p_2\). In this case, there are two pure Nash equilibria\(^4\), corresponding to the following strategies and payoffs (the payoffs are calculated adding the outcomes of the different situations, weighted by the probabilities):

1. \(\{(s_1, \text{he}), (s_2, \text{‘the hoodlum’}), (\{t_1, t_2\}, \text{Subj})\}\): the speaker should utter ‘he’ in \(s_1\), ‘the hoodlum’ in \(s_2\) and the speaker should interpret a pronoun as referring to Subj. Thus, the expected payoff is: \(p_1(10) + p_2(7) = 0.5(10) + 0.5(7) = 8.5\).

2. \(\{(s_1, \text{‘the cop’}), (s_2, \text{‘he’}), (\{t_1, t_2\}, \text{Obj})\}\): the speaker should utter ‘the cop’ in \(s_1\), ‘he’ in \(s_2\) and the speaker should interpret a pronoun as referring to Obj. Thus, the expected payoff is: \(p_1(6) + p_2(8) = 0.5(6) + 0.5(8) = 7\).

None of the other strategies are Nash equilibria. For example, the strategy of the speaker uttering definite descriptions both in \(s_1\) and \(s_2\) and the hearer interpreting a pronoun as referring to the subject is not a Nash equilibrium because the speaker can do better by deviating and using a pronoun instead of a definite description (her payoffs in this information state would increase from 6 to 10).

Among the two Nash equilibria of the game, the first one has the highest expected payoff; it is the only Pareto-Nash equilibrium of the game. Both participants can compute this equilibrium and will choose this strategy as the solution of the game. Communication, even in the absence of complete information, becomes possible.

Clark and Parikh (2007) also show how this account can deal with apparent counterexamples, in which the Pareto-Nash equilibrium seems to be violated. The basic idea is that

\[^3\]I change this assumption in the next section.

\[^4\]There are two other mixed Nash equilibria, in which the players choose each option with a certain probability.
several factors can influence the probabilities, so that one of the information states becomes more likely. For instance, note the following contrast:

(54)  
   a. John called Bill a Republican. Then he insulted him.
   b. John called Bill a Republican. Then HE insulted him.

The partial game just presented correctly predicts that the pronoun in 54a should refer to John. The game for 54b should be identical to the game for 54a. However, the contrastive stress on the pronoun has the effect of altering the probabilities, so that \( p_2 > p_1 \); that is, it becomes more likely that the speaker wants to refer to Obj, the object of the previous sentence. That is:

(55) \[ p_1 = \Pr(s_1 | \text{he bears contrastive stress}) \]
\[ p_2 = \Pr(s_2 | \text{he bears contrastive stress}) \]
\[ p_2 > p_1 \]

Since both speaker and hearer know that stress alters the probabilities, they can use this information to compute the optimal strategy.

Lexical semantics and world knowledge can also influence the probabilities, as the following examples show:

(56)  
   a. John can open Bill’s safe. He knows the combination.
   b. John can open Bill’s safe. He should change the combination.

The coreference of 56a is straightforwardly predicted by the model. In contrast, in 56b, world knowledge increases the probability of \( p_2 \), so that the pronoun corefers with ‘Bill’.

One aspect that makes this game theoretical approach conceptually different from Centering Theory or Optimality Theory approaches is that the former explicitly relates discourse anaphora to the rational choice of some agents; referring expressions are conceived of as a way of signaling a specific strategy. The idea behind the game theoretical system
for analyzing discourse anaphora is that participants in a discourse are able to communicate efficiently because they share some information, some common knowledge (the set of actions available, their payoffs and probabilities) and thus are able to use linguistic resources in the most efficient way.

The linguistic phenomena analyzed with games of partial information so far all present one ambiguous linguistic form competing against other less economical, non-ambiguous linguistic forms. Discourse anaphora in Catalan are different in this respect since there are two ambiguous forms competing against each other and against non-ambiguous forms. The next section presents an account of these cases.

### 4.3 An analysis of null-subject languages

In this section, I present a game theoretical model of the asymmetry predicted by the PAH, which, as was shown in Section 3.3, also holds for Catalan. Consider sentence 57, which was one of the items in Experiment 1.

\[(57)\] Marta wrote frequently to Raquel. $\emptyset$ Lived in the United States.

The game between hearer and speaker to resolve the anaphor in sentence 57 is shown in Figure 4.3. It looks similar to the game for the English discourse in Figure 4.2, although its complexity has increased. There are two information states, two situations speaker and hearer could be in. In particular, since experiments 1 and 2 showed that there is a relationship between salience and interpretation of anaphoric forms, information states will be understood as encoding antecedents with different, relevant degrees of salience. In this chapter, we consider the two degrees of salience studied so far: Subj, in which the speaker wants to refer to the antecedent in subject position, highly salient, and, Obj, in which the speaker wants to refer to the antecedent in object position, with lower salience.
In each of the two information states of the game, the speaker now has three choices instead of two: she can use an overt pronoun (OSP), a null pronoun (NSP) or a proper noun/definite description (DD). When hearing a sentence with either of the two pronominal forms, the hearer will have to decide whether the speaker wants to refer to Marta, the Subject, or to Raquel, the Object. The former corresponds to information state $s_1$ and the latter to information state $s_2$. I call the information set the hearer is in after hearing a sentence with an NSP $\{t_1, t_2\}$ and the one after hearing a sentence with an OSP $\{u_1, u_2\}$.

Figure 4.3: Game for Catalan pronouns
I follow the same assumptions as Clark and Parikh to assign payoffs to each option (see Section 4.2), with one change. I follow them in assuming a ranking within referring expressions, so that the referring expressions which are shorter and more context-dependent receive higher payoffs, while the ones which are longer and more conventional receive lower payoffs. This is the hierarchy I propose:

\[(58) \text{ Null Pronoun} > \text{ Overt Pronoun} > \text{ Proper Name/Definite Description}.\]

That is, NSPs are the most economical form, followed by OSPs, followed by proper names and definite descriptions. Therefore, I assume that the payoffs for each option are 10, 8 and 5, respectively. As mentioned before, what is important is not the numerical value of the payoff, but the relationship between payoffs: the relationship is what determines the Pareto-Nash equilibrium.

I do not follow Clark and Parikh (2007) in encoding in the payoffs any asymmetry between referring to a subject antecedent and an object antecedent. That is, I do not encode the hierarchy in 53 in the payoffs; my proposal is that the payoffs for correctly interpreting NSPs and OSPs are the same in \(s_1\) and \(s_2\). However, the same result they present can be achieved by introducing this asymmetry in the probabilities of the information states, which is how Clark and Parikh (2007) modeled the various non-default antecedent assignments they dealt with (examples 54 and 56). In a nutshell, my proposal is that speakers and hearers assign different probabilities to different information states and that these probabilities can be estimated through corpora counts. This distribution of the probabilities is common knowledge for the participants in a conversation and, thus, they can take advantage of it to make the most efficient use of their resources.

The corpus of Catalan narrations, presented in section 2.5, provides clear evidence that the two information states which we are considering here, Subj and Obj reference, are not equally likely. 79% of the subjects whose antecedents are in the previous sentence refer to the previous subject and 21% to another constituent. Therefore, the two information
states are not equally, or similarly, likely: the first one is much more likely than the second one. The idea that the default option is that the referent of the subject of the current utterance $U_i$ is the same as the referent of the previous utterance $U_{i-1}$ gets support from different sources. First, the same claim is found in Centering Theory literature, in which it represents a Continue Transition, which is the preferred transition (see also Walker et al. (1998) on discourse continuity). Second, research about discourse structure has shown that a discourse normally sticks to the same topic, talking about the same objects and events (see Jasinskaja and Zeevat (2008)). Third, there is evidence from psycholinguistic studies that referents in subject position are expected to be mentioned again. Kaiser and Trueswell (2008) performed an eye-tracking experiment and they found that, after an SVO sentence in Finnish, people anticipated that a subject would be mentioned again. Kim (2009) also found a subject preference in Korean. To sum up, subject continuity is not a property specific to a particular language or language family, but rather a cross-linguistic tendency; therefore, it is best encoded in the probabilities. As Jäger (2007) points out, probabilities in game theory should be used to represent cognitive and communicative tendencies, not particularities of a certain language. Subject continuity is one of these communicative tendencies.

As mentioned, corpora counts can be used to estimate probabilities. A different question would be where these probabilities come from; that is, why the probability distribution is the way it is or, in different words, why communicative tendencies are the way they are. This question is beyond the scope of this thesis. It is a question that can probably be addressed within the framework of evolutionary game theory, rather than with the framework of rationalistic game theory used in this thesis.

Going back to our game, I propose that probability $p_1$, corresponding to information state $s_1$, is greater than probability $p_2$, corresponding to information state $s_2$. For the purposes of showing the calculations, I assume that $p_1 = 2/3$ and $p_2 = 1/3$. However, note
that the equilibria will remain constant as long as $p_1 > p_2$ and that they do not depend on the particular values assigned to $p_1$ and $p_2$. The game has the following four pure Nash equilibria:

(59) a. $\{(s_1, \text{NSP}), (s_2, \text{OSP}), \{t_1, t_2\}, \text{Subj}, \{u_1, u_2\}, \text{Obj}\}$. The expected payoff is: $p_1(10) + p_2(8) = 2/3(10) + 1/3(8) = 28/3$.

b. $\{(s_1, \text{DD}), (s_2, \text{NSP}), \{t_1, t_2\}, \text{Obj}, \{u_1, u_2\}, \text{Obj}\}$. The expected payoff is: $p_1(5) + p_2(10) = 2/3(5) + 1/3(10) = 20/3$.

c. $\{(s_1, \text{OSP}), (s_2, \text{NSP}), \{t_1, t_2\}, \text{Obj}, \{u_1, u_2\}, \text{Subj}\}$. The expected payoff is: $p_1(8) + p_2(10) = 2/3(8) + 1/3(10) = 26/3$.

d. $\{(s_1, \text{NSP}), (s_2, \text{DD}), \{t_1, t_2\}, \text{Subj}, \{u_1, u_2\}, \text{Subj}\}$. The expected payoff is: $p_1(10) + p_2(5) = 2/3(10) + 1/3(5) = 25/3$.

No other strategy is a Nash equilibrium. For example, $\{(s_1, \text{null}), (s_2, \text{null}), \{t_1, t_2\}, \text{Obj}, \{u_1, u_2\}, \text{Subj}\}$ is not a Nash equilibrium. The speaker would always use a null pronoun, regardless of whether she wants to refer to the subject or the object, while the hearer would always understand a null pronoun as referring to the subject. This means that there would always be miscommunication whenever the speaker refers to the object. The expected payoff for this strategy is: $p_1(10) + p_2(0) = 2/3(10) + 1/3(0) = 20/3$. Given the strategy the hearer is using, it is in the speaker’s best interest to deviate from her own strategy and to use an overt pronoun when she wants to refer to the object: that is, she should use the strategy in 59a. This would increase her payoffs from 20/3 to 28/3.

There is a single Pareto-Nash equilibrium, which is the equilibrium in 59a. According to this equilibrium, the speaker should use an NSP to refer to a previous subject and an OSP to refer to a previous object. The hearer should interpret an NSP as referring to a previous subject and an OSP as referring to a previous object. It is easy to see that this strategy is equivalent to the predictions of the Position of Antecedent Hypothesis.
As mentioned before, we can think of the two information states of the game as two different degrees of salience: Subj is the information state with the highest degree of salience and Obj is the information state with the lowest degree of salience. The game of partial information easily derives the division of labor usually found in pragmatics, in which the unmarked form expresses an unmarked meaning (or rather, refers to an unmarked, expected referent) and the marked form expresses a marked meaning (or rather, refers to a marked, less expected referent).

This approach predicts that if $p_1 < p_2$ (if it becomes more likely that we are referring to the previous object), the NSP should be used to refer to the previous object. This prediction is borne out, as the following naturally-occurring example shows:

(60) Altre cop tira la granoteta fora però, com que estan a l’aigua, $\emptyset$ cau a l’aigua.

“Again $\emptyset_{bigfrog}$ pushes the little frog outside, but since $\emptyset$ are in the water, $\emptyset_{littlefrog}$ falls in the water.”

This is a story about two frogs. In the first clause of 60, an NSP refers to the big frog, while a DP in direct object position refers to the little one. In the second clause, a null pronoun can felicitously refer to the little frog, given that the semantic content of the sentences clearly biases the hearer in this direction: if $x$ pushes $y$, $y$, and not $x$, is the one likely to fall. With this extra information, the speaker can use the more economical form, the NSP, which the hearer can interpret correctly.

Note that Carminati presents the PAH not as a grammatical constraint, but as a pragmatic principle which expresses preferences that can be violated. However, she does not provide a mechanism to express when the biases predicted by the PAH can be violated. By translating the PAH into games of partial information, it becomes obvious how to do so: the probabilities of each information state encode the shared knowledge about the likelihoods of these states and, depending on how agents assess them, the biases emerging from the
PAH will be obeyed or violated.

In light of this analysis, consider again the results from the reading-time experiment (Experiment 2), which are repeated below.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Second Sentence Reading Time</th>
<th>Difference (Observed - Expected)</th>
<th>% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 1: subj + null</td>
<td>2464</td>
<td>-24</td>
<td>90</td>
</tr>
<tr>
<td>Condition 2: subj + pron</td>
<td>2929</td>
<td>290</td>
<td>90</td>
</tr>
<tr>
<td>Condition 3: obj + null</td>
<td>2587</td>
<td>45</td>
<td>91</td>
</tr>
<tr>
<td>Condition 4: obj + pron</td>
<td>2700</td>
<td>-1</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 4.4: Results for Experiment 2

The corrected reading times (in the Difference column) showed the asymmetry predicted by the PAH even in cases of semantic/pragmatic biasing (that is, even when the probabilities of $p_1$ and $p_2$ are being manipulated). However, the effect is very different in each one of the four conditions:

- Conditions 1 and 2 correspond to cases in which there was a bias towards the subject. While my proposal is that for unbiased situations $p_1 > p_2$, in these cases the difference between the probabilities is still larger. Thus, as expected, the null pronoun condition (Condition 1) is greatly favored, while the overt pronoun condition (Condition 2) receives a large penalty.

- Conditions 3 and 4 correspond to cases in which there was bias towards the object. So is this bias towards the object capable of eliminating the initial bias towards the subject? Looking at the results, the answer seems to be no, although they certainly show the effect of the conflicting biases. In Condition 3, there is some penalization in the reading time: that is, the biasing does not render the null pronoun completely felicitous. However, note that the penalization is much smaller than in Condition 2, as we would expect (thus, the semantic bias is indeed doing some work). In Condition 4, there is some facilitatory effect: that is, in spite of the bias towards $p_2$, the overt
pronoun is still easing the processing of the sentence. However, the facilitatory effect is quite small, particularly if we compare it with the one in Condition 1.

I take these results to indicate that the initial difference between $p_1$ and $p_2$ is fairly big and that, thus, it takes many extra signals to compensate for this initial difference and to reverse the probabilities. So, even in the case of some semantic bias, $p_1$ continues to be greater than $p_2$, and thus the OSP is needed to indicate reference to the object. This can be tested experimentally by constructing sentences with several degrees of biasing. Consider the following two conditions: (1) mild bias, with just some semantic bias in the discourse and (2) strong bias, in which the semantic bias is reinforced by discourse connectives. The prediction of this approach is that if we are referring to the object with an NSP, the reading times of Condition 1, with a mild bias, would still show some penalty, while the ones of Condition 2, with a strong bias, would not. Experiment 3 is aimed at showing that this prediction is fulfilled.

4.3.1 Experiment 3: self-paced reading experiment with different degrees of biasing

Experiment 3 is very similar to Experiment 2 and it also uses the methodology of self-paced reading. The goal of this experiment is to test how context affects the processing and biasing preferences of NSPs.

**Materials**: Materials consisted of sixteen two-sentence discourses with eight conditions. In these discourses, the first sentence introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The second sentence contains either an NSP or an OSP, it is semantically biased so that the pronoun refers either to the previous subject or previous object and this bias is either mild or strong. The degree of biasing is affected by means of connectives. The
idea behind this move is that, because connectives explicitly mark the rhetorical relation between sentences, they reinforce discourse coherence and pronouns can be interpreted more easily. The connectives used for the subject biasing condition were those marking narration, elaboration or explanation (‘after’, ‘in addition’, ‘it turns out’), while for the object biasing condition, the connectives marked result and violated expectation (‘that’s why’, ‘however’). These two sets of relations tend to trigger subject and object interpretation of the pronoun, respectively (Stevenson et al. (2000), Kehler (2002), Hobbs (1979)). Note that the goal of placing a connective is not to change the interpretation of the pronoun, but to increase the coherence of the text and see how this affects the processing of pronouns.

The eight conditions of the experiment are:

(61) a. Condition 1: Null pronoun + mild bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. $\emptyset$ Es va excusar repetidament.

“John made fun of Dani in front of everyone. $\emptyset$ Apologized many times.”

b. Condition 2: Null pronoun + strong bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Després, $\emptyset$ es va excusar repetidament.

“John made fun of Dani in front of everyone. Afterwards, $\emptyset$ apologized many times.”

c. Condition 3: Overt pronoun + mild bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Ell es va excusar repetidament.

“John made fun of Dani in front of everyone. He apologized many times.”

d. Condition 4: Overt pronoun + strong bias towards subject antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Després, ell es va excusar
repetidament.

“John made fun of Dani in front of everyone. Afterwards, he apologized many times.”

e. Condition 5: Null pronoun + mild bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Ψ Es va ofendre molt.

“John made fun of Dani in front of everyone. Ψ Was very offended.”

f. Condition 6: Null pronoun + strong bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Per això, Ψ es va ofendre molt.

“John made fun of Dani in front of everyone. That’s why Ψ was very offended.”

g. Condition 7: Overt pronoun + mild bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Ell es va ofendre molt.

“John made fun of Dani in front of everyone. He was very offended.”

h. Condition 8: Overt pronoun + strong bias towards object antecedent.

El Joan va deixar en ridícul el Dani davant de tothom. Per això, ell es va ofendre molt.

“John made fun of Dani in front of everyone. That’s why he was very offended.”

The conditions for each item set were counterbalanced and incorporated into a self-paced reading experiment together with 24 filler items and 5 practice items. Sixteen counterbalanced lists were constructed (the last eight lists with the items in reverse order), with a single randomization for all lists. The complete set of experimental items can be seen in Appendix C.

Procedure: The procedure is the same as explained for experiment 2. Discourses were presented on the computer, equipped with Eprime software. Subjects were asked to press
the space bar after each sentence and this is how the reading times for each sentence were measured. Comprehension questions, probing the resolution of the pronoun, were asked after each item.

Participants: Thirty-two members of the Universitat Pompeu Fabra community took part in this experiment. They had not participated in either Experiment 1 or Experiment 2 (they did participate in Experiments 4 and 5).

Results: Table 4.5 contains the results for this experiment. The second column contains the raw reading times; the third column the difference between the Observed and the Expected reading time and the fourth column the percentage of correct answers.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Second Sentence Reading Time</th>
<th>Difference (Observed - Expected)</th>
<th>% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond 1: subj + null + mild</td>
<td>2447</td>
<td>-176</td>
<td>92</td>
</tr>
<tr>
<td>Cond 2: subj + null + strong</td>
<td>2570</td>
<td>-423</td>
<td>92</td>
</tr>
<tr>
<td>Cond 3: subj + pron + mild</td>
<td>3077</td>
<td>288</td>
<td>83</td>
</tr>
<tr>
<td>Cond 4: subj + pron + strong</td>
<td>3342</td>
<td>275</td>
<td>85</td>
</tr>
<tr>
<td>Cond 5: obj + null + mild</td>
<td>2609</td>
<td>170</td>
<td>81</td>
</tr>
<tr>
<td>Cond 6: obj + null + strong</td>
<td>2757</td>
<td>-124</td>
<td>82</td>
</tr>
<tr>
<td>Cond 7: obj + pron + mild</td>
<td>2783</td>
<td>97</td>
<td>94</td>
</tr>
<tr>
<td>Cond 8: obj + pron + strong</td>
<td>3119</td>
<td>-104</td>
<td>77</td>
</tr>
</tbody>
</table>

Table 4.5: Results for Experiment 3

The average reading times for the main clause were computed, after eliminating times that were longer than 7000 ms and shorter than 200 ms (about 3.12% of the total number of trials). The number in the ‘% correct’ column refers to the percentage of answers in which participants understood the pronoun as referring to the expected, pragmatically-biased antecedent.

Deviations from regressions were computed to account for length differences, following the same method used in Experiment 2 (see Section 3.1) and these results will be the ones discussed here. Negative numbers indicate that the reading times were shorter than expected (i.e. they were read faster) and positive numbers that they were longer than ex-
pected (i.e. they were read slower). In the first four conditions, the ones with bias to the subject, we observe the pattern we have reported so far: the conditions with NSPs are read faster than expected, while conditions with OSPs are read slower than expected. The different level of biasing increases the ease of processing in the conditions with the null pronoun (Condition 1 vs. Condition 2), while it does not have any significant effect in the conditions with the overt pronoun (Condition 3 vs. Condition 4). The most interesting result for our purposes is the contrast observed for Conditions 5 and 6: the ones with bias to the object and NSPs. If the bias is mild (Condition 5), we see some difficulty in processing (the sentences are read slower than expected). However, if the bias is strong (Condition 6), this difficulty disappears and the sentence is read faster than expected. This is exactly what our model predicts: if the bias is strong enough so that the probabilities are switched, the speaker can use the more economical form and can expect the hearer to process the sentence without problems. Finally, we see a parallel pattern with the overt pronoun in Conditions 7 and 8, although both the ease and the difficulty of processing are less extreme. Note that we predict that a speaker should not produce an OSP with a strongly biased sentence and, therefore, the sentences in Condition 8 should be unnatural. This may be somewhat reflected in the percentage of correct answers, which is the lowest for all conditions (77%). However, it seems that the strong bias overrides the conflicting linguistic cue and hearers can nonetheless process the sentence with ease (although less than in Condition 6, with the null pronoun). In Condition 8, the strong bias speeds processing, but the conflicting linguistic cues (the discourse connective vs. the OSP) impair comprehension. In contrast, in Condition 7, it looks like the OSP is enabling comprehension, albeit at some processing cost.

The data regarding the difference between observed and expected reading times was submitted to an ANOVA analysis. The effect of the type of pronoun was significant (F1(1,31) = 7.55, p < 0.01; F2(1,15) = 26.67, p < .001), as was the effect of the type
of biasing, although only marginally by items (F1(1,31) = 7.74, p < 0.01; F2(1,15) = 3.41, p = .083). In addition, there was a significant bias by pronoun interaction (F1(1,31) = 11.85, p < 0.001; F2(1,15) = 12.94, p < .001).

These results clearly show that contextual information is crucial in assigning antecedents to the different referential forms and in processing them. Game of partial information provide a way of explicitly modeling the context, by assigning probabilities to different contextual states of affairs and this is one of the reasons why they are highly suitable for analyzing phenomena such as the one studied in this thesis.

### 4.4 Mixed strategies and uncertainty

The game of partial information presented in Section 4.3 has proved successful in modeling the experimental data from Chapter 3. These experiments have identified significant tendencies for different pronouns. However, the amount of data that does not follow the identified tendency is quite large. For example, consider the results for Experiment 1 (the questionnaire study) repeated in Table 4.6. The dispreferred antecedent was chosen 30% of the time for NSPs and 35% of the time for OSPs.

<table>
<thead>
<tr>
<th></th>
<th>subject antecedent</th>
<th>object antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>null pronoun</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>overt pronoun</td>
<td>35</td>
<td>65</td>
</tr>
</tbody>
</table>

Table 4.6: Results for Experiment 1

A natural way to think about this distribution of probabilities for a game theorist would be to see them as the result of a mixed strategy. In this section, I briefly explain the notion of a mixed strategy and argue that these strategies cannot be applied to the null/overt pronoun variation.

Consider the following game (originally from von Neumann and Morgenstern (1944))
between Sherlock Holmes and his enemy Moriarty. Sherlock Holmes wants to go from London to Dover and to the continent, to escape from Moriarty. Moriarty is aware of this plan. Holmes, then, has two options: (1) continue with his plan and go to Dover or (2) change his plan and leave the train at Canterbury, the only intermediate station. His adversary has the same choice: he can go all the way to Dover or he can stop at Canterbury. That is, they both have to choose and take into account what the other player might choose.

If they both decide to leave the train at the same stop, Moriarty will certainly catch Holmes and thus Moriarty will have a positive payoff of 10, while Holmes will have a negative payoff of \(-10\). If Holmes reaches Dover, while Moriarty leaves the train at Canterbury, Holmes will be able to temporarily escape and thus will get a positive payoff, say of 5, while Moriarty will receive a payoff of \(-5\). Lastly, if Moriarty goes all the way to Dover, while Holmes stays at Canterbury, this is best seen as a tie (0,0) between both players, since Holmes has so far escaped, but has failed to reach the continent. Note that this is a zero-sum noncooperative game, that is, the winnings of one player represent losses for the other player. The game is depicted in 4.7.

<table>
<thead>
<tr>
<th>Moriarty’s choices</th>
<th>Holmes choices</th>
<th>Dover</th>
<th>Canterbury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dover</td>
<td>-10,10</td>
<td>5,-5</td>
</tr>
<tr>
<td></td>
<td>Canterbury</td>
<td>0,0</td>
<td>-10,10</td>
</tr>
</tbody>
</table>

Table 4.7: Game with a mixed Nash equilibrium

There is no pure Pareto Nash equilibrium in this game. If Holmes plays Dover, then Moriarty should also play Dover. However, in that case, Holmes should deviate and play Canterbury, instead. There is, however, a mixed strategy. Holmes and Moriarty can randomize and play both actions with a certain probability, so that the other player does not have a reason to prefer one of the two options. Let \(p\) be the probability of Moriarty playing Dover and \(1 - p\) the probability of Moriarty playing Canterbury. The expected payoff
for Holmes to play Dover is calculated in 62a and the one to play Canterbury in 62b. If
$p = 3/5$, Holmes receives the same payoff in both Dover and Canterbury as shown in 62c
and, thus, has no reason to prefer a particular action. The same reasoning applies to the
other player.

(62)  
   a. $-10p + (1-p)5 = -15p + 5$
   b. $(1-p)10 = 10p - 10$
   c. $10p - 10 = -15p + 5 =$
      
   \[ p = 3/5 \]

The mixed equilibrium requires Moriarty to leave the train at Dover 60% of the time and
at Canterbury 40% of the time, and requires Holmes to leave the train at Canterbury 40% of
the time and at Dover 60% of the time. If they randomize according to these probabilities,
they prevent their adversary frp, anticipating their actions (Schelling, 1969).

Now the interesting question for our purposes is the following: is it plausible to think
that the results of Experiment 1 are a product of players playing a mixed strategy? In what
follows, I present what a game with a mixed Nash equilibrium solution would look like and
the predictions such a game would make.

Let’s assume first that the speaker uses an NSP. Again, the speaker may have used
this pronoun to refer to the previous subject or to refer to the previous object, while the
hearer needs to decide how to interpret the pronoun. Furthermore, let’s assume we have no
information about the payoffs, other than the fact that if speakers and hearers coordinate,
the payoffs will be positive and if they don’t the payoffs will be negative. This is depicted
in 4.8.5

Let’s now take the results from Experiment 1 and use them to represent the probabili-
ties with which the hearer chooses a particular interpretation. That is, the hearer chooses

5‘S’ stands for speaker and ‘h’ stands for hearer.
Subject with a probability of 0.7 and Object with a probability of 0.3. If this is a mixed strategy, this means that the payoffs for the speaker have to be equivalent in both strategies. That is, $s_1 \cdot 0.7 = s_4 \cdot 0.3$. This equation will not give us fixed values for the actions, but will give us a function for one option in terms of the other, or more specifically: $s_1 = s_4 \cdot 0.3 / 0.7 = 0.4 \cdot s_4$. This predicts that the payoff for assigning the NSPs an object antecedent should be roughly twice as much as assigning it a subject antecedent. This is not a plausible assumption given that the experimental results point to the opposite direction: subjects are the preferred antecedents for NSPs.

Consider now the case in which the speaker uses an OSP. The hearer’s probabilities are the following: the hearer chooses Subject with a probability of 0.35 and Object with a probability of 0.65. Doing the same calculations as before, the payoffs for the speaker have to be such that the following equality holds: $s_1 \cdot 0.35 = s_4 \cdot 0.65$ and, therefore, $s_1 = 1.8 \cdot s_4$. This predicts that the payoff for interpreting the OSP as the subject should be roughly twice as much as that for interpreting it as the object. Again, this is not plausible, since the empirical pattern is just the opposite.

Although the results of the experiment may look at first sight as if they are a product of mixed strategies, this would make very odd predictions about what the payoffs for the different options should look like. The fundamental difference between the Holmes and Moriarty game and the pronoun game is that the first is uncooperative, while the second is cooperative. That is, the point of using mixed strategies in the Holmes and Moriarty game is to confuse the other player so that he does not have a reason to prefer one action over the
other. This is not how language works. A speaker is cooperative because it is in his best interest to be understood, unless he is trying to deceive the hearer.⁶ A mixed strategy could be used to model cases of stable sociolinguistic variation (see for example Labov (1994)), that is situation in which two forms with the same meaning coexist, but not cases in which the two forms (1) can potentially convey different meanings and (2) are associated with different costs, such as the anaphora case.

Although further work should be done to explain the variation found in the experimental data, we can reject the idea that it is a product of agents playing mixed strategies and I would like to entertain two alternative explanations. One possible explanation would be that there is some uncertainty regarding the probabilities that speaker and hearer assign to different information states. In some cases, their probabilities might not exactly coincide: for instance, if the Speaker assigns \( p_1 = 0.6 \) and the Hearer assigns \( p_1 = 0.4 \), the speaker will use an NSP to refer to the subject, but the hearer will interpret it as referring to the object.

Consider the following discourse from Nesson et al. (2008):

(63)  a. My dog has been getting quite obstreperous lately.

   b. I took him to the groomer yesterday.

   c. He hates him.

   d. In fact, he tried to bite him last month.

   e. In fact, he always tries to schedule his appointments when the other groomer is

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⁶The game theoretical analysis of indirect speech by Pinker et al. (2008) is consistent with this idea. A speaker may want to be somewhat misleading and use indirect speech, which is less efficient and more costly than direct speech, but which can be “plausibly denied”. For instance, using indirect speech to convey a bribe is the optimal choice if the speaker thinks he might be talking to an honest officer, who will not accept the bribe, because the speaker can deny the bribe ever took place, while he would not be able to do that if direct speech is used.
on duty.

The third sentence is ambiguous and the following utterance in the discourse (either 63d or 63e) disambiguates the pronoun. In spite of the temporary ambiguity, these discourses are not perceived to be incoherent. Nesson et al. (2008) propose that this is due to the fact that the salience ranking of the two entities is not clearly fixed (neither referent appears in subject position in 63b) and it may be that hearer and speaker have different rankings or, in our terms, different probabilities. If the most likely referent is the same for both participants, the discourse will proceed without any problem. However, if it is not the same, the hearer will have to backtrack and correct his antecedent assignment in light of the contextual information. In fact, miscommunication regarding anaphora interpretation does occur in natural conversation. Speakers and hearers mostly understand each other, but communication is not always perfect. Thus, it is plausible that this type of mismatch in probability assignment happens occasionally.

If miscommunication due to anaphora does occur in natural conversation, with plenty of contextual information, it is not surprising to find a great amount of variation in experimental settings, in which context is very limited. In fact, the items used in the experiments had no previous context because pronouns are highly sensitive to the previous context and the goal of the experiments was to find out the pronoun preferences precisely in the absence of contexts. Participants had to estimate the probabilities of information states without any contextual cues and, therefore, it is not surprising that the results showed some amount of variation, although with very clear tendencies.

Another possible way of explaining the variation found in the experiments would be to think that there is some degree of uncertainty in the payoffs. That is, it might be that agents don’t assign a fixed value as payoff, but can only estimate the range in which the payoff is found. For example, consider a situation in which the agents assign a payoff of 10 for the null pronoun and a payoff in the range of 8 to 9 to the overt pronoun. In this situation, if
$p_1 = 0.70$, the Null-Overt strategy would yield an expected payoff in the range 9.7-9.4 and the Overt-Null strategy an expected payoff in the range 9.3-8.6. Therefore, the Null-Overt strategy is still the Pareto-Nash equilibrium. However, consider what happens if $p_1 = 0.6$. In this case, the Null-Overt strategy would yield a expected payoff in the range 9.6-9.2 and the Overt-Null strategy an expected payoff in the range 9.4-8.8. That is, there is some overlap in the payoffs and in such cases there is no single Pareto-Nash equilibrium. Figure 4.4 plots the range of payoffs for the two strategies against the different probabilities. The descending band represents the payoffs for the Null-Overt strategy and the ascending band the payoffs for the Overt-Null strategy. The dark area represents the area where there is some overlap and, thus, there is not a single Pareto-Nash equilibrium which is the solution of the game. Conversational agents may randomize if the payoffs of their strategies are found in this dark area and that would explain some of the variation that we find in the experiments.

As I mentioned before (see Section 4.1.1), the particular values that I have used to illustrate my analysis are not meaningful and they only indicate preferences. Giving ranges of values, instead of a single value, to payoffs is a way of saying that preferences may have some degree of vagueness and this can become relevant if the probabilities of the different information states are not very different and the expected payoffs have some degree of overlap.

### 4.5 Conclusion

In this chapter, I have presented a game theoretical analysis of the data obtained through the experiments presented in Chapter 3. The results of my experiments supported the PAH,

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7I use the following abbreviation: X-Y strategy means use X to refer to the subject and Y to refer to the object, where X and Y can be null or overt pronouns.
which is a principle that can easily be modeled using games of partial information. Moreover, by translating a principle such as the PAH to a game of partial information, we are able to express when the biases predicted by the PAH should be obeyed and when they should be violated. Experiment 3 confirms the prediction made by the game theoretical model that by manipulating the context, probabilities can be shifted and NSPs can become felicitous to refer to a less salient antecedent. That is, the preferences of NSPs in the absence of context are easily overridden in presence of context. A powerful model which associates probabilities with information states can easily accommodate these changing preferences. Finally, I have argued against analyzing the variation we find in the experimental data as a result of participants playing mixed strategies, instead, they are a result of their probabilities not perfectly matching in some circumstances or the payoffs not having a fixed value, but rather a range of values.

Pragmatic choices, including production and interpretation choices of referring expressions, are essentially rational choices, while cases of sociolinguistic variation or linguistic
change are not necessarily so. Rationalistic game theory is a good framework to deal with the former, while evolutionary game theory, which deals with behavior rather than with rationality, could be a good framework to deal with the latter.

In this chapter, I presented a first step towards constructing a game theoretical model that speakers and hearers use to choose and interpret anaphoric forms. The mathematics behind game theory, and in particular behind the Pareto-Nash equilibrium, determines the outcome of the game. Therefore, the task of the theorist is to propose a model that can capture the empirical data and specify its necessary ingredients: payoffs, probabilities, information states, choices and information sets. Given that game theory provides us with a powerful mechanism, it is important to justify well the ingredients of the model. In order to do so, I follow two criteria: (1) payoffs are assigned following two simple criteria and are kept constant throughout this thesis and (2) probabilities are always estimated following the same method (i.e. using corpora counts).

The goal of this thesis is to present the empirical data obtained through experiments and to specify the ingredients of the game theoretic model. In this chapter, I have presented an initial model which captures the tendencies of the data presented so far. In the next chapters, I present additional empirical evidence which calls for a redefinition of some aspects of the model.
Chapter 5

Pragmatic structure and pronouns: topic, link and focus

In the preceding chapters, I have examined the idea that there is a special relationship between NSPs and subjecthood, which is well supported by the experiments reported in Chapter 3. However, it is possible that this relationship is a byproduct of the pragmatic structure of the sentence. This chapter aims to establish whether the referring preferences of pronouns is determined by their pragmatic status. I start with the relationship between pronouns and links in Section 5.1 and then I examine the relationship between pronouns and focus in Section 5.2. Also, since we know that there is a relationship between reduced anaphoric forms and salience, we can gain insight into which factors compose salience, particularly because in Catalan there is not just one reduced anaphoric form, but two of them.

Regarding the relationship between pronouns and links, I argue that both syntax and pragmatics have an effect on the referring preferences of pronouns: both add to salience, but the former has a larger weight than the latter. NSPs refer to the most salient antecedent, which is always the subject, even if it is not the link (contra Frana (2007) or
Samek-Lodovici (1996)). In contrast, OSPs refer to a non-salient antecedent, if there is one.

As for the relationship between pronouns and focus, I argue that focal overt pronouns are ambiguous and do not show the same referring preferences as non-focal overt pronouns. I analyze this ambiguity and propose a model to derive the inability of NSPs to carry focal information.

5.1 Topics and links

I assume Vallduví’s (1992) proposal (see section 2.2), according to which a sentence is divided into focus and ground, where the ground is further divided into link and tail. The link indicates where the focal information should go (in which file, following the terminology from File Change Semantics (Heim, 1983)) and is represented by preverbal material in Catalan. In the experiments presented so far, the only preverbal material in the sentences was the subject. Therefore, in all the experimental items the subject of the sentences overlapped with the link, while the object was always non-link material. The results from Experiment 1 are thus compatible with two explanations: the preference of the NSP may be syntactic in nature (preference for a previous subject) or it may be pragmatic (preference for a previous link). Carminati’s hypothesis was casted in pure syntactic terms and she argues that this access to syntactic information is crucial in cases of non-referential uses, in which pronouns do not refer to discourse referents, since they act as bound variables. However, inter and intrasentential anaphora may work at different linguistic levels and, even intrasententially, none of Carminati’s experiments were designed to be able to distinguish the pragmatic from the syntactic hypothesis. In the next section, I review several pieces of related work that address this question.
5.1.1 Related work: Italian pronouns

Vallduví (1992) argued for the pragmatic hypothesis and his proposal is that, while NSPs inherit the previous topic, OSPs act as links and, thus, change the topic of the sentence. Frana (2007) pursued a similar idea, which she calls the Discourse-Prominence Hypothesis of Antecedent Assignment (DPH): NSPs have a link preference. Frana (2007) also entertains the Anti-Topic Hypothesis according to which OSPs decrease their preference for non-subject antecedents, when this position correlates with a link. She tested the DPH by performing an experiment very similar to Carminati’s Experiment 1, but manipulating the items so that, according to her analysis, the immediately preceding subject does not always coincide with the link. The details of the experiment are as follows:

**Materials:** the materials consisted of twenty two-sentence passages with four conditions. The first sentence introduces an individual by proper name (Referent 1). The second sentence is a complex sentence. In the subordinate clause, a new individual is introduced in subject position (Referent 2), while Referent 1 is repeated, either by a full DP or by a clitic. The main clause contains either an NSP or an OSP in subject position. The content of the second sentence is not pragmatically biased to refer to one of the two referents. Thus, the four conditions are:

(64)  

a. Cond 1: full DP + null  
   La signora Rossi è una persona molto maleducata che non merita alcun riguardo. Quando Maria incontra la signora Rossi per strada, ∅ fa sempre finta di non vederla.  
   “Mrs Rossi is a very rude person that does not deserve any regard. When Maria sees Mrs Rossi in the street, ∅ always pretends not to see her.”

b. Cond 2: full DP + overt  
   La signora Rossi è una persona molto maleducata che non merita alcun riguardo.
Frana assumes that this manipulation (clitic versus proper name) is able to distinguish subject from link. The clitic in conditions 3 and 4 is supposed to reinforce the DP it corefers with and its discourse referent and, as a consequence, reinforce its topical status. In these cases, Frana assumes that the clitic is the link of the sentence, although it is not the subject. In contrast, the proper name in conditions 1 and 2 is supposed to not reinforce the DP and, consequently, the subject, and not the object, is supposed to be the link of the sentence. Carminati (2002) predicts that this manipulation should not produce any effect and that conditions 1 and 3, on the one hand, and conditions 2 and 4, on the other hand, should behave in the same way. In contrast, if the DPH is correct, the prediction is that conditions 1 and 3 should show a different pattern: the NSP should prefer the subject antecedent in condition 1 and the object antecedent in condition 3. As for condition 4, Carminati predicts
object antecedent, while the Anti-Topic Hypothesis would predict subject antecedent.

**Procedure:** Four counterbalanced versions of the questionnaire were created. 32 Italian native speakers completed the questionnaire via e-mail.

**Results:** The results can be seen in Table 5.1.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Subject Antecedent</th>
<th>Object Antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond 1: null + full DP</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>Cond 2: overt + full DP</td>
<td>27</td>
<td>73</td>
</tr>
<tr>
<td>Cond 3: null + clitic</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>Cond 4: overt + clitic</td>
<td>16</td>
<td>84</td>
</tr>
</tbody>
</table>

Table 5.1: Results in Frana (2007)

The results for condition 1 and condition 2 are parallel to Carminati’s results for Italian or my results for Catalan. When the subject acts as a link, NSPs have a subject preference and OSPs have an object preference. However, the pattern for condition 3 is different. The NSP does not refer to the immediately preceding subject, but to the subject of the first sentence, which appears as an object clitic in the subordinate clause of the second sentence. Frana (2006) takes this as supporting evidence for the DPH. In addition, the Anti-Topic Hypothesis does not get support from the data, as shown by the results in condition 4. As in condition 3, in condition 4, OSPs preferably refer to the previous object, when it acts as a link, in a proportion that is even larger than when the object is not the link (condition 2).

I take these results as evidence that the relationship between syntactic position and type of pronoun is not as straightforward as proposed in Carminati (2002). However, I am not convinced that these results are conclusive evidence for the DPH. It can be argued that Frana’s experimental items are not manipulating the information structure of the sentence, which in Romance languages correlates with word order. Following Vallduví’s approach, if the update of the information is done clause by clause, the link of the experimental items by the time the pronoun is reached is the subject, *Maria*, in all four conditions. In Frana’s results, it is very striking that in conditions 3 and 4, there does not seem to be a way to refer
to the subject of the subordinate clause. That is, when there is a clitic coreferential with a previous antecedent, both pronouns have a preference for this referent. In what follows, I present two hypotheses why this is the case, one taking into account the previous discourse and the other referring to subsequent discourse.

First, Carminati’s experimental items were all concerned with intrasentential anaphora and all of them consisted of a single, complex sentence. My own experimental items address intersentential anaphora and all consist of multiple simple sentences. In contrast, Frana’s items have multiple sentences, one of which is complex. Thus, in her items, both intersentential and intrasentential anaphora play a role. An alternative explanation of the results could be that a pronominal clitic in a subordinate clause is a sign for future anaphoric pronouns to ignore this clause and look for a referent in some previous point of the discourse. That is, clitics may signal that resolution needs to be intersentential. If this is so, there is only one referent available in the previous sentence and this is what both pronouns end up referring to. In other words, the choice of referring expressions may affect discourse segmentation. A DP or a full noun phrase signal a new discourse segment, while a clitic signals a continuing discourse segment.

Of course, it is possible to remove the complexity which pronouns potentially corefering within and across sentences adds by constructing items such as the ones in 65, in which all potential coreferential relations are across sentences.

(65)  
a. La signora Rossi è una persona molto maleducata che non merita alcun riguardo.  
Maria incontra Mrs Rossi spesso. (Lei) fa sempre finta di non vederla.  
Mrs Rossi is a very rude person that does not reserve any regard. Maria sees  
Mrs Rossi often. (She) always ignores her.

b. La signora Rossi è una persona molto maleducata che non merita alcun riguardo.  
Maria la incontra spesso. (Lei) fa sempre finta di non vederla.
Mrs Rossi is a very rude person that does not reserve any regard. Maria sees her often. (She) always ignores her.

Second, it could be that clitics trigger certain expectations about how the discourse will continue. Since Frana’s sentences have quite a broad context, the concept of discourse topic may be playing an important role in determining pronoun preferences. According to Asher and Lascarides (2003), the discourse relation of Narration requires that there be a d-topic. In conditions 3 and 4, the clitic signals that the subject of the previous sentence, ‘la signora Rossi’, is the d-topic of the Narration. Thus, it is expected that this d-topic will be maintained and that the speaker will add some more information about it. In other words, the fact that ‘la signora Rossi’ is interpreted as a d-topic is responsible for the fact that in both conditions 3 and 4 the pronoun must be coreferential with it. In contrast, in conditions 1 and 2, there are not enough linguistic cues to construe ‘la signora Rossi’ as a d-topic, since there is no clitic reinforcing the subject of the previous sentence and, moreover, the name is repeated. A more general d-topic (such as, ‘what’s happening in our neighborhood’) is constructed and the coreferential pattern follows Carminati’s Position of Antecedent Hypothesis. In other words, a clitic can act as some sort of cataphoric marker, triggering the expectation that something else will be added about its referent.¹ Both the overt and null pronoun fulfill this expectation and are interpreted as adding information about the clitic referent. In order not to fulfill this expectation and change the d-topic, a stronger cue than a pronominal form would be needed. This stronger cue could be a definite description or a proper name, as shown in 66. The missing coreferential pattern is achieved by placing a proper name in the main clause and a null pronoun in the subordinate clause.

(66) Quando ∅ la incontra per strada, Maria fa sempre finta di non vederla.

When sees her on the street, Maria pretends not to see her.

¹Thanks to Aviad Eilam for discussion of this point.
Finally, it is possible that this manipulation is not related to topicality at all, since it has been suggested that pronominalization is one of the factors that contributes to the complex concept of ‘salience’. Kameyama (1999) claims that pronominalized non-subjects gain in salience by virtue of being pronominalized and that they compete in salience with a non-pronominalized entity in subject position. However, this claim is partially disconfirmed by one of Carminati’s experiments. In her experiment, she tested the reading times of non-ambiguous sentences which contained a clitic pronoun vs. name manipulation, as in 67.

\[(67)\]

a. Condition a: subject antecedent + name

Quando Maria cerca Roberto, \(\emptyset\) diventa ansiosa

"When Maria looks for Roberto, \(\emptyset\) becomes anxious (fem)."

b. Condition b\(^2\): object antecedent + clitic

Quando Maria lo cerca, \(\emptyset\) diventa ansioso

"When Maria him looks for, \(\emptyset\) becomes anxious (masc)."

Condition a was read faster than condition b\(^3\), while the Discourse Prominence Hypothesis would predict the opposite.

Frana’s study is the only study I am aware of that tries to distinguish linkhood from subjecthood in a null-subject language based on experimental data. As mentioned in Section 2.4.2, other authors support the idea that linkhood is responsible for the distribution of NSPs and OSPs. Several corpus studies using Centering Theory (see DiEugenio (1998) and Dimitriadis (1996)) assume that OSPs are used to mark a non-default transition. However, since subject and link largely overlap in corpus data, it is again difficult to decide which

\(^2\)This was condition c in Carminati’s experiment. She tested other factors which are not relevant for our purposes here.

\(^3\)The average reading time for condition a was 1358 ms., while it was 1537 ms. for condition b.
of the two approaches makes the best predictions. From a more theoretical perspective, Samek-Lodovici (1996) also argues for linkhood as the factor regulating the distribution of NSPs and OSPs. His evidence is based on the contrast between the passive in 68 and the wh-question in 69 in Italian in terms of their ability to license NSPs. He argues that the agent of a passive sentence cannot license a null pronoun, while the agent of a wh-question can. He assumes that the difference is that, in the passive, the subject, and not the referent in the oblique by-phrase, is the link. In contrast, in the wh-question, the referent of the by-phrase is the only non-wh-constituent and, thus, should be a link.

(68)  

a. Questa mattina, la mostra è stata visitata da Gianni.

“This morning the exhibition was visited by John.”


“Later on, *∅/he/he has visited the university.”

(69)  

a. Quali mostre sono state visitate de Gianni?

“What exhibitions were visited by John?”

b. Recentemente ∅/??egli/*lui ha visitato la mostra di Klee e di Miró.

“Recently ∅/??he/*he has visited the exhibits by Klee and Miró.”

I would like to note here that, to the extent that passive sentences are natural in Catalan, I find an NSP acceptable in a context like the one in 68, in which the pronoun has only one potential antecedent. This is in line with the game theoretical approach presented in Chapter 4 which predicts that whenever possible the more economical form should be used. As far as Italian is concerned, it seems to present some grammatical constraints on the distribution of NSPs, which are absent in Catalan (see Chapter 6 for some more considerations regarding cross-linguistic differences in pronoun distribution).

Unlike Samek-Lodovici (1996), Calabrese (1985), in line with Carminati (2002), argues
in favor of the subject hypothesis on the basis of sentences like 70, in which the direct object has been left-dislocated and, thus, occupies the link position. According to Calabrese, the NSP corefers with the subject and not with the left-dislocated constituent.

(70) a. Mario, Sandro, l’ha incontrato per strada ieri.

Mario, Sandro, met him in the street yesterday.

b. Apenna θ_1, θ_2’ha visto, θ_1, θ_2’è arroso

As soon as θ_1 saw him_2, θ_1, θ_2 blushed

Samek-Lodovici (1996) argues that it is not obvious what should be considered the link in the first sentence of 70. I agree with this criticism; since there is a preverbal subject in 70a, the two preverbal constituents might have some topical status. Also, although this is not discussed by either Samek-Lodovici or Calabrese, the judgments of discourses like 70 are far from absolute and, thus, experiments should be carried out to find out about the general preferences of speakers.

To sum up, there seem to be arguments both for the subject and the link hypothesis, although the discussion is far from being settled. I have also pointed out that it is difficult to construct experimental items which clearly separate subjecthood from linkhood, without adding other factors which might affect the results (such as constructing one of the referents as a discourse topic or mixing different levels in the resolution of anaphora). My experiments address these issues. Before presenting them, I will review some more work which deals with related phenomena in Finnish and English.

5.1.2 Related work in other languages

Kaiser and Trueswell (2008) have studied the interpretation of pronouns and demonstratives in Finnish. Finnish is a partial null-subject language (Holmberg et al., 2009), which allows 3rd person null subjects in very restricted circumstances. However, Finnish, as
Catalan, has two types of third person anaphors, the pronoun hän, 's/he' and the demonstrative tämä, 'this'. Additionally, like in Catalan, word order in Finnish is flexible: SVO is the default word order, but OVS sentences are also possible and felicitous when the object is discourse-old information and the subject is discourse-new information. Therefore, Finnish and Catalan map informational status with sentence position very similarly. Kaiser and Trueswell carried out a sentence completion task. Participants were presented with small discourses of three sentences. The third sentence was either SVO or OVS and the fourth sentence started either with the pronoun hän or with the demonstrative tämä. A sample item is given in 71:

(71) a. Sentence 1: Nina was shopping at the grocery store.
   Sentence 2: While waiting in line, she saw a cook with a white hat behind her
   b. Sentence 3a. SVO: The cook-subj pushed a baker-obj at the back of the line
      Sentence 3b. OVS: The cook-obj pushed the baker-subj at the back of the line
   c. Sentence 4a. Hän ...
      Sentence 4b. Tämä ...

The results from this study can be seen in table 5.2. Since tämä is a demonstrative, some of the continuations used it in this way. Also, when the continuation was ambiguous, it was coded as 'unclear'.

<table>
<thead>
<tr>
<th></th>
<th>Subject</th>
<th>Object</th>
<th>Demonstrative</th>
<th>Unclear</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVO Hän</td>
<td>64</td>
<td>13</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>SVO Tämä</td>
<td>0</td>
<td>88</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>OVS Hän</td>
<td>64</td>
<td>13</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>OVS Tämä</td>
<td>44</td>
<td>0</td>
<td>30</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 5.2: Results in Kaiser and Trueswell (2008)

The results show that the pronoun hän is sensitive primarily to syntactic role and has a subject preference regardless of word order. In contrast, the demonstrative is sensitive to
word-order. It prefers postverbal referents, but this preference is modulated by the syntactic role of the antecedent: it prefers objects to subjects. It is remarkable that in the last condition, OVS-Tämä, there were many uses of tämä as a demonstrative (for example, ‘this was fun’), indicating that the anaphoric use of tämä is less felicitous in the VOS condition than in the SVO condition. Kaiser and Trueswell (2008) take these results to show that salience cannot be described by a single-factor concept, but rather requires a model with multiple constraints, in which referential forms can show different degrees of sensitivity to different factors.

In another study, Kaiser (2006) studied how focalization affects subsequent pronoun interpretation. This sentence completion study manipulated whether the focused constituent was the subject or the object and whether focalization was only semantic or also structural (with a cleft). A summary of the conditions can be seen in 72.

(72)  

a. The maid scolded the bride.

b. (SVO + Object=focus) No that’s wrong. She scolded the secretary. She...

c. (SVO + Subject=focus) No that’s wrong. The secretary scolded her. She...

d. (cleft + Object=focus) No that’s wrong. It was the secretary that she scolded. She...

ej. (cleft + Subject=focus) No that’s wrong. It was the secretary who scolded her. She...

She found a subject preference across the board, regardless of whether the subject was a link or a focus. However, the preference was stronger in the first condition (SVO + Object=focus) than in the others. She suggests that these results show that subjecthood makes both topics and focus good antecedents for subsequent pronouns, but that this effect can be mitigated by other factors. Subject preference is not as strong in the other three conditions, because of the other factors: the structural focusing of the object in the condition 97.
‘cleft + Object=focus’ and the fact that the other potential antecedent is pronominalized in the conditions ‘Subject=focus’ takes away salience from the subject. Thus, again salience is once again seen as a multiple-factor system, which is computed by the interaction of several factors.

5.1.3 Experiment 4: questionnaire experiment

Experiment 4 aims to test whether the different referring preferences of NSPs and OSPs are due to syntactic factors (preference for antecedents in particular syntactic positions: subject vs. non-subject) or to pragmatic factors (preference for antecedents belonging to different pragmatic categories: link vs. non-link). As mentioned in Section 2.3, information structure is encoded through syntactic position in Catalan. Preverbal elements are links and they may take different shapes. Most often, links are syntactically encoded through subjects and the resulting sentence then has SVO order. However, links can also be realized by left-dislocated objects and, in this case, the resulting sentence has OVS order. Therefore, by manipulating the syntactic order, we can differentiate linkhood from subjecehood and test what drives the preferences of the different types of pronouns.

Materials: the materials consisted of sixteen three-sentence discourses with four conditions. Since OVS sentences are unnatural without context, all sentences were preceded by a question asking about the referent mentioned preverbally in the second sentence. The second sentence introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The content of the second sentence is not pragmatically biased to refer to one of the two referents. In two of the conditions, the first sentence has an SVO order, in which the subject is the link of the sentence; in the other two conditions, the first sentence has an OVS order, in which the object is the link and the subject is new information. The subject of the second clause is either an NSP or an OSP. Conditions 1 and 2 follow the same structure as the two conditions
in Experiment 1. Thus, the four conditions are:

(73) a. Cond 1: SVO + Null
    A: Què li va passar a la Marta?
    A: “What happened to Marta?”
    B: La Marta escrivia sovint a la Raquel. ∅ Vivia als Estats Units.
    B: “Marta wrote frequently to Raquel. ∅ Lived in the United States.”

b. Cond 2: SVO + Overt
    A: Què li va passar a la Marta?
    A: “What happened to Marta?”
    B: La Marta escrivia sovint a la Raquel. Ella vivia als Estats Units.
    B: “Marta wrote frequently to Raquel. She lived in the United States.”

c. Cond 3: OVS + Null
    A: Què li va passar a la Raquel?
    A: “What happened to Raquel?”
    B: A la Raquel, l’escrivia sovint la Marta. ∅ Vivia als Estats Units.
    B: “To Raquel, Marta wrote (to her) frequently. ∅ Lived in the United States.”

d. Cond 4: OVS + Overt
    A: Què li va passar a la Raquel?
    A: “What happened to Raquel?”
    B: A la Raquel, l’escrivia sovint la Marta. Ella vivia als Estats Units.
    B: “To Raquel, Marta wrote (to her) frequently. She lived in the United States.”

The conditions for each item set were counterbalanced and incorporated into a questionnaire experiment together with 24 filler items (some of them belonging to Experiment
5) and 5 practice items. Eight counterbalanced lists were constructed (the last four lists with the items in reverse order), with a single randomization for all lists. The complete set of experimental items can be seen in Appendix D.

Note that, as in Experiment 1, these items deal exclusively with intersentential anaphora, unlike Frana’s experimental items. The context is also kept quite minimal to avoid the construction of a discourse topic. Also, the subject is placed in postverbal position, which does not have a link interpretation, to avoid the problems found in sentences like 70.

**Procedure**: The procedure is the same as explained in Experiment 1. The discourses were presented on a computer screen. After reading them, the participants had to choose which paraphrase they preferred for the second sentence.

(74)  

(a) Marta lived in the United States  
(b) Raquel lived in the United States

**Subjects**: Thirty-two members from the Universitat Pompeu Fabra community took part in this experiment.

**Results**. The results can be seen in Table 5.3.4

<table>
<thead>
<tr>
<th>Condition</th>
<th>Subject Antecedent</th>
<th>Object Antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond 1: SVO + null</td>
<td>59.1</td>
<td>40.9</td>
</tr>
<tr>
<td>Cond 2: SVO + overt</td>
<td>35.2</td>
<td>64.8</td>
</tr>
<tr>
<td>Cond 3: OVS + null</td>
<td>58.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Cond 4: OVS + overt</td>
<td>51.1</td>
<td>48.9</td>
</tr>
</tbody>
</table>

Table 5.3: Results for Experiment 4

Conditions 1 and 2 follow the pattern predicted by the PAH and mimic the results in Experiment 1, although the results for condition 1 in the current experiment are less strong than the ones previously reported. The results also coincide with the results Frana obtained in her conditions 1 and 2. In contrast, the results for conditions 3 and 4 differ greatly from

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4I thank Enric Vallduví for discussion of these results.
the results for conditions 3 and 4 in Frana’s experiments. In condition 3, the NSP still shows a preference for the subject, and not for the object, which crucially is the link in these sentences. In condition 4, there is no clear preference of the OSP towards either the object or the subject. While conditions 1 and 2 are mirror images of each other, this is not the case for conditions 3 and 4. An ANOVA analysis of the frequency with which the subject antecedent was chosen in the four conditions was performed with subjects and items as random effects. The ANOVA shows that whether an anaphoric element is interpreted as referring to the preceding subject depends on the type of pronoun (null or overt): F1 (F1(1,31) = 7.02, p = 0.01; F2(1,15) = 5.07, p = 0.04). There is also a significant interaction between type of pronoun and word order, although it is only marginally significant by subjects (F1(1,31) = 2.32, p = 0.07; F2(1,15) = 3.06, p = 0.04). The lack of significance by subjects can probably be attributed to the behavior of the OSP in condition 4.

Note that the preferences in the SVO conditions are less clear in Experiment 4 than the ones reported in Chapter 3 for Experiment 1, although both results do point in the same direction. This can be attributed to the fact that Experiment 4 added OVS items, which require a more developed discourse context than the one used in the experiment. Experiment 4 did include some more context than Experiment 1 so that the OVS sentences would not sound completely unnatural. However, it seems that this was not enough, and the lack of sufficient context contributed to raise the overall variation found in the results.

The two pronominal forms are not sensitive to the same factors: while NSPs have a simple subject preference, regardless of the pragmatic function of the subject, OSPs have an object preference only when it is not the link and show no clear preference when the object is the link. In other words, NSPs are only sensitive to syntactic function, while OSPs are sensitive to both syntactic and pragmatic function. These results support a notion of salience in which various factors play a role and different referential expressions are sensitive to different factors. In particular, both subjecthood and linkhood add to salience,
but the former has a larger weight than the latter. NSPs, being the default pronominal form, have a preference for the most salient entity, the subject, which remains the most salient entity even if it is not the link (that is, both in condition 1 and condition 3). In contrast, OSPs have more constrained preferences: they are constrained to refer to low salience entities. When both factors contributing to salience (syntactic and pragmatic function) agree in marking a referent as low in salience, this is the one the OSP will prefer. When both factors do not agree (one potential antecedent is subject but non-link, and the other is non-subject but link), both potential antecedents have an intermediate degree of salience, there is no low salience antecedent, and, therefore, OSPs do not show a clear preference for any of the candidates. This explains the contrast between condition 2, in which the OSPs shows a clear preference for the object, non-link referent, and condition 4, in which OSPs do not exhibit a clear preference.\(^5\)

The crucial difference between the two types of pronouns is that NSPs have a simple preference for previous subjects, while OSPs have a more complex preference involving both syntactic and pragmatic factors. This proposal is very much in the spirit of Kaiser and Tureswell’s 2008 approach, according to which multiple constraints affect anaphora resolution. Note that the results for Catalan are very similar to the results of the Finnish (\(\text{hän/tämä}\)) study. The main difference is that while the overt pronoun in the OVS condition does not show a clear preference, the demonstrative \(\text{tämä}\) in Finnish showed a weak preference for the postverbal subject. However, the results for Finnish may have been affected by

\(^5\)The results of this experiment could also be attributed to the different syntactic structures of SVO and OVS sentences. In particular, the behavior of the OSP could be explained as follows: OSPs have a preference for non-subject antecedents in a position lower than Spec(IP). In SVO items, this behavior results in a preference for the object, while in OVS conditions there is no candidate that fulfills the conditions, the object having been left-dislocated in a position that cannot be lower than Spec(IP). In contrast, the NSP has a preference for subject antecedents, regardless of its syntactic position: in Spec(IP) in SVO sentences and in a lower position in OVS sentences. I thank Charles Yang for this observation.
the fact that the demonstrative use of tämä acted as an ’escape hatch’ in a situation where neither argument is a good antecedent. Catalan does not have such an escape hatch and participants just chose the possible antecedents at random.

The corpus data (see Section 2.5) is compatible with the approach presented here. I have identified 101 instances in which the subject is not the link of the sentence, either because it appears postverbally (64 instances), in a left-dislocation (10 instances) or with a focal particle (27 instances). These non-link subjects continue to be good referents for subsequent reference (their referents remain as subjects in 33% of the instances, in 57% the subject is an entity not mentioned in the previous sentence and in 9% the subject is some other (not subject, not link) constituent). There are only two instances in my corpus in which a non-subject link constituent becomes the subject of the next utterance. Thus, there is a tendency for subjects to remain subjects across sentences, regardless of whether they are links or not, while this is not the case for other constituents. The case of left-dislocations is particularly clear: a left-dislocation introduces a state of affairs in which a non-subject becomes the link of the sentence. However, the probability of this link to be selected for subsequent reference is not higher than for the other constituents. This has also been argued by Givón (1983) based on corpora studies; according to him, left-dislocations encode less continuous topics than canonical word-order and right-dislocations.

5.1.4 Game theoretical analysis

As I argued in Chapter 4, the role of the game theorist is to construct a model such that its equilibria coincide with the empirical data available. Therefore, my goal in this section is to adapt the model presented in Chapter 4, so that it can capture the new empirical evidence provided by Experiment 4. In Chapter 4, I mentioned that information states could be thought of as representing different degrees of salience a referent has. In this section, I apply this idea to account for the data provided by Experiment 4.
The results of Experiment 4 can be interpreted as a sign that hearers do not behave in a completely Gricean manner.\(^6\) That is, given that in condition 3 (OVS + null), there is a subject preference, we would expect to observe the usual division of labor and find an object preference in condition 4 (OVS + Overt). However, as argued in the previous section, OSPs seem to be highly constrained to refer only to low salience antecedents and not to object links. I discuss why this might be so at the end of this section.

I propose to model this situation by changing the model presented in the last chapter, so that there are three information states (IS), each corresponding to a degree of salience that is relevant for the problem at hand. The three ISs of the game are the following:

1. Information state [Subject]: the IS in which the speaker wants to refer to the previous subject (regardless of whether or not it is also the link or not). This IS corresponds to referring to the most salient antecedent. As shown in the experiments, the studied pronominal forms are not sensitive to whether a subject is acting as a link or not. Therefore, we do not need two different ISs for subjects depending on their status as links; rather, this can be left unspecified.

2. Information state [Object -link]: the IS in which the speaker wants to refer to a previous non-subject, non-link antecedent. This IS corresponds to referring to the least salient antecedent.

3. Information state [Object +link]: the IS in which the speaker wants to refer to a link non-subject antecedent. This IS corresponds to referring to an antecedent with an intermediate degree of salience. Since pronominal forms are sensitive to the status of object antecedents as links, this cannot be left unspecified and we need two different ISs for object referents.

\(^6\)Thanks to Satoshi Tomioka for discussion of this point.
This state of affairs is represented as a tree in Figure 5.1, which constitutes another game of partial information.

Figure 5.1: Game for interaction between subjecthood and linkhood

In this game of partial information, the speaker announces her choice but this choice may be compatible with different information states; it may be ambiguous for the hearer. The speaker must choose between three forms in each of the three information states: she can utter a sentence with a definite description, an NSP or an OSP. Both pronouns are, in principle, ambiguous across the three information states and a hearer encountering them
will not be certain of which state he is in. The two information sets are indicated by circling
the ambiguous nodes: there is one information set for the NSP \(\{t_1, t_2, t_3\}\) and another one
for the OSP \(\{u_1, u_2, u_3\}\).

The three information states do not have the same probabilities; they represent different cross-linguistic tendencies which are not equally likely. It is possible to estimate their respective probabilities through corpus counts, as I have done in the previous chapter. Information state [Subject] is, by far, the most common: it accounts for over 70% of the instances in the corpus of narrations; then comes information state [Object -link], which accounts for over 20% of the corpus instances. Finally, the information state [Object +link] occurs very rarely; there are only two attested instances in the corpus. To sum up, the probability of information state [Subject] is greater than the probability of the information state [Object -link], which is greater than the probability of the information state [Object +link].

For the purposes of showing the calculations, I assume the following probabilities:
\[p([\text{Subject}]) = \frac{7}{10}, \quad p([\text{Object -link}]) = \frac{2}{10} \quad \text{and} \quad p([\text{Object +link}]) = \frac{1}{10}.\] I keep the values for the payoffs of the different options constant from the last chapter: 5 for the definite descriptions, 8 for overt pronouns and 10 for null pronouns. That is, NSPs are the most economical forms, followed by OSPs and by DDs. In this situation, there is a single Pareto-Nash equilibrium, which states the following:

(75) In information state [Subject], use an NSP; in information state [Object -link], use
an OSP; in information state [Object + link] use a definite description.

When encountering an NSP, interpret it as referring to the previous subject; when
encountering an OSP, interpret it as referring to the previous non-link object.

The expected payoff for the equilibrium is
\[p(\text{Subject}) \cdot 5 + p(\text{Object-link}) \cdot 8 + p(\text{Object+link}) \cdot 10 = 7/10 \cdot 5 + 2/10 \cdot 8 + 1/10 \cdot 10 = 9.1.\]

As with the previous analysis, contextual and linguistic factors may affect the probabil-
ities and the shift in probabilities can change the Pareto-Nash equilibrium of the game, so that, for instance, NSPs can also be felicitously uttered in the other two information states.

The empirical data and its game theoretical modelization point to the following interpretation: Catalan has specific anaphoric forms to refer to antecedents at opposite ends on a scale of salience for activated referents. That is, NSPs refer to maximally salient antecedents (i.e. subjects) and OSPs to low salience antecedents in the immediate context (i.e. non-subject, non-link constituent). In contrast, there is no particular pronominal anaphoric form to refer to an antecedent with an intermediate degree of salience. Interestingly enough, there is also a correlation between the frequency of an IS and whether it is associated with a particular anaphoric form. As noted, cases of referents with an intermediate degree of salience are very scarce. This could explain the seemingly non-Gricean results of Experiment 4. Gricean behavior (and the division of labor between forms and interpretations) does take place, but only for interpretations that are distinct and frequent enough. Opposite ends on a scale of salience for activated referents fulfill the two conditions: they are distinct from each other and they are frequent (even if one end is much more frequent than the other). In contrast, the intermediate degree on a scale of salience, represented by link, non-subject referents, is neither distinct enough from the other two, nor frequent enough. The consequence of this is that no pronominal form shows a clear preference for referents with this intermediate degree of salience. Note that this approach proposes a more complicated relationship between anaphoric forms and salience than, for example, Ariel’s Accessibility Theory.

5.2 Focus

In the previous section, I examined one aspect of how the informational structure of a sentence affects pronoun resolution. In particular, I looked at how the pragmatic structure
of the previous context affects the preferences of the following pronouns. In this section, I examine how the pragmatic status of the pronoun itself affects its own preferences: namely, I consider what happens when a pronoun is marked as being focal. According to Vallduví (1992), focus is the update potential of the sentence. In Catalan, focal information remains in its canonical position, which, for subjects, corresponds to the postverbal position. In addition, subjects can also be explicitly marked as focal by other linguistic cues: syntactic constructions, such as clefts, or focal particles, such as ‘even’ or ‘also’, as in the following examples from the Nocando corpus.

(76)  

a. Postverbal subject pronoun:  

La granota gran va dir ‘Aquesta no es queda aquí a casa meva, si hi sóc jo’.  

“The big frog said ‘She will not stay here, in my place, if I am here’.”

b. Subject pronoun in the focus position of a cleft or pseudo-cleft:  

La mare s’enfada molt amb el nen perquè es pensa que ha sigut ell que l’ha enfonsat.  

“The mother gets very angry with the child because she thinks that he was the one who sank it.”

c. The pronoun appears together with a focal or emphatic particle (even, self, also etc.).  

A l’home li va caure el te, les ulleres, li va caure tot. Va caure fins i tot ell a terra.  

“The man dropped the tea, the glasses, everything. Even he fell down.”

Although it can be argued that the postverbal position is the canonical position for subjects, it is not the most frequent position. As mentioned, subjects act most frequently as links and appear preverbally. In the entire Nocando corpus, there were only 27 cases of focused
subjects and 64 instances of postverbal subjects (out of 5473 utterances). Most of these focal subjects (68 out of 91) refer to an entity not mentioned in the previous discourse. Out of the remaining 23 focal subjects, 12 refer to the previous subject and 11 to the previous object. The data for these counts is very scarce, given that, in the first place, focusing a subject is a marked operation and, in the second place, focused subjects usually refer to discourse-new (or newly introduced) referents. Since the focus of the sentence is the update potential of the sentence, it is a good place to introduce (or reintroduce) new referents in the discourse (Gundel and Fretheim (2001)), but this is only a tendency, not a necessity. The examples in 76 are good evidence of this: focused subjects can be pronouns, which by definition are discourse-old.

In these cases, there is no choice between the two types of pronouns. As mentioned in Section 2.4, focal information is placed at the end of the main clause in Catalan, which is where the main pitch of the sentence is located. If the subject is focal information and the speaker wants to use a pronoun, she is forced to use an OSP because only OSPs can host the main pitch of the sentence in the sentence-final focal position. Otherwise, if an NSP were used, the main pitch would be placed on some other constituent and this would yield a different informational structure. There is, however, a choice between using the pronoun or using a definite description. For example, in sentence 76b above, the choice is between the pronoun *ell* and the DP ‘el nen’ (‘the child’) (note that the same choice would be present in the English translation of the cleft).

Given the fact that OSPs in focal position are not optional anymore, it is an interesting question how this can affect their referring preferences. It may be that they retain the object preference of non-focal OSPs. However, since they are the most economical resource in this situation, it may be that they play the same role as NSPs in the default case and that they exhibit a subject preference. Yet another hypothesis is that focal OSPs are fully ambiguous.

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7Excluding subjects of unaccusative verbs, which tend to always appear postverbally.
Given that they appear in a very marked case (focal subject referring to a discourse-old referent) for which the statistical evidence is scarce, it also seems plausible that speaker and hearer are not able to estimate the probabilities of the two information states. The goal of Experiment 5 is to find out which of the three hypotheses is correct.

5.2.1 Experiment 5: questionnaire study with focal subjects

The goal of this experiment is to test the effect that focus marking has on the biases of OSPs. That is, in a context in which a pronoun is no longer optional, will the referential preferences remain the same as in the default case? Will the OSP take the place of the NSP as the most economical form or is it truly ambiguous?

**Materials**: The materials consisted of nine two-sentence discourses. In these discourses, the first sentence introduces two individuals by means of two proper names of the same grammatical gender, one in subject position and the other in object position. The second sentence contains an OSP in focus position: the focus marking comes from focal particles (such as ‘even’ and ‘only’) or from the syntactic structure (such as being the subject of a cleft). The content of the second sentence is not pragmatically biased to refer to any of the two referents.

(77) La Maria va trobar-se amb la Clara a la biblioteca. Era ella qui havia volgut que estudiessen juntes.

“Maria met Clara at the library. She was the one who wanted them to study together.”

The items were incorporated into a questionnaire experiment together with 24 filler items (some belonging to the items from Experiment 4) and 5 practice items. The complete set of experimental items can be seen in Appendix E.

**Procedure**: The procedure was the same as explained for Experiment 1. The discourses
were presented on the computer screen. Subjects were asked to indicate which interpretation of the second sentence they preferred, i.e., whether they thought it was a statement about the subject of the first sentence, or the object of the first sentence, by choosing one of the two possible paraphrases for the second sentence, such as the ones in 78.

(78)   a. La Maria havia volgut que estudiessin juntes.

   “Maria was the one who wanted them to study together.”

   b. La Clara havia volgut que estudiessin juntes.

   “Clara was the one who wanted them to study together.”

**Subjects:** Thirty-two members from the Universitat Pompeu Fabra community took part in this experiment.

**Results:** The results can be seen in Table 5.4. The numbers indicate the percentage with which every option was chosen. For comparison, I also include the results for condition 2 in Experiment 4, that is, the results for the non-focused overt pronoun with a preceding SVO sentence.

<table>
<thead>
<tr>
<th></th>
<th>subject antecedent</th>
<th>object antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>focused pronoun</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>non-focused pronoun</td>
<td>35</td>
<td>65</td>
</tr>
</tbody>
</table>

Table 5.4: Results for Experiment 5

Subject interpretation was chosen for 45% of the items, while object interpretation was chosen 55% of the time. A t-test was performed to test the hypothesis that the probability of choosing a subject antecedent is 0.5. This test yielded a p-value of 0.26 and a confidence interval between 0.37 and 0.53. Therefore, the null hypothesis cannot be rejected and we have no reason to believe that subject and object were chosen with different probabilities. Therefore, no statistically significant pattern is detected concerning the referring preferences of focused overt pronouns, which indicates that they behave in a truly ambiguous
way. This contrasts with the t-test performed on the data for non-focused pronouns (condition 2 of Experiment 4): the p-value is 0.005 and the confidence interval ranges from 0.25 to 0.45, and, therefore, the null hypothesis can be rejected. In the next section, a game theoretical analysis of these ambiguous focused pronouns is presented.

5.2.2 Game theoretical analysis

The results from Experiment 5 are also amenable to a game theoretical approach. As before, my goal here is to adapt the previous models so that they capture the empirical data just presented. To account for the focus data, we need a model containing the following four information states, in which the speaker has uttered the subject of utterance $U_i$.

1. Information state $[S +f]$: the speaker wants to refer to the subject of $U_{i-1}$ and mark the current subject of $U_i$ as focal.

2. Information state $[S -f]$: the speaker wants to refer to the subject of $U_{i-1}$ and not mark the current subject $U_i$ as focal.

3. Information state $[O +f]$: the speaker wants to refer to the object of $U_{i-1}$ and mark the current subject $U_i$ as focal.

4. Information state $[O -f]$: the speaker wants to refer to the object of $U_{i-1}$ and not mark the current subject $U_i$ as focal.\(^8\)

Each information state has an initial probability, which I call $p(1)$, $p(2)$, $p(3)$ and $p(4)$, respectively. When the speaker does not want to mark the current subject as focal, she has three options: using a definite description, an overt pronoun or a null pronoun. When the speaker wants to mark the current subject as focal, she has only two options: using an overt pronoun.

\(^8\)I am ignoring here the distinction added in the last section between link objects and non-link objects for simplicity. Nothing would change in the Pareto-Nash equilibria if these distinctions were considered.
pronoun or a definite description. The use of the null pronoun is not an option here, given the syntactic, phonological and informational structure of Catalan. The game tree for this game is shown in Figure 5.2.

![Game Tree for Focal Pronouns](image)

**Figure 5.2: Game for focal pronouns (1)**

Whenever the subject is marked as focal, there are explicit cues in the sentence that indicate so: for example, focal particles, the postverbal position of the subject, the use of a cleft, etc. Therefore, the hearer knows based on these cues whether the speaker wants to mark the subject as focal or not. That is, it is not ambiguous whether OSPs are focal or not.
Given this, there are three possible information sets the hearer can find himself in:

- When a focally marked OSP is used, the hearer will know he is either in [S +f] or [O +f].

- When a non-focally marked OSP is used, the hearer will know he is either in [S -f] or [O -f].

- When an NSP is used, the hearer will know he is either in [S -f] or [O -f].

The payoffs are assigned according to the same principles as before: shorter forms are more economical, and therefore receive higher payoffs than longer forms. NSPs receive a payoff of 10, OSPs a payoff of 8 and definite descriptions a payoff of 5.

I continue to estimate probabilities through corpus counts, which are also supported by theoretical considerations. The default state is that in which the current subject is non-focal and refers to a previous subject [S -f]. Most of the counts from the corpus belong to this class (almost 80%) and this reflects the fact that there is a connection between linkhood and subjecthood and that link-focus structures are the unmarked type of information structure (Lambrecht, 2001). Next comes the information state [O -f], with a probability lower than [S -f], since it is less frequent, although it still accounts for almost 20% of the cases. Finally, [S +f] and [O +f] both have the lowest probabilities. They appear much less frequently than the other two information states and with equal low frequency. In our corpus, out of the 23 focused subjects that refer to an antecedent in the previous clause, 12 refer to a previous subject and 11 to a previous object.

With this state of affairs, there are two Pareto-Nash equilibria. Both equilibria make the same predictions for [-f] states (states in which the current pronoun is not marked as

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9 I assume that p(1) = 6/10, p(2) = 2/10 and both p(3) and p(4) = 1/10. With these probabilities, the expected payoff for both Pareto-Nash equilibria is 8.9.

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focal), but differ in [+f] states. In [-f] states, the equilibria is that in [S -f] the speaker will utter an NSP and in [O -f] an OSP; the hearer will interpret the NSP as referring to the subject and the OSP as referring to the object. This is exactly the same equilibrium presented in Section 4.3 to model the Position of Antecedent Hypothesis. As for the [+f] states, the two equilibria differ and are the following:

(79) a. In [S +f], the speaker will use an overt pronoun and in [O +f] a definite description. The hearer will interpret the overt pronoun as referring to the subject.

b. In [S +f], the speaker will use a definite description and in [O +f] an overt pronoun. The hearer will interpret the overt pronoun as referring to the object.

That is, the speaker can use the OSP to refer to both the subject and the object (depending on which equilibrium he chooses) and the hearer can interpret the OSP as referring both to the subject and the object. In other words, focal OSPs are ambiguous in the absence of contextual bias, which is the behavior we wanted to model given the results of Experiment 5. In addition, the model predicts that once either [S +f] or [O +f] becomes more likely, due to contextual information, the Pareto-Nash equilibrium will change and the pronoun will be able to refer felicitously both to the subject and to the object. This seems to be correct. In all the corpus examples, there is either only one salient referent or the contextual information clearly indicates which is the intended referent. For example, if we slightly change the discourse in 76b so that the two referents are of the same gender, as in 80a, the contextual cues allow the hearer to interpret the pronoun as unambiguously referring to the previous object. It is also possible for the focused pronoun to refer to the subject, if the context points in this direction, as in 80b.

(80) a. La mare s’enfada molt amb la nena perquè es pensa que és ella qui ha enfonsat la barca.

“The mother gets very angry with the girl because she thinks that she was the
one who sank it.”

b. La mare s’enfada molt amb la nena perquè es pensa que és ella qui haurà de pagar les destrosses.

“The mother gets very angry with the girl because she thinks that she will be the one to pay for the damages.”

5.2.3 Incompatibility of NSPs and focus: a game theoretical perspective

The approach taken in the last section was to exclude the null pronoun as a valid option for the two [+f] information states. The goal of this section is to show that this incompatibility does not need to be built into the model, but rather can be derived from the model. Samek-Lodovici (1996) points out that the possibility of a focused null subject is usually rejected on the basis that focusing always requires stress, which null subjects evidently cannot support. However, as mentioned above, subjects can be focused structurally, that is, by occupying a postverbal position and no emphatic stress is then needed. In these cases, the null pronoun is, in principle, an option, which needs to be ruled out independently. As I pointed out before, the overt postverbal pronoun does get the nuclear accent of the sentence, but this is something that can be derived from the game and does not need to be stipulated.

There is, however, a fundamental difference between the game I present in this section and the games presented in Chapter 4 and in Section 5.1.4. Those games captured tendencies which are highly affected by context. In fact, games of partial information are particularly useful to model anaphora phenomena because they can capture this context-dependency through the probabilities associated with information states. However, in this case, it is a grammatical fact, and not a tendency, that NSPs cannot convey focal informa-
tion. The idea I entertain in this section is that this grammatical rule is the “frozen” outcome of a game of partial information, “frozen” because the probabilities and, as a consequence the equilibria, cannot be altered by contextual factors.

Consider the model shown in figure 5.3. As before, there are four information states. The speaker may wish to refer to the previous subject and mark the current subject as focal ([S+f]) or as non-focal ([S-f]) or to refer to the previous object and mark the current subject as focal ([O+f]) or as non-focal ([O-f]). Let’s now assume that, in all four information states, the speaker may choose any of the three forms available. That is, the difference vis-à-vis the previous game is that we allow NSPs as a possible option in the [+f] states. The situation for each of the linguistic forms is the following:

- When the speaker chooses a definite description, its referent is not ambiguous for the hearer. In addition, word-order disambiguates the information-structure of the sentence, so whether the subject is focal or non-focal is not ambiguous.

- When the speaker chooses an NSP, the pronoun is in principle ambiguous with regard to its referent and also with regard to its information structure. That is, in a structure with an NSP, the hearer cannot in principle tell whether it is preverbal or postverbal (that is, whether is has been focused or not).

- When the speaker chooses an OSP, it will in principle be ambiguous with regard to its reference, just like the NSP. In addition, unlike the NSP, the sentence has two distinct syntactic structures depending on the information structure; that is, the OSP is either preverbal or postverbal depending on whether it is non-focal or focal, respectively. Therefore, the informational role of the OSP is not ambiguous.

Thus, we have three information sets, circled in the figure, where, in principle, there is some degree of ambiguity for the hearer:
1. The use of an NSP is ambiguous across the four information states.

2. The use of a preverbal OSP is ambiguous between the first two information states: [S -f] and [O -f]. Given the syntactic position of the pronoun, it is impossible for it to be focal.

3. The use of a postverbal OSP is ambiguous between the last two information states: [S +f] and [O +f]. Given the syntactic position of the pronoun, it must be focal.

As in previous games, the payoffs of each form are assigned according to their complexity: 10 for the NSP, 8 for the OSP, and 5 for the definite description. The probabilities assigned to each information state follow from corpus frequencies and are kept constant from the last section: the information state [S -f] is the most frequent one, followed by [O -f] and followed by the two +focus states [S + f] and [O +f]. The probabilities used for the computation are the same as were used in the previous game: p(1) = 6/10, p(2) = 2/10, p(3) = 1/10 and p(4) = 1/10.

With this state of affairs, the equilibria are exactly the same as for the game presented in the previous section. That is, the same results are obtained even if we allow for the NSP to be an option in all information states. The results are the following: there are two Pareto-Nash equilibria, with an expected payoff of 8.9. Both equilibria make the same predictions for [-f] states, but differ in [+f] states. In [-f] states the equilibria is that in [S -f] the speaker will utter a NSP and in [O -f] an OSP; the hearer will interpret the NSP as referring to the subject and the OSP as referring to the object. These are exactly the same equilibria presented in Section 4.3, capturing the predictions of the Position of Antecedent Hypothesis. As for the [+f] states, the two equilibria are the following:

• In [S +f], the speaker will use an OSP and, in [O +f], a definite description. The hearer will interpret the OSP as referring to the subject.
• In [S +f], the speaker will use a definite description and, in [O +f], an OSP. The hearer will interpret the OSP as referring to the object.

Therefore, the prediction is that NSPs will not occur if the speaker wants to mark them as focal, even if we allow them as a potential option in the game. The fact that the use of an NSP triggers a potential four-way ambiguity (it is ambiguous among the four information states) makes it not an optimal option in the more marked (with lower probabilities) information states.

The idea behind this game is that its outcome becomes grammaticalized and it becomes a part of the grammar that NSPs cannot be used to convey focal information. Once this happens, the probabilities of the different information states cannot be altered and NSPs can never be the optimal solution when the speaker wants to mark the subject as focal. This game is, then, at a different level than the other games presented here. The other games were meant to represent a model of speaker and hearer competence, which reflects how they choose and interpret different referring expressions. In contrast, the last model presented here is meant as a proposal of why it needs to be the case that it is grammatically impossible for NSPs to convey focal information.

5.3 Conclusion

In this chapter, I have argued for a more complex model to account for the referring preferences of NSPs and OSPs. The experimental data shows that neither the Position of Antecedent Hypothesis nor the Discourse Prominence Hypothesis can account for the behavior of both pronouns. NSPs have a simple subject preference, while OSPs are influenced by both syntax and information structure: they prefer low salience antecedents. In addition, in contexts where there is no variation, such as when OSPs convey the focal information of the sentence, their preferences disappear and they become fully ambiguous.
The relationship between pronouns and information structure categories has been modeled with games of partial information in Sections 5.1.4 and 5.2.2. A game theoretical explanation of why null pronouns cannot convey focal information is proposed in section 5.2.3.

One of the findings reported in this section is that there seems to be a correlation between lack of preferences of a pronominal expression in a particular context and scarcity of data regarding the use of the pronominal expression in that particular context. It is then an interesting question how much data is necessary so that speakers and hearers can form estimations about the use of a form and take advantage of them to make the most efficient use of the different linguistic resources at their disposal.
Figure 5.3: Game for focal pronouns (2)

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Chapter 6

Cross-linguistic variation

The main focus of interest in this thesis is analyzing the behavior of NSPs and OSPs in Catalan and modeling this data. However, it is interesting to look at other null-subject languages and dialects (NSL) and discuss how we can deal with cross-linguistic variation. In the first section of this chapter, I discuss data from other languages that shows that not all Romance NSLs behave in a uniform way, in both quantitative and qualitative terms. Subsequently, I explore two different options for capturing this variation. My goal is not to review all the Romance dialects and to provide a definitive answer about these issues, but to draw attention to two promising hypothesis: the priming hypothesis and the grammar competition hypothesis.

6.1 Null and overt subjects across varieties

It is well-attested in the literature that not all NSLs behave the same. The contexts in which NSPs and OSPs are required or forbidden vary across dialects, as well as their respective rates. In this section, I review some of the main differences across some Romance languages and dialects. I cannot do justice here to the vast literature on the topic (see
Flores-Ferrán (2007) for a nice overview for Spanish); my aim here is just to highlight some interesting differences. I start with quantitative differences revealed by sociolinguistic studies and continue with qualitative differences investigated in other frameworks.

### 6.1.1 Quantitative studies

There has been extensive sociolinguistic research on the variable use of OSPs in different Romance varieties, particularly in different Spanish dialects. These studies have identified several factors which regulate this variation and have also highlighted that there is significant variation in the overall use of OSPs.

Table 6.1 summarizes the overall rate of OSPs found in different sociolinguistic studies. As can be seen, there is a wide range of overall use of OSPs; Brazil and Caribbean (Dominican, Puerto Rican and Cuban Spanish) varieties being at one end of the spectrum and Mexican, Iberian Spanish and European Portuguese at the other end.

<table>
<thead>
<tr>
<th>% of overt pronouns</th>
<th># of verbs</th>
<th>study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>56</td>
<td>8924</td>
</tr>
<tr>
<td>San Juan (Puerto Rico)</td>
<td>45</td>
<td>2110</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>41</td>
<td>2217</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>35</td>
<td>3805</td>
</tr>
<tr>
<td>Cuba</td>
<td>33</td>
<td>2778</td>
</tr>
<tr>
<td>Ecuador</td>
<td>27</td>
<td>3735</td>
</tr>
<tr>
<td>Colombia</td>
<td>24</td>
<td>1926</td>
</tr>
<tr>
<td>Portugal</td>
<td>22</td>
<td>162</td>
</tr>
<tr>
<td>Madrid (Spain)</td>
<td>21</td>
<td>1059</td>
</tr>
<tr>
<td>Mexico</td>
<td>19</td>
<td>2569</td>
</tr>
<tr>
<td>Portugal</td>
<td>8</td>
<td>6091</td>
</tr>
</tbody>
</table>

Table 6.1: Overall rate of OSPs in different varieties

In his sociolinguistic study, Cameron (1992) did an extensive comparison between two of the dialects which sit at opposite ends of the spectrum: he compared his own data for Puerto Rican Spanish and data from Madrid Spanish, coming from a collection of inter-
views (Esgueva and Cantarero, 1981). The participants in both studies were comparable in terms of age and socioeconomic class. As mentioned, the overall percentage of OSPs is much higher in San Juan as in Madrid. This is the case for every pronoun, except for the second person singular pronoun. This pronoun can be used to refer to one of the participants of the conversation, [+specific] you, or can also be used generically, [-specific] you. The two dialects studied by Cameron treat these two types of second person singular pronouns differently: the two dialects show a similar rate when it is [+ specific], but not when it is [-specific]. In the latter situation, there is an increase of pronominal subjects for the Puerto Rican data (69%) and a decrease for the Madrid data (19%).

<table>
<thead>
<tr>
<th>Category</th>
<th>% of OSPs in San Juan</th>
<th>% of OSPs in Madrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>45</td>
<td>21</td>
</tr>
<tr>
<td>specific you</td>
<td>48</td>
<td>40</td>
</tr>
<tr>
<td>unspecified you</td>
<td>69</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 6.2: Distribution of pronouns across categories in Cameron (1992)

Cameron identified Switch Reference as the most important constraint regulating the appearance of NSPs and OSPs. Switch Reference is the configuration in which the pronoun under study (called the target) does not refer to the previous subject (called the trigger) and Same Reference is the one in which the pronoun does refer to the previous subject. Table 6.3 shows the data according to this condition in both dialects. It can be observed that in both dialects Switch Reference favors the expression of the OSP, which is of course compatible with the Catalan experiments presented in Chapter 3. However, the rate of overt pronouns is still twice as much in Puerto Rico than in Madrid in the two categories.

<table>
<thead>
<tr>
<th></th>
<th>Madrid Same</th>
<th>Madrid Switch</th>
<th>San Juan Same</th>
<th>San Juan Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overt</td>
<td>11</td>
<td>30</td>
<td>31</td>
<td>57</td>
</tr>
<tr>
<td>Null</td>
<td>89</td>
<td>70</td>
<td>69</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 6.3: Distribution of OSPs in switch and same conditions in Cameron (1992)
Although the rates are very different, Cameron argues that the strength of the constraints on the variation is the same. He argues this on the basis of the Varbrul weights of his statistical analysis, which:

“[...] provide a measure of the strength of a given constraint on variation which is relative to other constraints within the same domain as they apply within the dialect or group of speakers being analyzed. Therefore, it is possible for two dialects or groups of speakers to exhibit strikingly different rates of the occurrence of a given variant, and yet to share similar Varbrul weights for the strength of factors which constrain the presence of this constraint (Cameron, 1992, page 227)”.

The Varbrul weights for Switch and Same Reference in both dialects in Cameron’s study are shown in table 6.4:

<table>
<thead>
<tr>
<th></th>
<th>San Juan</th>
<th>Madrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>.64</td>
<td>.65</td>
</tr>
<tr>
<td>+Same</td>
<td>.34</td>
<td>.34</td>
</tr>
</tbody>
</table>

Table 6.4: Varbrul weights for Switch Reference in Cameron (1992)

Thus, although the rates of pronominal expression are very different in the two dialects, the weights are very similar. Cameron offers a speculative explanation of this fact. In the grammar of a language, both the overall rate with which a particular variant occurs and the Varbrul weights associated with the constraints of variation are defining features of this grammar. If there is a change in the weight of a constraint regulating a variation, this may result in a change of the rate of the distribution of this variation, which may, in turn, serve to assign new weights to the other constraints on variation. However, if these weights are resistant to change, a way of maintaining the values would be to increase or decrease the overall expression rate of the variant involved. For the null/overt variation, this idea is translated as follows:
“At some point in time, the effect of Nonspecificity on second person TÚ changed in various dialects of Spanish. In order to maintain the values of the Varbrul weights associated with other constraints in the language, such as Switch Reference, the overall rate of pronominal expression increased or decreased as the case may be. This, in turn, served to maintain the value of the weights associated with the constraints of variation.”

I will explore this idea in connection with another factor that has been identified as regulating this variation: priming effects. Many studies have found that an OSP appears to favor a following OSP, while an NSP appears to favor a following NSP. Table 6.5, from Cameron (1992), shows this effect for the two Spanish dialects he studied. When there is a Same Reference configuration, we find a significant priming effect: OSP triggers, in contrast to NSP triggers, favor OSP targets. When there is a Switch Reference configuration, the priming effect is only significant for the Puerto Rican Spanish data, and not for the Madrid data. In Puerto Rican Spanish, there is again a significant priming effect, such that OSPs lead to more OSPs and NSPs to more NSPs.

<table>
<thead>
<tr>
<th>Trigger is</th>
<th>Madrid</th>
<th>San Juan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both</td>
<td>14 38</td>
<td>35 66</td>
</tr>
<tr>
<td>Overt</td>
<td>24 41</td>
<td>47 72</td>
</tr>
<tr>
<td>Null</td>
<td>11 37</td>
<td>26 63</td>
</tr>
</tbody>
</table>

Table 6.5: Percentage of overt singular pronouns in Madrid and San Juan: cross-tabulation of trigger status by same/switch condition

This priming effect has been extensively discussed for subject pronouns in Spanish (see also Flores-Ferran (2002)) and noticed in many sociolinguistic and psycholinguistic studies for other phenomena (for instance, see Branigan et al. (2000) for syntactic priming or Poplack (1981) for priming effects in the expression of plural markers in Puerto Rican Spanish). Jäger and van Rooij (2007) argue that language users show a tendency to repeat
linguistic material from the immediately preceding context. If a certain item or construction has been used before, the likelihood that it is used again increases, possibly because activated units are more likely to be used than non-activated ones.

6.1.2 Qualitative studies

It has also been proposed that the high frequencies of overt pronouns in Brazilian Portuguese and Caribbean Spanish (Dominican, Cuban and Puerto Rican varieties) are due to changes in the settings of the null subject parameter. For instance, Toribio (2000) argues that Dominican Spanish is undergoing a change process and displays properties both of NSL and Non-NSL. Although null subjects are grammatical, overt pronouns may be used as expletives and in non-finite clauses, as 81a and 81b show. These sentences are ungrammatical in other dialects of Spanish. Also, the discourse in 81c shows a density of overt pronouns which would be highly infelicitous in, for instance, Peninsular Spanish:

(81) a. **Ello** quiere llover
   It wants to rain

b. Ven acá, para nosotro**s** verte
   ‘Come here, for us to see you’

c. Entre tú más estudias tú te vas proyectando mejor y estás adquiriendo más experiencia. algo que tú no conoces o no conocías a través de los estudios. tú lo vas a conocer. Si tú decías una palabra mal anteriormente, tú ya la hablas correctamente
   “The more you study the better you project yourself and acquire more experience. Something that you don’t know or didn’t know through studies you begin to know. If you used to say a word badly before, you now speak it correctly”.

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Moreover, unlike other Spanish varieties, word-order in Dominican Spanish is almost categorically SVO, even in contexts which would require subject inversion in other varieties, such as in matrix an embedded questions:

(82) a. Que tú piensas?
   What you think?
   b. No sabía cuándo ella iría.
   No know when she would go
   ‘I did not know when she would go.’

Toribio (2000) argues that Dominican Spanish is in a state of change and that it contains two grammars: a grammar with the null subject settings and a new, incoming grammar with the non-null subject settings.

Similar claims are found in the literature regarding Puerto Rican Spanish (Morales, 1989) and Brazilian Portuguese. Duarte (1993) claims that Brazilian Portuguese is evolving from being NSL to being non-NSL. She presents some examples in which an obligatory NSL has become optional, as in 83. In other Romance varieties, these contexts (embedded subject coreferential with the main subject of the clause and left-dislocation of the subject) require an NSP. Moreover, Duarte’s diachronic data shows a great increase of the rate of OSPs, from a rate of 20% in 1845 to a rate of 74% in 1992 (shown in Figure 6.1).

(83) a. De repente ela, sabe que ela, quando criança ficava meio triste perisso.
   ‘It may happen that she knows that she as a child would be sad for that.’
   b. A Clarinha ela cozinha que é uma maravilha.
   ‘Clarinha she can cook wonderfully.’

Moreover, diachronic data from de Andrade Berlinck (2000) also shows how the frequency of SV orders has increased from 42% at the beginning of the 19th Century to an
Figure 6.1: Full pronominal subjects during seven periods in Brazilian Portuguese

almost categorical 96% in the second half of 20th Century. The opposite has been the case for postverbal orders, which have almost disappeared. VSX orders decreased from 34% to 2% and VXS orders from 24% to 2%.

6.2 Game theory and cross-linguistic variation

In this section I present two hypotheses about how to understand the dialectal differences presented in the previous section. Let dialect A be the generic name for a dialect with a high rate of overt pronouns (Brazilian Portuguese or Caribbean Spanish) and dialect B the generic name for a dialect with a low rate of overt pronouns (Catalan or Spanish from Madrid or Mexico). The first hypothesis derives the rate differences between dialects from the priming effects presented in Section 6.1.1. The second hypothesis takes as a basis the qualitative differences between dialects just presented and explores that idea that the high rates of OSPs present in dialect A is the result of two grammars currently competing in this dialect.
6.2.1 Hypothesis I: Priming effects

The first hypothesis I explore is the following: priming effects are responsible for (at least, part of) the rate differences between dialect A and dialect B. Consider what happens if priming exerts an effect in a particular dialect: if a particular form is used, this use primes other instances of the same form and, as a consequence, its overall rate increases. If, in a particular context of dialect A, OSPs become highly favored, they will get primed more often, including outside the context that initially triggered them, and, therefore, their overall rate will increase in the whole of this linguistic system. In the case of Puerto Rican Spanish, a good candidate for a triggering context would be the association between OSPs and second person singular pronouns to express generic statements (recall that 70% of generic second person subjects were expressed through OSPs). Most instances of second person singular pronouns express generic statements (Cameron, 1992) and the increase of OSPs in this context could spread to other contexts, which in principle do not favor OSPs, and raise their overall rate.

A way to think about priming effects in a game theoretical model would be to treat them as a Schelling point (Schelling, 1969), that is, as a focal point salient for the participants of the game, in this particular case by virtue of having just been used in the conversation. Once something becomes a Schelling point, it is active in the mental representations of speaker and hearer and it can become easier to produce and interpret. The form that has been used to refer to an antecedent becomes a temporary convention to refer to that particular referent. That is, the initial advantage of NSPs as the maximally economical form may be leveled by OSPs, if they have been primed by another OSP.

It is interesting that in Cameron’s data the priming effect is not equally strong in Same Reference and Switch Reference contexts. It is particularly strong for Same Reference, and not that strong for Switch Reference. In the data for Madrid Spanish, the priming effect was statistically significant only in the Same Reference context and, in San Juan, although
it was significant for both, Same and Switch contexts, the difference of OSP expression between primed and unprimed contexts was 21% for Same Reference, and only 9% for Switch Reference. I believe this is related to the fact that in Same Reference contexts there is one clearly favored form, the NSP, while in Switch Reference contexts there is no such clearly favored form; rather, the preferred form depends on the probabilities assigned to the information states.

Let me spell out in more detail the differences between the two contexts and how this might affect priming effects. Our models from Chapters 4 and 5 predict the use of NSPs in cases of Same Reference. There is one favored form and there is room for priming effects to alter this preference. That is, the Pareto-Nash equilibrium of the game may change if an OSP was used before and is being primed. This would explain why we find twice as many Overt-Overt sequences than Null-Overt sequences in Same Reference contexts. As I mentioned before, the form itself becomes temporally associated with the referent, becomes a Schelling point which participants in the conversation use as a convention to refer to a particular antecedent, temporally overriding the pragmatic constraints that regulates the distribution of NSPs and OSPs.

The situation is quite different in Switch Reference contexts, in which priming effects play a relatively minor role. First, our models already predict that there should be more variation in these contexts: the use of an OSP is predicted, unless there are cues indicating a change of probabilities, in which case an NSP can be used to refer to the object. That is, in Switch Reference contexts, there is already much more variation between the two forms, since the distribution of probabilities in the information states regulate which pronoun will be used and there is less room for priming effects to appear. Second, the nature of Switch Reference contexts, in which the referents of two consecutive subjects are different, does not allow for the association between a particular form and a particular referent.

When there are two factors influencing a particular choice, the effect of each is stronger
when the other factor is less constraining. This has been reported for the relative role of heaviness and newness in Heavy NP Shift and Dative Alternation constructions (Arnold et al., 2000). In our case, priming is able to have a greater effect if the other factor (syntactic and pragmatic constraints) clearly predicts a particular form.

It is beyond the scope of this thesis to work out the details of (i) how priming should be formalized in a game of partial information and (ii) when exactly priming effects operate. With respect to the first question, a possibility would be to translate priming effects directly into the payoff function: that is, the payoff of a particular form rises if it has been primed by the same form. This spike of payoffs of a primed form could alter the Pareto-Nash equilibrium of the game, so that, for instance, an OSP in a Same Reference context becomes the optimal form. As for the second question, although it is clear that priming has an effect on the choice of pronouns, it is also clear that it does not always have an effect and that its effects are temporally limited. That is, there are many appearances of unprimed forms. Thus, it cannot be the case that a primed pronoun always gets higher payoffs, although this does seem to be the case in some circumstances.

### 6.2.2 Hypothesis II: Competition of grammars

Hypothesis II takes as its basis Toribio’s (2000) idea that dialect’s A grammar is undergoing a change in progress from being NSL to being non-NSL. While the change is in progress, speakers will have both grammars at their disposal, although their respective rates will change overtime.

In order to give a game theoretical analysis of dialect A, we need both the model for NSLs proposed in Chapter 4 and refined in Chapter 5 (see figures 4.3 and 5.1) and the model for non-NSLs (see Figure 4.2). The two games, belonging to two different grammars, are in competition and when the innovative grammar is selected in the competition, it may be that an OSP will be used in a context in which a speaker of dialect B would have used an
NSP.

How does the competition of grammars evolve and how do their respective rates change through time? Yang (2000) develops a model of language change and acquisition, which I briefly summarize here. Language acquisition is seen as a competition process among a population of grammars. When an input sentence $s$ is presented, a grammar $G$ is selected with a certain probability $p$. If that grammar can parse the sentence, the selected grammar is rewarded and all the others are punished. If the sentence cannot be parsed, the selected grammar is punished and all the other are rewarded. The penalty probability is what defines the fitness value of a grammar: the penalty probability of a grammar $G_i$, $c_i$, is the probability that an item $s$ in the linguistic environment cannot be parsed by $G_i$.

Language change occurs when two generations, $n$ and $n + 1$, are exposed to sufficiently different linguistic evidence, due to some factor, be it migration, real linguistic innovation or social and cultural factors affecting the distribution of the linguistic expressions in a population. Suppose that the expressions used in a linguistic environment, let’s call them $E_{\{G_1, G_2\}}$, come from two different grammars, $G_1$ and $G_2$. Suppose a proportion $\alpha$ of $G_1$ expressions are incompatible with $G_2$ and a proportion $\beta$ of $G_2$ expressions are incompatible with $G_1$.

At generation $n$, a proportion $p$ of expressions are generated by $G_1$ and a proportion $q$ are generated by $G_2$, where $p + q = 1$. This constitutes the linguistic evidence for the next generation $n + 1$. The penalty probabilities of $G_1$ and $G_2$, $c_1$ and $c_2$, correspond to $\beta q$ and $\alpha p$. We can then compute $p'$ and $q'$, the weights of $G_1$ and $G_2$ respectively, as internalized by the learners of the next generation $n + 1$ (the reader is referred to the original paper for all the mathematical details), which may be different from the weights of the previous generation.

In order for $G_2$ to overtake $G_1$, $q$, the weight of $G_2$, needs to increase in successive generations, until the weight of $G_1$ eventually reaches 0. Expressed in other terms, $G_2$
overtakes \( G_1 \) if \( \beta > \alpha \), which has the following corollary: once a grammar is on the rise, it is unstoppable. Moreover, the weight of \( G_2 \) increases overtime, yielding an S-shaped curve, as frequently described in the language change literature (Kroch, 1989).

In the case at hand, in order for a language to change from being NSL to being non-NSL, there needs to be more sentences in the linguistic evidence that are incompatible with the \( G_1 \) grammar (null-subject grammar) than with the \( G_2 \) grammar (non null-subject + rigid SVO). In the dialect that is changing we cannot observe \( \alpha \) and \( \beta \) directly, but only \( \alpha \cdot p \) and \( \beta \cdot q \). However, we can observe \( \alpha \) and \( \beta \) in varieties in which there is no change in progress, that is, in pure monolingual NSL and non-NSL.

In order to estimate \( \alpha \), we need the percentage of items in a \( G_1 \) grammar which are incompatible with a \( G_2 \) grammar, that is, those sentences with a null or postverbal subject. These counts are fairly easy to find in sociolinguistic or acquisition studies. For example, table 6.6 shows the rates of null and postverbal subjects for Catalan (Casanova (1998)), Mexican Spanish (Silva-Corvalán (1994)) and Italian (Lorusso et al. (2005) and Bates (1976)).

<table>
<thead>
<tr>
<th></th>
<th>% Null Subject</th>
<th>postverbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalan (Casanova, 1998)</td>
<td>72</td>
<td>8.6</td>
</tr>
<tr>
<td>Italian (Bates, 1976)</td>
<td>51</td>
<td>23</td>
</tr>
<tr>
<td>Italian (Lorusso et al., 2005)</td>
<td>74</td>
<td>NA</td>
</tr>
<tr>
<td>Mexican Spanish (Silva-Corvalán, 1994)</td>
<td>59</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 6.6: Percentage of \( G_1 \) items incompatible with a \( G_2 \) grammar

Although there is some variation in the data, these three dialects show a comparable behavior and it is possible to estimate \( \alpha \) at around 75%.

In order to estimate \( \beta \), we need the percentage of items in a \( G_2 \) grammar which are incompatible with a \( G_1 \) grammar, that is, those sentences with expletive subjects, infinitival subjects, left-dislocated subjects followed by an OSP, preverbal subjects in contexts where an NSL would display a postverbal subject (i.e. in questions) and cases of overuse of
OSPs. These counts are somewhat more complicated to obtain. Yang (2003) estimates the appearance of expletive subjects at 1.2% in English. Infinitival subjects and left-dislocated subjects followed by pronouns are not very frequent constructions either. We can safely assume that they are not more frequent than expletive subjects and approximate their frequency at 1% at most. It is also not obvious how to estimate the percentage of preverbal subjects which would be postverbal in an NSL and the rate of overuse of OSPs. For the former, we can assume that most of the postverbal subjects in Spanish or Catalan data would be ungrammatical or dispreferred if placed preverbally. Thus, we can estimate at 18% the percentage of items with preverbal subjects which would be incompatible with an NSL. For the latter, it is hard to decide what constitutes an overuse of OSPs. However, we can get a good approximation looking at data from a topic-drop language, such as Chinese. In Chinese, both subjects and objects can be dropped when they refer to the discourse topic. Chinese topic-drop is more restricted than Romance pro-drop. For instance, if a topic phrase has been fronted in Chinese, an NSP is only possible if the topic phrase is an adjunct and, thus, it is not a possible referent of the NSP. In contrast, if the topicalized constituent is an argument of the verb, the subject cannot be dropped. The contrast is shown in examples 84a and 84b, taken from Yang (2003). In Romance pro-drop, these sentence are acceptable, as the Catalan example in 84c shows.

(84) a. Zai gonguyan-li, e₁ t₂ da-le ren. (e₁ = John)
In park-LOC₂, e₁ t₂ beat-ASP people
‘It is in the park that John beat people up’

b. * Sue₂, e₁ xihuan t₂ (e₁ = John)
Sue₂, e₁ likes t₂
‘It is Sue that John likes’

c. La Sue₂, e₁ estima t₂ (e₁ = John)
Sue, e₁ loves
‘It is Sue that John loves’

The instances of pro-drop in Romance are roughly a superset of the instances of topic-
drop in Chinese. It is a superset because NSPs in Romance do not have to refer to a previous topic, but can refer to a least salient entity depending on the distribution of probabilities in the information states (see Experiment 3 in Section 4.3.1). In addition, those pronouns referring to previous topics will most likely be null: we have shown in Chapters 3 and 5 that null pronouns have a tendency to refer to previous subjects and syntactic subjects tend to coincide with topics most of the time. We can assume that an OSP referring to a topic in a null-subject language would be felt as ‘unnatural’ and would be counted as a case of overuse of an OSP. Since the rate of subject drop in Chinese is 50% (Yang (2003)), we can estimate at 50% the rate of overt pronouns in a $G_2$ grammar which would be incompatible with a $G_1$ grammar (which would count as an ‘overuse’ of OSPs in a $G_1$ grammar).

<table>
<thead>
<tr>
<th>Contexts</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expletive subjects</td>
<td>1.2</td>
</tr>
<tr>
<td>Infinitival subjects</td>
<td>$\approx1$</td>
</tr>
<tr>
<td>Left dislocation + OSP</td>
<td>$\approx1$</td>
</tr>
<tr>
<td>Preverbal subjects in questions</td>
<td></td>
</tr>
<tr>
<td>+ other contexts in which postverbal would be preferred</td>
<td>$\approx18$</td>
</tr>
<tr>
<td>‘Overuse’ of OSPs</td>
<td>$\approx50$</td>
</tr>
</tbody>
</table>

Table 6.7: Percentage of $G_2$ items incompatible with a $G_1$ grammar

Therefore, we can estimate $\beta$ at around 72%. We see, then, that the estimated values of $\alpha$ and $\beta$ are quite close to each other. In fact, there are many stable NSLs and non-NSLs so it is plausible to think that they cannot be easily overcome by other grammars. If so, what can we say about Brazilian Portuguese?

It has been observed that Popular Brazilian Portuguese, the variety spoken by the rural and working class, presents significant differences with standard Brazilian Portuguese. Guy (1981) argues that some of its properties could not have arisen from a natural language change and claims that this dialect originated in a creole language spoken by African speakers in the colonial period, which subsequently underwent a process of decreolization. Brazil had the largest proportion of slaves displaced to the New World, around 3.6 million peo-
ple according to Curtin (1969), cited in Guy (1981). These slaves formed the entire labor force in agriculture and mining and, at the end of the colonial period, in 1817, the African population represented 75% of the population. Therefore, during the period in which the foundations of Popular Brazilian Portuguese were being laid, Afro-Brazilians were the largest group. African languages most likely to have influenced Brazilian Portuguese are the West African languages, Igbo and Yoruba, and the Bantu languages of Angola and the Congo River basin.

One of the linguistic variables studied by Guy and considered incompatible with a natural language change is the variable agreement found in Popular Brazilian Portuguese within a noun phrase or between subject and verb. Guy found that, within a noun phrase, the first word of the NP was almost always marked for plural, while other positions disfavored plural marking. This type of rule has no precedent in the history of Portuguese and Romance languages and does not easily lend itself to a natural change account. In contrast, this same pattern is found in a number of creole varieties of Portuguese and Spanish. The hypothetical Brazilian proto-creole probably lacked agreement, as most creoles do, and would use some NP-initial element to express plurality. This is precisely the pattern found in many West African languages, which were the native languages of the African people brought to Brazil in colonial times.

Also, interestingly, some of the linguistic variables studied by Guy (1981), such as variable agreement, are shared between Brazilian Portuguese and the Caribbean Spanish dialects, and not with the rest of the Spanish-speaking world. In fact, the Caribbean was the region of the Spanish Empire which used slave labor more heavily. Holms (2004) analyzes both Popular Brazilian Portuguese and Nonstandard Caribbean Spanish as semi-creoles, or partially restructured languages, which have some features of both creoles and non-creoles. According to him these varieties are different both from unrestructured overseas dialects (Quebec French or Chilean Spanish) and from completely restructured creole languages.
(Guyanese Creole English and Palenquero Creole Spanish). The ratio between native and non-native speakers of the source language during the first century of creation of the new dialect seems to be the most important factor in determining in which group it will fall. In unrestructured dialects, native speakers were the vast majority. In restructured creoles, non-native speakers were a vast majority. In partially restructured dialects, there was a majority of non-native speakers, but also a significant percentage of native speakers (around 30-40%). Holms also points out that the lack of subject inversion in questions is common in the Atlantic creoles and in the African substrate languages.

As mentioned, Yoruba and Igbo are two of the languages that are most likely to have influenced Popular Brazilian Portuguese. Yoruba is an SVO language, without null subjects (Bode, 2000). As for Igbo, it has traditionally been analyzed as non-NSL as well. However, Eze (1995) argues that it should be treated as an NSL and that its subject pronouns should be analyzed as subject clitics. In any event, whether the languages that influenced Popular Brazilian Portuguese were NSL or not is not crucial for the argument. There is extensive evidence form the field of second language learning that shows that learners of an NSL will overuse OSPs even if their language also allows null subjects. For instance, according to Bini (1993), Spanish learners of Italian use OSPs significantly more than native Italian speakers, although the two languages show a very similar distribution of null and overt pronouns. Similar results are reported by Marzaga and Bel (2006) for Greek learners of Spanish. Bini argues that learners produce these OSPs, which would be absent in their L1, because they have not fixed the [+null subject] value of their Italian Interlanguage yet and need to reinforce verbal morphology. It could also be that in order to ease the processing load of the foreign language, OSPs serve as some sort of ‘default strategy’ (Sorace et al. (2009)).

The hypothesis I entertain is that Brazilian Portuguese began to change due to the migration of African people during colonial times. A language change due to migration can
be modeled using equations coming from population genetics. Population genetics is interested in modeling the evolution of different alleles of the same gene within a population. In particular, population genetics deals with what happens when the proportions of different alleles change due to migration. In the so-called island model, there are two alleles $A$ and $a$, $A$ being favored over $a$. Their respective fitness values are $1$ and $1 - s$ and their respective frequencies are $p$ and $q$ (or $1 - p$). If the island receives some migration $m$ from the continent, in which only allele $a$ is present (and, therefore, $p$ is $0$ for this population), $p$ will change in the island after migration. In particular, it can be shown that if $m \geq s$ (Hartl and Clark, 1989), i.e., if the percentage of migrants is greater than the fitness advantage of the local language, the incoming variety will take over the local variety. In our case study, if the proportion $m$ of immigrants speaking a non-NSL variety is greater than the fitness advantage $s$ that an NSL variety has over a non-NSL variety, the incoming variety (non-NSL) is predicted to take over the local NSL variety. As we have seen, the fitness values of NSL and non-NSL varieties are very similar, so $s$ is certainly smaller than the proportion $m$ of immigrants in Brazil and the Caribbean that spoke a creole, or a non-NSL variety, during colonial times. It is, then, expected that these varieties will lose null pronouns and will go through a period in which they exhibit properties of both NSL and non-NSL.

### 6.3 Conclusion

Null-subjecthood is not displayed uniformly across NSLs: there are both quantitative and qualitative differences, which were reviewed in Section 6.1. I presented two hypotheses regarding how to formalize these differences. Hypothesis I derives the rate differences across dialects from priming effects. Once a particular pronominal form becomes favored in a particular linguistic context, it gets primed more often and, thus, its overall rate increases. Cameron’s (1992) data for Puerto Rican and Madrid Spanish fits nicely with this idea. Hy-
hypothesis II entertains the idea that some dialects are undergoing a process of change and are currently in a transition state from being an NSL towards being a non-NSL with rigid SVO order. Caribbean Spanish and Brazilian Portuguese are good candidates for such varieties.
Chapter 7

Contrast

As mentioned in Section 2.4, OSPs in Romance null subject languages become obligatory when they convey contrast, while NSPs are generally prohibited in these contexts. This is widely acknowledged in the literature about subject expression in Romance. However, often no definition is offered of what is meant by contrast. Moreover, naturally-occurring instances of contrastive OSPs seemingly convey different types of contrast and it is not obvious that they are amenable to a unitary analysis.

In this chapter, I present an analysis of the contrastive import of Romance contrastive OSPs, based on data from Catalan, Spanish and Italian. I claim that contrastive OSPs are Contrastive Topic markers and I offer a definition based on previous analyses by Büring (2003), Tomioka (2008) and Hara and van Rooij (2007). The basic meaning of a Contrastive Topic is an uncertainty contrast, which can be strengthened into an exhaustive contrast in some particular discourse conditions. The pairing between forms and meanings will be derived using game theory.

Section 7.1 presents the data on contrastive Romance pronouns by examining corpus examples. Section 7.2 reviews different approaches to the notion of contrast. Section 7.3 presents an analysis of the corpus data in which OSPs are analyzed as Contrastive
Topics markers, and I advocate for a particular approach to Contrastive Topics. The pairing between forms and meanings is derived by means of game theory in section 7.3.2. Finally, section 7.4 concludes.

7.1 The data

This section presents corpus examples in which the subject pronoun may be taken to convey some notion of contrast. The corpus examples do not all follow the same structure, nor do they seem to convey the same contrastive meaning. Thus, there seem to be different types of examples and different notions of contrast seem to be at stake. Unless otherwise noted, all examples are taken from the Nocando (2004) corpus of narrations: Catalan, Spanish and Italian speakers were asked to narrate stories presented to them with illustrations only. There were three different stories and each story was told by several speakers in their native language. The narrations were recorded and transcribed.

Descriptively, the corpus examples can be broadly divided into three classes: those conveying a double contrast between two entities, those conveying an implicit contrast and those conveying what I call a weak contrast.

7.1.1 Double contrast

I call “double contrast” discourses those two-clause discourses in which two different referents occupy the subject position and their respective verb phrases predicate two different, and in some sense opposite, actions or states. Consider the two examples from Catalan in 85. There are antonym predicates in the two discourses: be happy and be sad in the first one and go (sailing) and stay in the second one. These two opposite actions or states are predicated of two different referents in subject position.

(85) a. En el camí de tornada tots estan enfadats i ell, en canvi, està content.
“On the way home, they are all angry and he, in contrast, is happy.”

b. Ara nosaltres anirem a navegar per l’aigua i tu et quedàs aquí sola.

“Now we will go sailing in the water and you will stay here on your own.”

This type of contrast is explicitly stated in the discourse (as opposed to the implicit contrast that I present in Section 7.1.2) and, for each of the relevant entities in the discourse, it is conveyed whether they did (or did not do) the action that it is predicated of them (as opposed to the weak contrast that I present in Section 7.1.3).

The two sentences become infelicitous if the OSP is replaced by just an NSP. The infelicity of these sentences without the OSP is neither due to potential ambiguity nor to the fact that there is coordination. As for potential ambiguity, the verbal morphology unambiguously indicates the person of the verb, which is different in the two clauses of both sentences: third person plural and third person singular in 85a and first person plural and second person singular in 85b. As for coordination, NSPs in a coordination that do not convey contrast are acceptable, as shown in example 86a. In contrast, NSPs in a discourse without coordination, but which conveys contrast, are still infelicitous, as shown in example 86b, a modified version of 85a.

(86) a. A mig camí la gran tira la granoteta avall i $\textit{smallfrog}$ es queda endarrerida i, a sobre, $\textit{smallfrog}$ es fa mal.

“On the way, the big frog pushes the small frog and $\textit{smallfrog}$ is left behind and, on top of that, $\textit{smallfrog}$ hurts itself.”

b. En el camí de tornada tots estan enfadats amb el nen. # En canvi, $\textit{thechild}$ està content.

“On the way home, they are all angry with the child. # In contrast, $\textit{thechild}$ is happy.”
Similar examples are found in Spanish and Italian, as shown in 87.

(87)  a. La tortuga grande se queda a un lado del río, mientras ellos van a dar una vuelta con la barca.

“The big turtle stays at the side of the river, while they go around with the boat.”

b. Io resto sulla barca e tu cadì in acqua.

“I stay on the boat and you fall into the water.”

This type of contrastive OSP, in a double contrast discourse, is usually excluded from the envelope of variation between NSPs and OSPs in sociolinguistic studies, since there does not seem to be variation between the two forms. Cameron (1992), who studied subject expression in Puerto Rican Spanish, is one of these studies. In particular, he distinguished three subcases of double contrast to be excluded from the envelope of variation.

- **Contrast of Negation**: the same predicate (or two similar predicates) occurs in two sentences, but it is negated in the second one:

(88) **Ellos** fueron pero **yo** no fui.

“They went but I did not go.”

- **Contrast of Scalar Opposition**: there are two similar predicates, which are modified by adjuncts which are construable as elements of a scalar set, such that the two adjuncts differ by degree.

(89) Mi señora habla bien inglés pero **yo** lo hablo bastante mal.

“My wife speaks English well but I speak it very brokenly.”
- Contrast of Alternatives: this type occurs when object arguments of the first and second sentences are construable as elements of a set and understood as alternatives to one another.

(90)  **Yo fuí a una escuela y él fue a otra.**

“I went to a school and he went to another one.”

However, it is not the case that NSPs are always excluded in double contrast discourses. In fact, Matos Amaral and Schwenter (2005) argue against the idea that OSPs are obligatory when contrast is conveyed and show that other linguistic material (such as adverbs) can enable the appearance of an NSP, as 91 shows for Spanish. The reply of Informant A in 91c is unacceptable if there is no contrast marker. It becomes felicitous when a contrastive marker is present, be it an OSP or the adverb *aquí* (literally *here*, translated by Matos and Schwenter, as ‘in our case’). According to them, adverbials that can be constructed as referring to the referent of the subject of the sentence will be acceptable in situations that require a contrastive marker.

(91)  a. Inf A: Vosotros lo tenéis el lunes?

‘You guys have it on Monday?’

b. Inf B: El lunes. Un día estratégico, además.

‘Monday. A day, a strategic day, besides.’

c. Inf A: Bueno, *(nosotros / aquí/ *())* lo tenemos el viernes.

‘OK, we have it on Friday.’

‘OK, here we have it on Friday.’
7.1.2 Implicit contrast

Implicit contrast discourses do not have the explicit contrastive structure we have just examined. However, they do convey an implicit contrast between the antecedent of the pronoun and another entity, highly salient in the context.

Consider example 92a for Catalan: two frogs are the main characters of this story. The big frog is the referent of the NSP of the clause before the OSP. Thus, this referent is maximally salient at the moment of utterance of the OSP. However, an OSP, which, as we have seen, has a preference for non-subject referents, is used to refer to this maximally salient entity. By using this OSP, a contrast is conveyed between the antecedent of the pronoun and the other entity salient in the discourse (that is, the other frog): that is, it is conveyed that one frog, the referent of the pronoun, is big, while the other is not, although this second frog is not explicitly mentioned.

If the OSP were absent, the discourse would still be acceptable and the NSP would still refer to the same referent (to the previous subject, which is what NSPs tend to refer to), but no contrast would be evoked.

The same thing happens with the second OSP of 92b, by which an implicit contrast between the boy and the rest of the family is established, and it is conveyed that the rest of the family, unlike the boy, was looking forward to the dinner.

(92) a. El nen torna a renyar la granota gran i li torna a dir que això no pot ser, que han de ser amics, que s’han de comportar bé i que i $\emptyset_{bigfrog}$ l’ha de cuidar perquè ella$_{bigfrog}$ és la gran.

“The child scolds the big frog again and tells it again that this can’t continue, that they should be friends, they should behave themselves and that $\emptyset_{bigfrog}$ should take care of it because she$_{bigfrog}$ is the big one.

b. En el camí de tornada tots estan enfadats i ell, en canvi, està content perquè ell
no tenia cap ganes d’anar-se’n a sopar.

“On the way home, they are all angry and he, in contrast, is happy, because he was not looking forward going out for dinner.”

This type of contrast is also conveyed through OSPs in Spanish and Italian. The OSP in 93a refers to a highly salient referent and the discourse strongly conveys that while the small frog (the referent of the pronoun) wanted to be friends with the big one, the opposite was not true. The same implicit opposition is true in 93b, in which the speaker implicitly contrasts him having known Michelino for many years with the addressee, who has just met him.

(93)  a. La ranita se pone a llorar porque se ha hecho daño y además ella quería que las dos fueran amigas.

“The little frog starts crying because she has hurt herself and, moreover, she wanted them to be friends”.

b. Guarda che io lo conosco da un sacco di anni, a Michelino.

“Look, I have known Michelino for many, many years.”

### 7.1.3 Weak contrast

Finally, the third type of contrast is the weakest of all three types: it is conveyed that the speaker ignores or does not want to commit herself to whether the predicate is true of anyone else than the antecedent of the OSP. That is, unlike double contrast and implicit contrast, it is not conveyed that there is an opposition between the antecedent of the OSP and some other entity in the discourse or in the context. Rather, the speaker is only making a claim about the referent of the OSP and leaves it open whether this claim should or should not apply to the other entities relevant in the discourse.
Consider example 94a: a waitress is asking a group of people what they would like for dinner. The mother answers with a sentence containing an OSP. Her answer does not convey an implicit contrast between her eating chicken and someone else eating something else, but it is just a partial answer to the waitress’ questions; the other people in the group may or may not eat chicken. The sentence without the OSP would be unacceptable, because it would present the answer as if it was complete and exhaustive in a context in which obviously it is not.

(94) a. ‘Què voldran per sopar?’ La mare diu: ‘Bé, doncs jo vull pollastre’ i el pare ‘Doncs, jo vull sopa’.

‘What will you have for dinner?’ The mother says: ‘Well, I’ll have chicken’ and the father says ‘Well, I will have soup’.

b. “Miri, senyora, nosaltres no sabem pas res de cap granota”

“Look, Ma’am, we don’t know anything about a frog”

The context for 94b is the following: a frog has been creating trouble in a restaurant, one of the costumers complains to the waiters, which are quite clueless about what is going on with the frog. As before, there is no opposition between them not knowing about the frog and someone else knowing about it, but the sentence conveys a weaker meaning: as far as they are concerned, they don’t know anything about a frog; someone else may or may not know the answer.

This weaker contrast can also be expressed through OSPs in Spanish and Italian. In example 95a, taken from Stewart (2003), the informant of a sociolinguistic interview is explaining how she prepares for her job as a journalist. In the first part of the example, she uses the generic second person. However, when she wants to make it clear that this is just her personal experience and that other journalists may or may not do what she has just described, she switches to first person and uses an OSP. In 95b, the speaker makes explicit
her own ignorance, leaving it open whether other people may or may not the answer to the question under discussion.

(95) a. Entonces cuando por la mañana sabes que se convoca una manifestación de estudiantes o, vamos, una cosa similar, pues te informas un poco del tema.
Vamos yo por lo menos pues miro si ha pasado en días anteriores

“so when one morning you know that a student demonstration is to be held, or, well something like that, well, you find out a bit about the issue. Well, at least I, well, look if it has happened on previous days.”

b. “Ma, io non so niente”

“But I don’t know anything about it”

7.1.4 Stressed and unstressed overt pronoun

As mentioned in Section 2.4.5, Rigau (1986; 1989) also noticed that OSPs can convey the weak contrast just examined and, moreover, she noticed that there is a difference between stressed and unstressed OSPs. Unstressed OSPs are compatible with the speaker claiming ignorance about some other entity, while stressed OSPs are not, as shown in 96 for Catalan. That is, unstressed OSPs can convey a weak contrast, while stressed OSPs cannot.

(96) a. Qui vol venir, tu o en Joan?

‘Who wants to come, you or John?’

b. Jo vull venir... en Joan, no ho sé.

c. # JO vull venir.. en Joan, no ho sé.

‘I want to come.. John, I don’t know’

Following Kuno (1972), Rigau’s proposal is that an unstressed OSP triggers an exhaustive listing interpretation, while a stressed one triggers a contrastive focus interpretation.
Rigau (1989) assumes that the two readings are variants of the same emphatic operator. The exhaustive listing interpretation could be paraphrased as ‘Among the people under discussion, only A wants to come’. The contrastive focus interpretation conveys the negation of some alternative and can be paraphrased as ‘as for A (A = 1st person in 96c), but not for X, A wants to come’.

While I agree with the judgments, the labels she uses do not seem correct. The unstressed OSP does not convey an exhaustive listing interpretation. If it did, since “only A wants to come” conveys that the speaker knows that nobody else wants to come, sentence 96b should be a contradiction, but it is not.

Also, interestingly, stressed OSPs cannot appear in discourses with double contrast:

(97)  

a. ‘Qui vindrà?’

‘Who will come?’

b. # JO vindré, però ELLA es quedarà.

‘I will come, but SHE will stay.’

7.2 On the notion of contrast

This section contains a review of the different notions of contrast in the literature. They can be broadly divided into those which look at contrast from the point of view of rhetorical relations and those which see it as a semantic operator. These two points of view are reviewed here and, finally, I concentrate on the analysis of Contrastive Topics, which will be used to analyze the contrastive import of Romance contrastive OSPs.
7.2.1 Contrast as a rhetorical relation

In his approach to discourse relations, Kehler (2002) categorizes contrast as a type of a Resemblance relation. Resemblance relations require that commonalities and contrasts among corresponding sets of entities and relations be recognized. For each relation, the hearer identifies a relation $p_1$ that applies over a set of entities $a_1, ..., a_n$ from the first sentence $S_1$, and a corresponding relation $p_2$ that applies over a corresponding set of entities $b_1, ..., b_n$ from the second sentence $S_2$. Coherence results from inferring a common (or contrasting) relation $p$ that subsumes $p_1$ and $p_2$, along with a suitable set of common (or contrasting) properties $q_i$ of the arguments $a_i$ and $b_i$. In particular, contrast can create this inference in two ways:

- Infer $p(a_1, a_2, ...) \text{ from the assertion of } S_1$ and $p(b_1, b_2, ...) \text{ from the assertion of } S_2$, in which for some property vector $q$, $q_i(a_i)$ and $\neg q_i(b_i)$ for some $i$.

  (98) Gephardt supported Gore, but Armey supported Bush.

  In this example, the same relation $p$ (support) applies in both sentences, and for the contrasting elements $a_2$ (Gore) and $b_2$ (Bush), there is a property $q$ (belong to the Democratic party), such that it is true of $a_2$ and false of $b_2$.

- Infer $p(a_1, a_2, ...) \text{ from the assertion of } S_1$ and $\neg p(b_1, b_2, ...) \text{ from the assertion of } S_2$, in which for some property vector $q$, $q_i(a_i)$ and $q_i(b_i)$ for all $i$.

  (99) Gephardt supported Gore, but Armey opposed him.

  In this example, $p_1$ and $p_2$ correspond to the relations denoted by support and oppose; the common relation $p$ that subsumes these might be the relation denoted by have an attitude towards a candidate. The contrasting elements $a_1$ and $b_1$ correspond to Gephardt and Armey, who have the contrasting property of $q_1$ of supporting different political parties.
The parallel elements $a_2$ and $b_2$ correspond to the meanings of *Gore* and *him*, which share the trivial common property $q_2$ that they denote the same individual.

### 7.2.2 Contrast as a semantic operator

Vallduví and Vilkuna (1998) convincingly argue that it is necessary to distinguish between informational rhematicity and quantificational kontrast\(^1\), two notions that are often subsumed under the term *focus*. According to them, konstrest is a semantic operator which generates a set of alternatives which become available to the semantic computation as a quantificational domain of, for instance, focus-sensitive adverbs. If an expression $a$ is konstrastive, a set $M$ of alternatives is generated. These alternatives need to be comparable to $a$, in the sense of being similar but different (see Umbach (2004) for discussion). For instance, in 100a, the focused (or kontrast-marked) constituent ‘Sue’ generates a set of alternatives, whose elements need to be different from Sue but similar to her at the same time, for instance by including other friends or colleagues of John. The unacceptability of 100b shows that the alternatives need to be different, that is one cannot subsume the other (100b is only acceptable if *martini* is not a drink). In 100c, the need for the alternatives to be similar triggers the interpretation of *port* as a drink.

\begin{align*}
(100) & \quad \text{a. John only saw SUE at the dinner party.} \\
& \quad \text{b. # John only paid for the DRINKS, not for the MARTINI.} \\
& \quad \text{c. John only paid for the BEER, not for the PORT.} \\
\end{align*}

Vallduví and Vilkuna (1998) explore several ways in which contrastiveness can operate in the set of alternatives. Particularly relevant for our purposes is the distinction between identificational, exhaustiveness and thematic kontrast, which they informally define as:

\[^1\text{They spell konstrast like this to distinguish it from the general notion of contrast.}\]
• Identificational kontrast: if $M = \{a,b,c\}$ and $P(x \in M)$, then $P(a)$.

• Exhaustiveness kontrast: if $M = \{a,b,c\}$ and $P(x \in M)$, then $\neg (P((y \in M) \neq a))$.

• Thematic kontrast: if $M = \{a,b,c\}$ and $P(a)$, then $P'(y \in M) \neq a$.

There is some controversy in the literature about whether focused constituents convey an identificational or exhaustiveness contrast. Rooth (1985) argues that in a sentence like 101a contrast is merely "identificational". The contrastive import of the focused phrase could be paraphrased as follows: if a proposition of the form “John saw x at the dinner party” is true, then “John saw Sue at the dinner party” is true. In contrast, operators like only give rise to exhaustiveness by negating all the alternatives created by the focused constituent (101b). Other authors argue that focused constituents do not trigger an identificational kontrast, but an exhaustive one, even if no adverb such as only is present (see, for example Svoboda and Materna (1987)). Also, according to Kuno (1972), the Japanese morpheme $ga$ triggers what he calls an exhaustive listing interpretation, which can be paraphrased as ‘x and only x’ or ‘it is x that’ and is equivalent to the exhaustiveness contrast just presented.

(101) a. John saw SUE at the dinner party

b. John only saw SUE at the dinner party

Finally, the thematic contrast can be paraphrased as “if a property $P$ holds of $a$, then other properties $P'$ hold of other members of $M$”. Vallduví and Vilkuna argue that this is the contrast conveyed by “Contrastive Topics” (see also Szabolcsi (1981)). This paraphrase captures the idea that a Contrastive Topic triggers alternatives and that it is left unspecified what is asserted of these alternatives. Subsequent analyses of Contrastive Topics have attempted to make more explicit their meaning. The main analyses will be reviewed in the next section.
7.2.3 Contrastive Topics


Büring (1999, 2003) proposes an analysis for Contrastive Topics (CT, henceforth)\(^2\). In particular, Büring discusses CTs in English and German, which mark CTs with stress, namely with a rising pitch contour, L-H\(^*_\), unlike Focus, which receives a falling one, H-L\(^*_\). In example 102, the first constituent is the CT, while the last one is a Focus.

(102) a. A: Which book would Fritz buy?
   b. B: [I]\(_{CT}\) would buy [‘The Hotel New HAMPshire’]\(_F\)
   c. B’: # I would buy [‘The Hotel New HAMPshire’]\(_F\)

Büring’s idea is that CTs introduce alternatives, in a similar way as Focus does. However, instead of introducing a set of propositions, like Focus does (Rooth, 1992), a CT introduces a set of sets of propositions or, in other words, a set of questions. Consider again example 102. The focus value of answer B (103a) is a set of propositions, such as the one in 103b, while its Contrastive Topic value (represented by [[A]]\(_{CT}\)) is a set of such sets of propositions, such as in 103c or 103d.

(103) a. A: [I]\(_{CT}\) would buy [‘The Hotel New HAMPshire’]\(_F\)

\(^2\)In earlier papers, Büring refers to Contrastive Topics as S-Topics or Sentence Topics.

d. {Which book would I buy, which book would Paul Simon buy, which book would Fritz buy, ...}

In addition, Büring proposes the following Question/Answer Condition:

(104) Question/Answer Condition: the meaning of the question Q must match one element in the Topic value ([A]_{CT}) of its answer A.

This condition explains the felicity of a Contrastive Topic, as illustrated in answer B of 102: Since the answer introduces alternatives, including ‘Which book would Fritz buy?’, the meaning of the question matches this alternative.\(^3\) In contrast, answer B’ is not felicitous, since it lacks the Topic marking and only the focal alternatives are introduced. The Question/Answer Condition also explains the felicity of a partial Topic, in which the answer addresses part of the Topic. The meaning of the question 105a matches one element in the Topic value of the answer, namely the one represented first in the set in 105d.

(105) a. A: What did the popstars wear?

b. B: The [female]\(_T\) pop starts wore [caftans]\(_F\)

c. B’: # The female pop starts wore [caftans]\(_F\)

d. {What did the male or female pop stars wear, what did the female pop stars wear, what did the male pop stars wear, what did the Italian pop stars wear}

Furthermore, Büring assumes that CTs carry the following implicature:

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\(^3\)Krifka (1999) points out that the Question/Answer Condition is a necessary, but not sufficient condition for the felicity of this type of answer. The answer only makes sense if we can assume that there is some relation between the original question and the answer.
(106) Topic Implicature: Given a sentence A, containing an Contrastive Topic, there is an Element Q in $[[A]]_{CT}$ such that Q is still under consideration after uttering A.

That is, there is a question in the set of questions denoted by $[[A]]_{CT}$ which is still disputable, which he calls Residual Topic. The Residual Topic might be 107a for 103a and 107b for 105. Note that in both cases the Residual Topic is an element of the Topic Value; in the second case, it is the original Topic, which has not been yet resolved.

(107) a. What would Fritz buy?
   b. What did the male pop stars wear?

   This Topic Implicature accounts for the so-called purely implicational Topic, as illustrated in example 108. The answer without the Topic marking would be felicitous as well. However, the answer with the Topic is also acceptable. According to Büring, the CT introduces alternatives, such as the ones in 109 and, by the Topic Implicature, at least one element in 109 is still under consideration and can serve as a Residual Topic. With this kind of utterance, the speaker can indicate that there is at least one person whose wife might or might not have kissed other men.

(108) a. A: Did your wife kiss other men?
   b. B: [My]$_{CT}$ wife [didn’t]$_F$ kiss other men
   c. B’: My wife [didn’t]$_F$ kiss other men

(109) \{\{my wife kissed other men, my wife didn’t kiss other men\}, \{your wife kissed other men, your wife didn’t kiss other men\}, \{Fritz’ wife kissed other men, Fritz’ wife didn’t kiss other men\},...\}

According to Büring (2003), CTs are used to mark a discourse strategy to answer a Question Under Discussion and are obligatory when there is an implicit sub-question. For instance, in the case of partial Topics (105), an answer with a CT is not fully answering
the Question Under Discussion, but an implicit sub-question, which addresses part of the Question Under Discussion. Büring relates this to the fact that not-given information needs to be marked in discourse.

**Hara and van Rooij (2007)**

Hara and van Rooij (2007) claim that the Japanese morpheme *wa* is a Contrastive Topic marker and that it is licit when the speaker is not sure of the alternatives having the property denoted by the verb or when the speaker knows that the alternatives do not have this property, as the following example shows.

(110)  

a. Among John and Bill, who came to the party?  
   
b. JOHN-wa kita.  
   
   John-wa came.  
   
   (John came, Bill didn’t come or I don’t know about Bill; the speakers considers the possibility that ‘Bill came’ is false.)

Hara and van Rooij (2007) point out a number of problems with Büring’s proposal and propose a simpler way to obtain the Topic alternatives. The main problem with Büring’s approach is that it predicts that Topic marking can only occur with partial answers and should not be able to occur when questions are completely resolved. This prediction is not born out, as answer 111b shows. That is, the CT marking on *Bill* implies that there is still an alternative under consideration. However, at this point, the questions has been completely answered. A possible way out for Büring would be to limit the domain of the partial-answer requirement to each conjunct. However, then another problem would arise: answer 111c would be predicted to be felicitous.

(111)  

a. Among John and Bill, who came to the party?  
   
b. \[[CT \text{ John}] \text{ came, and } [CT \text{ Bill}] \text{ didn’t come.}\]
c. \[ [_{CT} \text{John}] \text{ came, and } [_{CT} \text{ Bill}] \text{ came.} \]

Tomioka (2008) also notes that Japanese \textit{wa} is licensed even without a focused constituent and this poses a problem for Büring’s approach, which crucially relies on a focused marked constituent to generate the alternatives.

Hara and van Rooij (2007) propose that Topic marking creates a simple set of Topic-alternative propositions and gives rise to the implicature that one of the Topicalternatives is not known to be true by the speaker. Crucially, knowledge is defined as “a speaker has more knowledge about \textit{P} if she knows of more individuals that they have property \textit{P}” (Schulz and Van Rooij, 2006): thus, knowing that some individual does not have property \textit{P} is not counted as knowledge. Then, for the speaker not to know that one of the Topic alternatives is true is compatible with both ignoring whether it is true or not and knowing that it is false. Their proposal is summarized in 112.

\begin{align*}
\text{(112) a. Topic alternatives: } & \{\text{P(T'): } T' \in \text{Alt(T)}\} \\
\text{b. CT-implicature: } & \exists T'[T' \in \text{Alt}(T)] \left[ \neg K_{sp}(\text{P}(T')) \right], \text{ where } K_{sp} \text{ represents “the speaker knows that”}.
\end{align*}

This proposal derives the contrast in 111 in the following way. Consider first the acceptable answer in 111b. The first conjunct of this sentence generates the Topic alternatives in 113a and the implicature in 113b. The implicature is compatible with the second conjunct of the sentence; in fact, the second conjunct is just strengthening the implicature (113c). The second conjunct generates the set of Topic alternatives in 114a and the implicature in 114b. Again, the implicature is compatible with the assertion of the first conjunct (114c). Note that the implicature of the second conjunct is not informative, since it conveys something weaker than the previous assertion: however, this does not render the discourse infelicitious. Compatibility between implicatures and assertions is all that is needed to make the discourse felicitous.
(113)  a. Topic alternatives: \{John came, Bill came\}
   b. CT-implicature (1st conjunct): \(\neg K_{sp} \) (Bill came)
   Possibly Bill did not come.
   c. \(\neg K_{sp} \) (Bill came)_{implicature} and \(K_{sp} \neg \) (Bill came)_{assertion}

(114)  a. Topic alternatives: \{John did not come, Bill did not come\}
   b. CT-implicature (2nd conjunct): \(\neg K_{sp} \) (John did not come)
   Possibly John came.
   c. \(K_{sp} \) (John came)_{assertion} and \(\neg K_{sp} \) (John did not come)_{implicature}

Consider now the unacceptable answer in 111c. The same Topic alternatives are generated for both conjuncts, namely those in 113a. The CT of the first conjunct implicates \(\neg K_{sp} \) (Bill came) and this is contradicted by the assertion of the second conjunct: \(K_{sp} \) (Bill came). Note also that this means that this implicature should be treated as a Conventional Implicature (in the sense of Potts (2007)) since it cannot be canceled by a following assertion.\(^4\)

Tomioka (2008) notes that this knowledge based analysis cannot easily account for the presence of CT marking in a variety of speech acts, other than assertions, such as questions, imperatives or performatives (see example 115). His approach is discussed in the next section.

(115)  a. Zyaa Erika-WA doko-e itta-no?
   “Well, then, where did Erika\(_{CT}\) go?”
   b. Eego-WA tyanto yatte-ok-e.
   “At least, prepare yourself for English\(_{CT}\).”

\(^4\)Or rather a stronger cue is needed to cancel the implicature, such as the particle too. Krifka (1999) proposes an analysis for these particles, which basically provides a mechanism to get around what he calls the Distinctiveness Constraint, similar to the CT-implicature discussed here.
Another problem with Hara and van Rooij (2007) is that it does not follow from their approach why the CT marking should be obligatory in 111b. That is, it is not explained why the alternatives and the CT-implicatures are crucial for the felicity of the discourse, which is something Büring (1999) did address.

**Tomioka (2008)**

Tomioka’s analysis is based on the idea that CTs operate at the level of Speech Acts, which are assumed to be within the bounds of sentence grammar. A Contrastive Topic triggers a set of alternatives, not at the sentence level, but at the speech act level. In Tomioka’s approach the rest of the work is done by Gricean reasoning, as is usually applied to implicatures. Consider again the answer in 110: the Contrastive Topic generates a set of alternative speech acts and the pragmatic Gricean reasoning applies.

The Topic alternatives are derived as follows:

\[(116)\]  
\[
a. \quad \text{[[John]]}_{1CT \text{ came}]f^{(g)} = \{ p : \exists h, h \text{ is a distinguished assignment, } p = \lambda w. h(1)\} \\
\text{passed in } w = \{ p : \exists x \in D_e p = \lambda w. x \text{ came in } w\} \\
b. \quad \text{[assert [John]]}_{1CT \text{ came}]f^{(g)} = \{ a : \exists x \in D_e a = \text{assert}(\lambda w. x \text{ came in } w)\} \\
\]

Then, the usual Gricean reasoning applies to the set of alternatives in 116b.

\[(117)\]  
\[
a. \quad \text{The speaker asserted that John came.} \\
b. \quad \text{There are two possible assertions that she could have made, but she only asserted one of them.} \\
c. \quad \text{There must be a reason for not asserting the remaining one.} \\
\]

This last step brings about the sense of uncertainty or incompleteness which invites the hearer to make speculations about the reasons for using a CT. The listener may deduce that the speaker does not know about Bill, but this is only one of the possibilities. If the hearer
knows that the speaker has complete knowledge, she might think that the speaker considers it impolite to advertise that Bill did not come to the party, etc.

Thus, Tomioka’s analysis in principle does not preclude the possibility that the speaker is fully knowledgeable (and neither did Hara and van Rooij’s). He notes, however, that this possibility is absent with CT on measure phrases. The answer in 118b conveys that the speaker does not have full knowledge or, in other words, ‘three’ cannot mean ‘exactly three’. Tomioka derives this effect from a competition between the CT marking and the focus marking. The speaker could have marked the measure phrase with a focus accent, as in 118c. The result of this competition between CT and focus marking adds an extra step in the pragmatic reasoning, as specified in 119:

(118)  a. How many people will come to the party?
       b. SAN-NIn-wa kuru-desyoo.
            “(At least) Three people will come.”
       c. SAN-NIn kuru-desyoo.
            “Three people will come.”

(119)  d. The speaker could have avoided using a CT by using focus. There must be a reason for the speaker choosing a CT.

A CT will, then, bring about a sense of uncertainty or incompleteness when a focus could have been used, but was not (as in 118). A CT will not preclude complete knowledge on the part of the speaker if focus is not possible, as in examples 110 and 111b repeated below, in which it is not possible to use focus marking.

(120)  a. Did both Ken and John come to the party?
       b. # John-ga ki-ta.
            “[John_F] came.”
c. #John-ga ki-ta ga Bill-ga ko-nakat-ta.


Tomioka’s approach can capture the compatibility of *wa* with a variety of speech acts. However, it loses some of the insights from Hara and van Rooij’s theory. Consider first 121b. Tomioka predicts that this sentence could be uttered in the following scenario: the speaker organized a party and invited, among other people, John and Bill. Bill was not really supposed to come to the party, because he was supposed to help take care of his twins, who are sick, but he came to the party anyway. The hearer knows that the speaker has complete knowledge about who came to the party and about Bill’s situation. In this scenario it should be possible for the hearer to reason that the alternative assertion was not uttered because the speaker considers it impolite to announce that Bill did come to the party. However, 121b is not acceptable in this scenario and, if the speaker has complete knowledge, it can only be understood as implying that Bill did not come.

Consider now 121c. It is not clear how the Gricean reasoning should apply in this discourse. Steps (b) and (c) of the Gricean reasoning in 117 do not apply in 121c because in fact the alternatives were asserted, so it is not clear what Tomioka’s predictions are for this example.

(121) a. Among John and Bill, who came to the party?
   b. [CT John] came.
   c. # [CT John] came, and [CT Bill] came.

### 7.2.4 A reformulation

My proposal is to combine the insights of Hara and van Rooij (2007), Tomioka (2008) and Büring (1999, 2003). From Hara and van Rooij (2007), I use the idea that CTs trigger

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5I thank Elena Castroviejo for discussion of this section.
an implicature, to which I refer as uncertainty contrast; from Tomioka (2008), I use the idea that CTs operate on Speech Acts and, from Büring (1999, 2003), I use the idea that CTs are obligatory to address subquestions of the Question Under Discussion. Finally, I also propose that the CT-implicature, the uncertainty contrast, can be strengthened into a stronger contrast under certain circumstances.

CTs convey a CT-implicature, which is basically the CT-implicature proposed by Hara and van Rooij (2007), but applied to alternative Speech Acts (derived following the mechanism proposed by Tomioka (2008)). This implicature is informally stated in 122.

(122) CT-implicature (uncertainty contrast): the speaker conveys that she is not carrying out the alternative speech acts generated by the mechanism in 116.

I use ‘uncertainty contrast’ as a label to refer to this meaning: after triggering a set of alternative speech acts, the speaker refuses to carry them out and the hearer is left wondering why this is so. In the case of assertions, not carrying out an assertion amounts to the proposal by Hara and van Rooij (2007): there is an alternative assertion that the speaker does not want to make either because the speaker knows it is false or because she does not know whether it is true.

Consider now speech acts other than assertions, such as the ones in 115. Regarding the question (115a), a set of alternative questions are generated and it is CT-implied that the speaker is not carrying out the alternative questions. That is, although there are alternative questions she could make, the speaker is only asking about the CT-marked referent. As for the imperative (115b), a set of alternative commands are generated and it is CT-implied that the speaker does not want to carry out these alternative commands either because she has nothing to say about subjects other than English or because she thinks that her addressee should not prepare for subjects other than English.

Furthermore, this CT-implicature can be strengthened into a stronger meaning, under
certain circumstances, whenever one of the Topic-alternatives is salient either in the context or the discourse itself.

(123) Strengthened CT-implicature (exhaustive contrast): a speech act is implied, whose content is the opposite of the content of the salient speech act.

In the case of assertions, the Strengthened CT-implicature implicates the opposite assertion of the salient assertion alternative. That is, the speaker conveys that the proposition expressed by the salient assertion alternative is false. I use ‘exhaustive contrast’ as a label to refer to this meaning.

Finally, we also need Büring’s idea about the relationship between CTs and the Question Under Discussion, which is repeated in 124.

(124) CTs are obligatory when they do not address the Question Under Discussion, but an implicit sub-question of the Question Under Discussion.

The next section shows how this reformulation accounts for all the data presented in Section 7.1.

7.3 Analysis of contrast in Romance OSPs

7.3.1 Contrastive OSPs as Contrastive Topics

The main proposal of this chapter is that, in all the examples from section 7.1, the pronoun is a Contrastive Topic marker, which conveys the CT-implicature just presented: the speaker conveys that she is not carrying out the generated alternative speech acts. This CT-implicature can be strengthened in certain circumstances: that is, the uncertainty contrast can be coerced into an exhaustive contrast. In this section, I apply this analysis to contrastive OSPs and I make more precise the pairing between forms and meanings. I con-
centrate on applying the analysis to the Catalan examples, but the same reasoning applies to Spanish and Italian.

All the corpus data presented here deals with assertions and, thus, Tomioka’s insight about CTs operating on Speech Acts is not crucial to derive the correct interpretation. However, Romance OSPs provide support for Tomioka’s idea: contrastive OSPs can appear in Speech Acts other than assertions, without their contrastive import changing. For instance, 125 is an example of an imperative. The answer with the OSP triggers a set of alternative commands (126), which the speaker chooses not to utter. The meaning we derive is that the speaker does not have anything to say about Bill or that she thinks that Bill should not prepare for English.

(125) a. Quins examens ens haurem de preparar els estudiants de primer?
   ‘Which exams should we, first year students, prepare for?’

b. Tu prepara’t l’exàmen d’anglès.
   ‘You prepare yourself for English.’

(126) {I command that you prepare for English, I command that Bill prepares for English, ...

Let us now go back to the data. The weak contrast examples will be examined first, since they are the ones that fit best with the unstrengthened meaning of Contrastive Topics. Consider first example 94a, repeated in 127a. By virtue of being a CT marker in an assertion, the OSP introduces alternative assertions (127b) and the CT-implicature conveys that the speaker is not asserting the introduced alternatives. An uncertainty contrast is derived: the speaker is not committing herself to asserting what other members of the family will eat. Note that the answer is a partial answer to the Question Under Discussion, that is, an answer to a subquestion of the Question Under Discussion. As a consequence, we expect
the OSP to be obligatory. An answer without the OSP would be unacceptable in this context, because it would present the mother’s answer as a complete answer to the Question Under Discussion, although obviously this is not the case. Note also that, at the end of the dialogue, the Question Under Discussion is completely resolved.

(127) a. ‘Què voldran per sopar?’ La mare diu: ‘Bé, doncs jo vull pollastre’ i el pare ‘Doncs, jo vull sopa’.

‘What will you have for dinner?’ The mother says: ‘Well, I’ll have chicken’ and the father says ‘Well, I will have soup’.

b. {I assert ‘My husband will have soup’, I assert ‘My son will have soup’}

Consider now example 94b, repeated below. This is what Büring would call a Purely Implicational Topic: the OSP is not necessary because the utterance does not need to be interpreted as an answer to a sub-question of the Question Under Discussion. However, the OSP serves to trigger the CT-implicature about the non-asserted propositions. That is, it serves to convey an uncertainty contrast: as far as the speaker is concerned, someone else may (or may not) know about the frog.

(128) a. “Miri, senyora, nosaltres no sabem pas res de cap granota.”

“Look, mam, we don’t know anything about any frog.”

b. {I assert ‘The kids don’t know anything about any frog’, I assert ‘The cooks don’t know anything about any frog’}

Let us move now to the implicit contrast exemplified by the examples in 92, repeated below in 129 and 130. The OSP also introduces Topic alternatives but, in these cases, the CT-implicature gets strengthened: the speaker does not want to carry out the alternative assertion, not because she does not know whether it is true or not, but because she knows it is false. The uncertainty contrast is coerced into an exhaustive contrast. The discourse
leaves no feeling of uncertainty to the hearer because there is one salient Topic alternative in the context which is not likely to be true.

For instance, in 129a, the hearer can easily see that one of the Topic alternatives of the set (represented in 129b), namely the assertion ‘the small frog is the big one’ is not true. Thus, the CT-implicature gets strengthened: the weak contrast becomes an implicit contrast between two entities and it is implicated that the contextually salient Topic-alternative is not true.

(129) a. El nen torna a renyar la granota gran i li torna a dir que això no pot ser, que han de ser amics, que s’han de comportar bé i que l’ha de cuidar perquè ella és la gran.

“The child scolds the big frog again and tells it again that this can’t continue, that they should be friends, they should behave themselves and that she should take care of it because she is the big one.

b. {‘The child asserts ‘The little frog is the big one’, The child asserts ‘the big frog is the big one’}

The same reasoning holds for 130a. It is clear in the story told by the speaker that the boy (referred to by the pronoun he) was not looking forward to the dinner, while the rest of the family was. With the use of the Contrastive Topic, it is implied that this salient Topic alternative is not true: the CT-implicature is strengthened and a stronger implicit contrast is conveyed.

(130) a. En el camí de tornada tots estan enfadats i ell, en canvi, està content perquè ell no tenia cap ganes d’anar-se’n a sopar.

“On the way home, they are all angry and he, in contrast, is happy, because he was not looking forward to going out for dinner.”
b. \{The speaker asserts ‘The rest of the family was not looking forward to going out for dinner’, the speaker asserts ‘the pets were not looking forward to going out for dinner’\}

Note that the OSP refers to a previous subject (against its tendency) and that its use is optional, since the utterance does not need to be interpreted as an answer to a sub-question of the Question Under Discussion. An NSP would refer to the same antecedent but no implicature would be triggered (there would be no implicit contrast between the two referents). Thus, the OSP is used here not to select a particular referent, but to convey a particular implicature.

Finally, consider the cases of double contrast from 85, also repeated below. In these cases, the OSP is mandatory and there is no uncertainty feeling overall in the discourse. I argue that this is just another case of the Strengthened CT-Implicature being conveyed, of an uncertainty contrast being coerced into an exhaustive contrast. The OSP is mandatory because a CT is needed to mark that each of the conjuncts is addressing a sub-question of the Question Under Discussion.

Consider the example in 85b, repeated below in 131. This whole discourse is an answer to the implicit question under discussion in 132a, but each conjunct is an answer to the sub-questions in 132b and 132c and, thus, the OSP is needed in each conjunct.\(^6\) Sentences with NSPs are understood as complete answers to the Question Under Discussion. If an NSP were used in 131, the second conjunct would become uninterpretable.

(131) Ara nosaltres anirem a navegar per l’aigua i tu et quedaràs aquí sola.

“Now we will go to the boat to sail in the lake and you will stay here on your own.”

(132) a. What will everyone do?

\(^6\)Or an adverbial of the type discussed by Matos Amaral and Schwenter (2005). See Section 7.3.2 for more comments on this.
b. What will we do?

c. What will you do?

With a pronoun marking a CT in each conjunct, a set of alternatives is introduced for each conjunct (133a and 133b). The hearer will try to make sense of these sets and of why the speaker did not assert the non-asserted alternatives. In this case, he can easily arrive at the conclusion that the alternatives were not asserted because they are not true, since, in fact, they are explicitly negated in the discourse. The discourse, thus, does not leave an overall feeling of uncertainty and, by virtue of the Topic alternatives being explicit in the discourse, the CT-implicature can be strengthened.

(133) a. \{I assert ‘We will sail in the lake’, I assert ‘you will sail in the lake’\}

b. \{I assert ‘We will stay here’, I assert ‘you will stay here’\}

In this example, and in all examples of double contrast, there is a rhetorical relation of contrast, but this is orthogonal to the discussion. Whenever one of the Topic alternatives ends up being subsequently negated, the resulting rhetorical relation will be of contrast, but this does not need to be the case, as in the other examples discussed above (examples 127, 128, 129, and 130).

The approach defended here explains two correlations reported in sociolinguistic studies as well: correlations between pronominal subject expression and (i) first person singular pronouns (Cameron, 1992; Silva-Corvalán, 1994) and (ii) psychological verbs (Silva-Corvalán, 1994; Travis, 2005). First person singular often serves to convey the speaker’s own opinion. It is, then, not unexpected that first person singular triggers a higher rate of overt pronouns if the speaker wishes to convey that those are exclusively her opinions which may or may not coincide with those of other people. The same argument holds for psychological verbs which express subjective opinions or points of view. Note that although variationist studies claim that they exclude contrastive pronouns from the envelope
of variation, they would not exclude those cases in which the Contrastive Topic conveyed by the OSP is optional (such as examples 94 and 92). These optional contrastive pronouns could also account for some percentage of OSPs in same reference contexts, which, in principle, favor NSPs. Finally, this approach is also consistent with views coming from discourse analysis studies. For instance, Davidson (1996) claims that pronouns serve to increase the ‘pragmatic weight’ of utterances and make them ‘more personally relevant’ and Stewart (2003) claims that overt pronouns are used as a way to hedge the speaker’s opinions and protect their pragmatic face. In fact, these analyses point to observations that are a byproduct of pronouns expressing Contrastive Topics and, thus, bringing about some sense of uncertainty or non-finality about the non-asserted alternatives. The speaker may wish to trigger this uncertainty feeling for politeness reasons: by uttering a Contrastive Topic in first person singular, the speaker is protecting her face (the “public self-image that every member wants to claim for themselves” (Brown and Levinson, 1987)) and conveying that she is making a modest claim that need not be true of other discourse alternatives.

7.3.2 Game theory and contrast

Let me begin this section with a reminder of the pairings between forms and meanings found in Romance null subject languages. These will be the pairings derived by means of game theory.

- A contrastive overt pronoun is a Contrastive Topic marker (Hara and van Rooij, 2007; Tomioka, 2008), which conveys an uncertainty contrast, by means of the CT-implicature. This uncertainty meaning can be coerced into an exhaustive meaning if there are enough contextual cues (if there is one salient alternative in the context or the discourse).

- In cases of double contrast, the overt pronoun cannot be replaced by only a null
pronoun, but can be replaced by another contrast marker, such as an adverbial. There is no overall uncertainty meaning.

- Stressed overt pronouns convey an exhaustive contrast, but are not acceptable in double contrast structures (see Section 7.1.4).

A contrastive OSP is not used to select the correct antecedent, but mainly to trigger the desired interpretation. Thus, the information states in the game cannot select between different antecedents, but between different interpretations. The relevant interpretations are (i) a non-contrastive one, (ii) an uncertainty contrast interpretation and (iii) an exhaustive contrast interpretation. My proposal is that we need a chain of two games to derive the pairing between forms and meanings described above. In the first game, the decision of the speaker is between uttering an NSP or an OSP and the decision of the hearer is between interpreting the discourse contrastively or non-contrastively (I call this game Contrast I Game, henceforth). In the second game, the decision of the speaker is which type of OSP to utter, stressed or non-stressed, and the decision of the hearer is which type of contrastive interpretation to arrive at, uncertain or exhaustive (I call this game Contrast II Game).

Contrast I Game can be seen in figure 7.1 and its structure is as follows. There are two relevant Information States: $s_1$, Non-Contrast, and $s_2$, Contrast. In the former state, the utterance is a complete answer to the Question Under Discussion and no contrast with other entities is conveyed. In the latter state, there is some contrast between the referent of the pronoun and some other entity. In each of the information states, the speaker has two options: she can either use an NSP or an OSP. Note that it is left underspecified in Contrast I Game both whether the OSP is stressed or not and whether contrast is exhaustive or not. This is precisely the goal of Contrast II Game.

The two pronouns are in principle ambiguous with respect to the two potential interpretations. Whenever an NSP is used, the hearer will be in the information set $\{t_1, t_2\}$. 

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Whenever an OSP is used, the hearer will be in the information set \( \{u_1, u_2\} \). The payoffs for the two pronominal forms are kept constant from past chapters: 10 for NSPs and 8 for OSPs in both information states. As for the probabilities of the two information states, Non-contrast is the default, unmarked state, while Contrast is the non-default marked state, and therefore, the probability assigned to the the former, \( p_1 \), is greater than the probability assigned to the latter, \( p_2 \). With this state of affairs we derive the following Nash equilibria.\(^7\)

\[(134) \quad a. \quad \{(s_1, \text{NSP}), (s_2, \text{OSP}), (\{t_1, t_2\}, \text{Non-contrast}), (\{u_1, u_2\}, \text{Contrast})\}. \text{ The expected payoff is: } p_1(10) + p_2(8) = 2/3(10) + 1/3(8) = 28/3.\]

\[b. \quad \{(s_1, \text{OSP}), (s_2, \text{NSP}), (\{t_1, t_2\}, \text{Non-contrast}), (\{u_1, u_2\}, \text{Non-contrast})\}. \text{ The expected payoff is: } p_1(8) + p_2(10) = 2/3(8) + 1/3(10) = 26/3.\]

\[c. \quad \{(s_1, \text{NSP}), (s_2, \text{NSP}), (\{t_1, t_2\}, \text{Non-contrast}), (\{u_1, u_2\}, \text{Contrast})\}. \text{ The calculations assume } p_1 = 2/3 \text{ and } p_2 = 1/3, \text{ but the equilibrium will be the same whenever } p_1 > p_2.\]
expected payoff is: \[ p_1(10) + p_2(-10) = \frac{2}{3}(10) + \frac{1}{3}(-10) = \frac{10}{3}. \]

None of the other strategies are Nash equilibria. The first of the three Nash equilibria (134a) is the only Pareto-Nash equilibrium of the game, the Nash equilibrium with the highest payoffs. According to this equilibrium, the speaker should use an NSP in \( s_1 \) and an OSP in \( s_2 \). Also, when the hearer finds himself in the information set \{t, t'\}, he should interpret the NSP as not conveying contrast; when the hearer finds himself in the information set \{u, u'\} he should interpret the OSP as conveying contrast.

This equilibrium corresponds to Horn’s division of pragmatic labor (Horn, 2004), according to which marked forms express marked meanings and unmarked forms express unmarked meanings. A further prediction of the game theoretical model is that if probabilities change, the Pareto-Nash equilibrium of the game will also change. That is, if probability \( p_2 \) becomes greater than \( p_1 \), then the Pareto-Nash equilibrium would be the second equilibrium of 134, rather than the first one. For the purposes of our game, what could make the probabilities change? What could make a contrastive interpretation more likely than a non-contrastive answer? The adverbials studied by Matos Amaral and Schwenter (2005) are a good candidate. Since the adverb is already marking contrast, \( s_2 \) becomes more likely and the equilibrium in 134b becomes the Pareto-Nash equilibrium: in this circumstance, the null pronoun can be used felicitously when the speaker wants to convey contrast.

It also follows from this game that in a situation in which the discourse is sensible with and without a contrastive interpretation (see for example the optional contrastive pronouns in 129a and 130a), both types of pronouns will be acceptable; the only difference will be whether the selected information state is contrastive or not.

The second game is played only if the optimal interpretation in the equilibrium of Contrast I Game was a contrastive one and the optimal form the OSP. A representation of this game can be seen in figure 7.2. The Information States in this game are also two different interpretations, in this case two different contrastive interpretations: \( s_1 \) represents an
uncertainty contrast interpretation (it is not conveyed whether the relevant alternatives did or did not do what is predicated about the referent of the pronoun) and \( s_2 \) represents an exhaustive contrast interpretation (the relevant alternatives did not do what is predicated about the referent of the pronoun) As usual, in each of the information states, the speaker could potentially use two different linguistic expressions: a non-stressed overt pronoun and a stressed overt pronoun, the latter being more marked and requiring more effort than the former. Thus, the payoffs of the non-stressed overt pronouns should be greater than the payoffs for the stressed overt pronouns: I assign them a payoff of 8 and 7, respectively. As for the probabilities, note that all instances of exhaustive contrast are a subset of uncertainty contrast, which is less informative and more general. That is, uncertainty contrast is more unspecified and compatible with more states of affairs than exhaustive contrast. This is a clear indication of their relative probabilities: the probability assigned to uncertainty contrast IS, \( p_1 \), needs to be greater than the one assigned to the exhaustive contrast IS, \( p_2 \).

Figure 7.2: Contrast II Game
With this state of affairs, the game has three Nash equilibria.\(^8\)

\[135\quad \text{a. } \{(s_1, \text{Non-stressed OSP}), (s_2, \text{Stressed OSP}), \{t, t'\}, \text{Uncertainty Contrast}), \{u, u'\}, \text{Exhaustive Contrast})\}. \text{ The expected payoff is: } p_1(8) + p_2(7) = 2/3(8) + 1/3(7) = 23/3.\]

\[135\quad \text{b. } \{(s_1, \text{Stressed OSP}), (s_2, \text{Non-stressed OSP}), \{t, t'\}, \text{Exhaustive Contrast}), \{u, u'\}, \text{Uncertainty Contrast})\}. \text{ The expected payoff is: } p_1(7) + p_2(9) = 2/3(7) + 1/3(8) = 22/3.\]

\[135\quad \text{c. } \{(s_1, \text{Non-stressed OSP}), (s_2, \text{Non-stressed OSP}), \{t, t'\}, \text{Uncertainty Contrast}), \{u, u'\}, \text{Uncertainty Contrast})\}. \text{ The expected payoff is: } p_1(8) + p_2(-10) = 2/3(8) + 1/3(-10) = 6/3.\]

There are no other Nash equilibria and the only Pareto-Nash equilibrium is the one in 135a. Again, the game of partial information derives the division of labor between stressed and unstressed OSPs and two different contrastive interpretations: non-stressed OSPs serve to express the less informative, more general uncertainty contrast and stressed OSPs serve to express the more informative, more specific exhaustive contrast.

The prediction is again that this Pareto-Nash equilibrium can be altered and that the non-stressed OSPs can successfully convey an exhaustive contrast. I argue that this happens precisely in two cases identified before: (i) when there is one salient alternative in the context, that is, in cases of implicit contrast (see examples 92a and 92b) and (ii) when there is one salient alternative in the discourse, that is, in cases of double contrast (see examples 85a and 85b). In both cases, \(p_2\) becomes greater than \(p_1\). In one case, there is a salient alternative in the context and the referent of the pronoun is in contrast with this alternative. In the other case, the salient alternative with which the referent of the pronoun

\(^8\)The calculations again assume \(p_1 = 2/3\) and \(p_2 = 1/3\), but the equilibrium will be the same whenever \(p_1 > p_2\).
contrasts is in the discourse itself. The existence of this salient alternative is able to make the probabilities switch and the non-stressed OSP can express an exhaustive contrast. In all other cases, a stressed OSP needs to be used to convey an exhaustive contrast.

Finally, note that we are predicting that an OSP should be uttered for two different, independent reasons: to select the correct antecedent, based on the pragmatic and syntactic factors described in Chapters 4 and 5, or to express (exhaustive or uncertainty) contrast. That is, an OSP will be used if there is either (i) contrast or (ii) reference to a non-salient antecedent or if both conditions are fulfilled. The discourses in 136 show the three possibilities: 136a shows an OSP that is both contrastive and refers to a low salience antecedent, 136b a non-contrastive OSP that refers to a low salience antecedent and 136c a contrastive OSP that refers to a high salience antecedent.

(136) a. La tortuga veu el nen i ell xiscla, però ella no.

“The turtle sees the child and he screams, but she does not.”

b. La tortuga veu el nen i ell xiscla.

“The turtle sees the child and he screams.”

c. La granota gran ha de cuidar la petita perquè ella és la gran.

“The big frog must take care of the small one since she is the big one.”

7.4 Conclusion

Although there seem to be different kinds of contrastive OSPs in Romance, I have argued that all contrastive OSPs are in fact Contrastive Topic markers. A Contrastive Topic generates Topic alternatives and the speaker conveys that she is not carrying out the alternative speech acts. This implicature, the uncertainty contrast, can be coerced into an exhaustive contrast if there are enough contextual cues: namely, there needs to be a salient relevant
alternative either in the context or in the discourse (in the cases of double contrast). In addition, a Contrastive Topic is needed when the utterance is not a direct answer to the Question Under Discussion, but to a sub-question of the Question Under Discussion.

These pairings between forms and meanings were derived by having a chain of two games of partial information, which matched unmarked, frequent meanings with unmarked, cheap forms and marked, infrequent meanings with marked, expensive forms.
Chapter 8

Conclusion

8.1 Contributions of this thesis

This thesis has examined the variation between null subject pronouns and overt subject pronouns in Catalan, a null-subject language. The empirical basis of the thesis was obtained through five psycholinguistic experiments and corpus data, which were then modeled using game theory. In order to summarize the main contributions of this thesis, the four questions posed in Chapter 1 can now be answered.

- **Question 1:** What is the relationship between syntactic function and pronouns in Catalan? Do different pronouns have biases towards antecedents in particular syntactic positions?

NSPs and OSPs have different preferences depending on the syntactic position of the antecedent: NSPs have a subject preference and OSPs an object preference. The two experiments of Chapter 3 (a questionnaire study and a self-paced reading task) both showed this asymmetry between the two types of pronouns. This division of labor was first studied by Carminati (2002), who called it the Position of Antecedent Hypothesis (PAH). The PAH can easily be captured as the Pareto-Nash equilibrium of a
game of partial information, in which more economical and less marked forms correspond to more frequent and less marked information states, while less economical and more marked forms correspond to less frequent and more marked information states.

Experiment 3 showed that the biases predicted by the PAH can be overridden if there is enough contextual information. NSPs can felicitously refer to the previous object if there are enough contextual cues. Since context is explicitly encoded in games of partial information by assigning probabilities to the different information states, this context dependency directly follows from the model.

- **Question 2:** What is the relationship between information structure and pronouns in Catalan? Do different pronouns have biases towards antecedents playing different roles in the information structure of a sentence? Can the syntactic preferences of pronouns be understood as a byproduct of their pragmatic preferences? What does this tell us about the notion of salience?

Experiment 4 shows that the syntactic preferences of subject pronouns are not a by-product of their pragmatic preferences, but that the two levels interact and the PAH needs to be redefined in order to capture the pronouns’ preferences. NSPs have a simple preference for subject antecedents, regardless of whether they are links or not. OSPs have a more complex preference for low-salience (non-subject, non-links) antecedents.

This data points to a multi-factor concept of salience, to which both syntactic and pragmatic factors contribute, although with different weights. Syntactic factors have a greater weight, so that if a referent is in subject position, it is the most salient antecedent, even if it is not the link of the sentence.

Experiment 5 showed that the lack of variation affects the preferences of the OSP. In
a context in which OSPs become mandatory, because they are focused, they do not have a low-salience preference, but are fully ambiguous.

- **Question 3:** It is well known that different NSLs present different overall rates of OSPs. How should we deal with this cross-linguistic variation in our game theoretical approach?

  I have presented two possibilities. Hypothesis I is that priming effects are responsible for the dialect differences. It has been found in sociolinguistic studies that the use of a particular form primes the subsequent use of this same form. If, in a particular context, OSPs become favored (for instance, OSPs become favored to express genericity in Puerto Rican Spanish), this preference will prime OSPs outside this particular context and the overall rate of OSPs will increase. Hypothesis II is that some dialects (namely, Brazilian Portuguese and Caribbean Spanish) are in a transition from being a null subject language to being a non-null subject language. The two grammars are currently active in those dialects and this affects the use of pronouns and makes the rates of OSPs higher than in other Romance varieties.

- **Question 4:** How should contrastive pronouns be analyzed? Is there only one type of contrastive pronoun? Are they always mandatory?

  I have argued that all contrastive OSPs in Catalan are Contrastive Topic markers. A Contrastive Topic generates a set of alternatives and triggers an implicature concerning the alternatives. This meaning, an ‘uncertainty contrast’, can be strengthened into an ‘exhaustive contras’ under certain circumstances: when there is a salient alternative in the discourse or in the context. Otherwise, a stressed OSP needs to be used to derive this contrast.

  Contrastive pronouns are not always mandatory, but only when they must be interpreted as answering a sub-question of the Question Under Discussion.
8.2 Directions for future work

There are several issues relevant to this thesis that remain open for future work. In this section I discuss several open questions.

- What is the role of definite descriptions? Although the goal of this thesis was to examine the variation between NSPs and OSPs, the role of definite descriptions has been mentioned and used in the analysis. However, more needs to be said about their role in discourse. It is clear that DDs are lower in Ariel’s Accessibility Hierarchy or Gundel et. al.’s Givenness Hierarchy and, thus, they can refer to less activated referents. However, they can also refer to previous objects or even to previous subjects, as shown in 137.

(137) Llavors el gat salta i, doncs, ∅ vol caçar la granota$_j$, però la granota$_j$ s’agafa al biberó

Then, the cat jumps and, well, ∅ wants to hunt the frog$_j$, but the frog$_j$ holds on to the baby bottle

These uses of definite descriptions may be related to stylistic or discourse considerations. For instance, it might indicate the beginning of a new discourse segment or a change of discourse topic. The experiments have shown that a payoff-dominant equilibrium (that is, a Pareto-Nash equilibrium) is used to interpret anaphoric forms. However, it could also be that speakers occasionally decide to use a risk-dominant equilibrium (Sally, 1993), both to add some variation to their speech and to make absolutely sure the hearer is understanding correctly, when they believe there is a risk of mismatches, such as the ones explored in Section 4.4.

- Related to the previous point, I leave it for future work to examine how referring expressions affect the construction of a discourse structure. As just mentioned def-
inite descriptions are likely to contribute to the building of discourse structure. In Chapter 5, I also discussed the role of clitics and how they affect the segmentation of past and future utterances. The segmentation of discourse into different units, as well as the construction of the information structure of sentences, could be seen as part of a bigger game, in which several linguistic cues are used to achieve the desired segmentation.

- How much evidence is necessary so that conversational agents can form estimations and use them? This thesis has used an approach which estimates probabilities of information states based on corpora counts. I have shown that focused OSPs are ambiguous and do not have the non-subject preference of non-focused OSPs. This correlated with the fact that the two involved information states ([subject reference + focused subject] and [object reference + focused subject]) are very rare in corpora, again unlike their unfocused counterparts, so participants are not able to form estimates and use them to choose the maximally efficient form. Is there a minimal threshold so that speakers and hearers can use frequencies in corpora to approximate probabilities of information states?

- How exactly should the role of priming effects be formalized? Priming has been found to have an effect on pronoun choice. It has also been found that it plays a greater role in Same Reference contexts than in Switch Reference contexts (in which there is already much more variation between the two forms). However, it is not the case that priming has an effect all the time. Is it constrained by some other factor? The payoff function is a good place where priming effects could have been encoded in a game theoretical model. How should exactly priming effects modify the payoff function of the game?

- It has also been left for future work how to formalize the implicature conveyed by a
contrastive OSP. The formalization proposed by Hara and van Rooij (2007) should be modified so that it does not rely on the speaker’s knowledge but on her intentions to not carry out the alternative speech acts. It would also be desirable to be more precise about how the strengthening of the implicature takes place. A promising idea would be to use speech acts operators, such as Assert or Quest (Krifka, 1995), so that the relative scope of negation and the speech act operator determine which of the CT implicatures is obtained.
Chapter 9

Appendices

9.1 Appendix A. Materials for Experiment 1

List of the sixteen experimental items in the two conditions and the two paraphrases of the second sentence. The two conditions are:

- Condition 1: null pronoun.
- Condition 2: overt pronoun.

(1)  
   a. La Marta escrivia sovint a la Raquel. Vivia als Estats Units.
   
   ‘Marta wrote frequently to Raquel. She lived in the United States.’

   i. La Marta vivia als Estats Units.
   
   ‘Marta lived in the United States.’

   ii. La Raquel vivia als Estats Units.
   
   ‘Raquel lived in the United States.’

(2)  
b. El Robert va insultar el Carles. Ell estava borratxo.

‘Robert insulted Carles. He was drunk.’

i. El Robert estava borratxo.

‘Robert was drunk.’

ii. El Carles estava borratxo.

‘Carles was drunk.’

(3) a. La Gemma ja no veu l’Anna. S’ha casat fa poc.

b. La Gemma ja no veu l’Anna. Ella s’ha casat fa poc.

‘Gemma does not see Anna anymore. She got recently married.’

i. La Gemma s’ha casat.

‘Gemma got married.’

ii. L’Anna s’ha casat.

‘Anna got married.’


b. L’Adrià ha trucat a l’Albert. Ell estava a l’oficina.

‘Adrià called Albert. He was at the office.’

i. L’Adrià estava a l’oficina.

‘Adrià was at the office.’

ii. L’Albert estava a l’oficina.

‘Albert was at the office.’

(5) a. Demà la Montse anirà al teatre amb la Marta. No ha de treballar.

b. Demà la Montse anirà al teatre amb la Marta. Ella no ha de treballar.
‘Tomorrow Montse will go to the theater with Marta. She doesn’t have to work.’

i. La Montse no ha de treballar.

‘Montse doesn’t have to work.’

ii. La Marta no ha de treballar.

‘Marta doesn’t have to work.’

(6) a. La Sònia ha trucat a la Sílvia. Sempre arriba tard.

b. La Sònia ha trucat a la Sílvia. Ella sempre arriba tard.

‘Sònia called Sílvia. She is always late.’

i. La Sònia sempre arriba tard.

‘Sònia is always late.’

ii. La Sílvia sempre arriba tard.

‘Sílvia is always late.’

(7) a. El Toni farà un viatge amb el Marc. Vol anar de viatge a l’agost.

b. El Toni farà un viatge amb el Marc. Ell vol anar de viatge a l’agost.

‘Toni will travel with Marc. He wants to travel in August.’

i. El Toni vol anar de viatge a l’agost.

‘Toni wants to travel in August.’

ii. El Marc vol anar de viatge a l’agost.

‘Marc wants to travel in August.’

(8) a. El Josep sempre juga a tennis amb el Martí el dijous a les sis. Té la tarda lliure.

b. El Josep sempre juga a tennis amb el Martí el dijous a les sis. Ell té la tarda lliure.
‘Josep always plays tennis with Martí Thursday at six. He is free in the afternoon.’
   i. El Josep té la tarda lliure.
      ‘Josep is free in the afternoon.’
   ii. El Martí té la tarda lliure.
      ‘Martí is free in the afternoon.’

(9) a. La Roser va anar a veure la Marina. Tenia problemes.
   b. La Roser va anar a veure la Marina. Ella tenia problemes.
      ‘Roser went to see Marina. She had problems.’
   i. La Roser tenia problemes.
      ‘Roser had problems.’
   ii. La Marina tenia problemes.
      ‘Marina had problems.’

(10) a. El Jordi va avisar el Gabriel que tindrien problemes. Està espantat.
   b. El Jordi va avisar el Gabriel que tindrien problemes. Ell està espantat.
      ‘Jordi warned Gabriel that they would have trouble. He is scared.’
   i. El Jordi està espantat.
      ‘Jordi is scared.’
   ii. El Gabriel està espantat.
      ‘Gabriel is scared.’

   b. El Germà va insultar el Pere. Ell el va pegar.
      ‘Germà insulted Pere. He hit him.’
i. El Germà va pegar.
   ‘Germà hit.’
ii. El Pere va pagar.
   ‘Pere hit.’

(12) a. La Lali va sempre d’excursió amb la Jordina. Ella disfruta caminant.
   ‘Lali always goes hiking with Jordina. She likes walking.’
   i. La Lali disfruta caminant.
      ‘Lali likes walking.’
   ii. La Jordina disfruta caminant.
      ‘Jordina likes walking.’

   ‘Andreu usually goes to the opera with Ricard. He’s quite an expert.’
   i. L’Andreu és molt aficionat a l’òpera.
      ‘Andrew is quite an opera expert.’
   ii. El Ricard és molt aficionat a l’òpera.
      ‘El Ricard is quite an opera expert.’

(14) a. L’Estel va conèixer la Blanca a la facultat. Era força més gran que la resta.
   ‘Estel met Blanca in college. She was older than the rest of the people.’
   i. L’Estel era més gran.
'Estel was older.'

ii. La Blanca era més gran.

‘Blanca was older.’

(15) a. La Núria ha marxar a viure lluny de la Rosa. La troba a faltar.

‘Nuria has moved far away from Rosa. She misses her.’

i. La Núria troba a faltar la Rosa.

‘Nuria misses Rosa.’

ii. La Rosa troba a faltar la Núria.

‘Rosa misses Núria.’

(16) a. El Víctor no està d’acord amb el Rubén. És molt tossut.

‘Víctor does not agree with Rubén. He’s very stubborn.’

i. El Víctor és molt tossut.

‘Víctor is very stubborn.’

ii. El Rubén és molt tossut.

‘Rubén is very stubborn.’

9.2 Appendix B. Materials for Experiment 2

List of the sixteen experimental items in the four conditions:

- Condition 1: null pronoun + subject bias.
- Condition 2: overt pronoun + subject bias
• Condition 3: null pronoun + object bias.

• Condition 4: overt pronoun + object bias.

(1)  a. El Joan va deixar en ridícul al Dani davant de tothom. Es va excusar repetidament.

   ‘John made fun of Dani in front of everyone. He apologized many times.’

b. El Joan va deixar en ridícul al Dani davant de tothom. Ell es va excusar repetidament.

c. El Joan va deixar en ridícul al Dani davant de tothom. Es va ofendre moltíssim.

   ‘John made fun of Dani in front of everyone. He was very offended.’

d. El Joan va deixar en ridícul al Dani davant de tothom. Ell es va ofendre moltíssim.

(2)  a. El Marc li ha demanat al Lluís que no fumés. Li ha dit que era al·lèrgic al fum del tabac.

   ‘Marc asked Lluís to stop smoking. He told him he was allergic to tobacco smoke.’

b. El Marc li ha demanat al Lluís que no fumés. Ell li ha dit que era al·lèrgic al fum del tabac.

   ‘Marc asked Lluís to stop smoking. He told him he was allergic to tobacco smoke.’

c. El Marc li ha demanat al Lluís que no fumés. Li ha dit que mai no aconseguia deixar-ho.

   ‘Marc asked Lluís to stop smoking. He told him he had not managed to quit.’

d. El Marc li ha demanat al Lluís que no fumés. Ell li ha dit que mai no aconseguia deixar-ho.

(3)  a. La Carla sempre contradiu la Júlia. Ho fa per venjar-se.
b. La Carla sempre contradiu la Júlia. Ella ho va per venjar-se.

‘Carla is always contradicting Júlia. She wants revenge.’

c. La Carla sempre contradiu la Júlia. Sempre s’acaba enfadant.

d. La Carla sempre contradiu la Júlia. Ella sempre s’acaba enfadant.

‘Carla is always contradicting Júlia. She always ends up being angry.’

(4) a. La Mercè va visitar la Rosa a l’hospital. Li va portar bombons.

b. La Mercè va visitar la Rosa a l’hospital. Ella li va portar bombons.

‘Mercè visited Rosa in the hospital. She brought her sweets.’

c. La Mercè va visitar la Rosa a l’hospital. Ja està fora de perill.

d. La Mercè va visitar la Rosa a l’hospital. Ella ja està fora de perill.

‘Mercè visited Rosa in the hospital. She is out of danger now.’

(5) a. La Maria es va trobar la Núria inconscient al sofà. Es va espantar molt.

b. La Maria es va trobar la Núria inconscient al sofà. Ella es va espantar molt.

‘Maria found Núria unconscious on the couch. She got very scared.’

c. La Maria es va trobar la Núria inconscient al sofà. Estava molt pàl·lida.

d. La Maria es va trobar la Núria inconscient al sofà. Ella estava molt pàl·lida.

‘Maria found Núria unconscious on the couch. She was very pale.’

(6) a. El Pere va desafiar el Miquel a beure’s una ampolla sencera de whisky. No ho va dir de broma.

b. El Pere va desafiar el Miquel a beure’s una ampolla sencera de whisky. Ell no ho va dir de broma.

‘Pere challenged Miquel to drink a whole bottle of whiskey. He was not joking.’
c. El Pere va desafiar el Miquel a beure’s una ampolla sencera de whisky. Va acceptar el repte.

d. El Pere va desafiar el Miquel a beure’s una ampolla sencera de whisky. Ell va acceptar el repte.

‘Pere challenged Miquel to drink a whole bottle of whiskey. He accepted the challenge.’

(7)  


‘Vicenc insulted Enric on the street. He used very harsh words.’

c. El Vicenc va insultar l’Enric pel carrer. Li va tornar insults encara pitjors.

 d. El Vicenc va insultar l’Enric pel carrer. Ell li va tornar insults encara pitjors,

‘Vicenc insulted Enric on the street. He insulted him with even worse words.’

(8)  


‘Llorenc respects Quim’s opinion a lot. He always asks him for advice.’

c. El Llorenc respecta molt l’opinió del Quim. Se sent molt important.

d. El Llorenc respecta molt l’opinió del Quim. Ell se sent molt important.

‘Llorenc respects Quim’s opinion a lot. He feels very important.’

(9)  
a. La Irene sempre li fa regals cars a la Maria. Sovint arriba molt justa a fi de mes.

b. La Irene sempre li fa regals cars a la Maria. Sovint ella arriba molt justa a fi de mes.

‘Irene always gives expensive presents to Maria. She has often trouble to make ends meet.’
c. La Irene sempre li fa regals cars a la Maria. A canvi, la convida sovint al teatre.

‘Irene always gives expensive presents to Maria. She invites her to the theater in return.’

(10) a. La Carme sempre intimida la Sònia. Té un caràcter molt fort.

b. La Carme sempre intimida la Sònia. Ella té un caràcter molt fort.

‘Carme has always intimidated Sònia. She has a very strong personality.’

c. La Carme sempre intimida la Sònia. No s’atreveix a parlar-li.

d. La Carme sempre intimida la Sònia. Ella no s’atreveix a parlar-li.

‘Carme has always intimidated Sònia. She does not dare to talk to her.’

(11) a. La Paula va renyar la Núria. És una persona molt exigent.

b. La Paula va renyar la Núria. Ella és una persona molt exigent.

‘Paula scolded Núria. She is a very demanding person.’

c. La Paula va renyar la Núria. Havia comès un error greu.

d. La Paula va renyar la Núria. Ella havia comès un error greu.

‘Paula scolded Núria. She had made a serious mistake.’

(12) a. El Miquel va ensenyar al Joan a tocar la guitarra. És un bon mestre.

b. El Miquel va ensenyar al Joan a tocar la guitarra. Ell és un bon mestre.

‘Miquel taught Joan to play the guitar. He’s a good teacher.’

c. El Miquel va ensenyar al Joan a tocar la guitarra. És un bon alumne.

d. El Miquel va ensenyar al Joan a tocar la guitarra. Ell és un bon alumne.

‘Miquel taught Joan to play the guitar. He’s a good student.’
(13)  a. La Maria sempre vol que la Núria li faci massatges. Així no té mal d’esquena.

b. La Maria sempre vol que la Núria li faci massatges. Així ella no té mal d’esquena.

‘Maria always wants Núria to gave her a massage. She does not have back pain like this.’

c. La Maria sempre vol que la Núria li faci massatges. És massatgista professional.

d. La Maria sempre vol que la Núria li faci massatges. Ella és massatgista professional.

‘Maria always wants Núria to gave her a massage. She’s a professional masseuse.’


b. El Pau mai no vol anar al cine amb el Joan. Ell prefereix anar-hi tot sol.

‘Pau never wants to go to the movies with Joan. He prefers to go there on his own.’

c. El Pau mai no vol anar al cine amb el Joan. Ell sempre xerra durant la peli.

d. El Pau mai no vol anar al cine amb el Joan. Ell sempre xerra durant la peli.

‘Pau never wants to go to the movies with Joan. He always talks during the film.’

(15)  a. La Raquel va ser la mestra d’anglès de l’Anna. Té bon record de la seva estudiant.

b. La Raquel va ser la mestra d’anglès de l’Anna. Ella té bon record de la seva estudiant.

‘Raquel was Anna’s English teacher. She has good memories of her student.’
c. La Raquel va ser la mestra d’anglès de l’Anna. Té bon record de la seva professora.

d. La Raquel va ser la mestra d’anglès de l’Anna. Ella té bon record de la seva professora.

‘Raquel was Anna’s English teacher. She has good memories of her teacher.’

(16)  a. L’Albert va ajudar el Toni a pintar la casa. Sempre ajuda els amics quan pot.

b. L’Albert va ajudar el Toni a pintar la casa. Ell sempre ajuda els amics quan pot.

‘Albert helped Toni to paint the house. He always helps his friends when he can.’

c. L’Albert va ajudar el Toni a pintar la casa. Li va agrair molt el cop de mà.

d. L’Albert va ajudar el Toni a pintar la casa. Ell li va agrair molt el cop de mà.

‘Albert helped Toni to paint the house. He was grateful for his help.’

9.3 Appendix C. Materials for Experiment 3

List of the sixteen experimental items in the eight conditions:

- Condition 1: null pronoun + mild subject bias.
- Condition 2: null pronoun + strong subject bias.
- Condition 3: overt pronoun + mild subject bias
- Condition 4: overt pronoun + strong subject bias
- Condition 5: null pronoun + mild object bias.
- Condition 6: null pronoun + strong object bias.
• Condition 7: overt pronoun + mild object bias.

• Condition 8: overt pronoun + strong object bias.

In parenthesis, the added connective in the ‘strong bias’ conditions.

(1)  a. El Joan va deixar en ridícul al Dani davant de tothom. (Després), es va excusar repetidament.

b. El Joan va deixar en ridícul al Dani davant de tothom. (Després), ell es va excusar repetidament.

‘John made fun of Dani in front of everyone. (Afterwards), he apologized many times.’

c. El Joan va deixar en ridícul al Dani davant de tothom. (Per això), es va ofendre moltíssim.

d. El Joan va deixar en ridícul al Dani davant de tothom. (Per això), ell es va ofendre moltíssim.

‘John made fun of Dani in front of everyone. (That’s why), he was very offended.’

(2)  a. El Marc li ha demanat al Lluís que no fumés. (Resulta que) és al·lèrgic al fum del tabac.

b. El Marc li ha demanat al Lluís que no fumés. (Resulta que) ell és al·lèrgic al fum del tabac.

‘Marc asked Lluís to stop smoking. (It turns out that) he is allergic to tobacco smoke.’

c. El Marc li ha demanat al Lluís que no fumés. (Tanmateix), no aconsegueix deixar-ho.
d. El Marc li ha demanat al Lluís que no fumés. (Tanmateix), ell no aconsegueix deixar-ho.

‘Marc asked Lluís to stop smoking. (However), he told him he had not managed to quit.’

(3) a. La Carla sempre contradiu a la Júlia. (A més), a ella li agrada fer-la empipar.

b. La Carla sempre contradiu a la Júlia. (A més), li agrada fer-la empipar.

‘Carla is always contradicting Júlia. (In addition), she wants revenge.’

c. La Carla sempre contradiu a la Júlia. (Per això), sempre s’acaba enfadant.

d. La Carla sempre contradiu a la Júlia. (Per això), ella sempre s’acaba enfadant.

‘Carla is always contradicting Júlia. (That’s why), she always ends up being angry.’


‘Vicenç insulted Enric on the street. (After having insulted him), he used very harsh words.’

c. El Vicenç va insultar l’Enric pel carrer. (Després de ser insultat), li va tornar insults encara pitjors.

d. El Vicenç va insultar l’Enric pel carrer. (Després de ser insultat), ell li va tornar insults encara pitjors.

‘Vicenç insulted Enric on the street. (After being insulted), he insulted him with even worse words.’


‘Llorenç respects Quim’s opinion a lot. (In addition), he always asks him for advice.’

c. El Llorenç respecta molt l’opinió del Quim. (Tanmateix), no li sol donar gaire bons consells.

‘Llorenç respects Quim’s opinion a lot. (However), he usually does not give good advice.’

(6) a. La Carme sempre intimida la Sonia. (Resulta que) té un caràcter molt fort.

b. La Carme sempre intimida la Sonia. (Resulta que) ella té un caràcter molt fort.

‘Carme has always intimidated Sonia. (It turns out that) she has a very strong personality.’

c. La Carme sempre intimida la Sonia. (Per això), no s’atreveix a parlar-li.

d. La Carme sempre intimida la Sonia. (Per això), ella no s’atreveix a parlar-li.

‘Carme has always intimidated Sonia. (That’s why), she does not dare to talk to her.’

(7) a. La Paula va renyar la Núria. (Tanmateix), ho va fer sense ser gaire dura.

b. La Paula va renyar la Núria. (Tanmateix), ella ho va fer sense ser gaire dura.

‘Paula scolded Núria. (However), she was not too tough.’

c. La Paula va renyar la Núria. (Resulta que) havia comès un error greu.

d. La Paula va renyar la Núria. (Resulta que) ella havia comès un error greu.

‘Paula scolded Núria. (It turns out that) she had made a serious mistake.’
a. La Maria es va trobar la Núria inconscient al sofà. (Després de trobar-la), va trucar l’ambulància.

‘Maria found Núria unconscious on the couch. (After finding her), she called an ambulance.’

b. La Maria es va trobar la Núria inconscient al sofà. (Després de trobar-la), ella va trucar l’ambulància.

‘Maria found Núria unconscious on the couch. (After finding her), she called an ambulance.’

c. La Maria es va trobar la Núria inconscient al sofà. (Després que la trobessin), va recuperar a poc a poc el coneixement.

‘Maria found Núria unconscious on the couch. (After being found), she slowly recovered consciousness.’

d. La Maria es va trobar la Núria inconscient al sofà. (Després que la trobessin), ella va recuperar a poc a poc el coneixement.

‘Maria found Núria unconscious on the couch. (After being found), she slowly recovered consciousness.’


‘Pau prepared dinner for Albert. (In addition), he also prepared dessert.’


‘Pau prepared dinner for Albert. (In addition), he also prepared dessert.’

c. El Pau va preparar-li el sopar a l’Albert. (Tanmateix), no se’l va poder acabar.

d. El Pau va preparar-li el sopar a l’Albert. (Tanmateix), ell no se’l va poder acabar.

‘Pau prepared dinner for Albert. (However), he could not finish it.’

(10) a. El Pere va guanyar el Pau al futbolí. (Resulta que) té molta més experiència.

‘Pere beat Pau at table football. (It turns out that) he is much more experienced.’
c. El Pau va guanyar el Pau al futbolí. (Tanmateix), no s’enfada quan perd.

d. El Pere va guanyar el Pau al futbolí. (Tanmateix), ell no s’enfada quan perd.

   ‘Pere beat Pau at table football. (However), he does not get angry when he loses.’

(11) a. L’Adrià va felicitar el Manel pel seu aniversari. (A més), li va fer un regal.

b. L’Adrià va felicitar el Manel pel seu aniversari. (A més), ell li va fer un regal.

   ‘Adrià wished Manuel a happy birthday. (In addition), he gave him a present.’

c. L’Adrià va felicitar el Manel pel seu aniversari. (Tanmateix), odia fer anys.

d. L’Adrià va felicitar el Manel pel seu aniversari. (Tanmateix), ell odia fer anys.

   ‘Adrià wished Manuel a happy birthday. (However), he hates getting older.’

(12) a. La Verònia no va reconèixer la Marina pel carrer. (Resulta que) és una mica despistada.

b. La Verònia no va reconèixer la Marina pel carrer. (Resulta que) ella és una mica despistada.

   ‘Verònia did not recognize Marina in the street. (It turns out that) she is a bit absent-minded.’

c. La Verònia no va reconèixer la Marina pel carrer. (Resulta que) estava molt canviada.

d. La Verònia no va reconèixer la Marina pel carrer. (Resulta que) ella estava molt canviada.

   ‘Verònia did not recognize Marina in the street. (It turns out that) she was looking very different.’

(13) a. L’Elena va regalar un llibre a la Gemma. (Tanmateix), no té per costum fer regals.
b. L’Elena va regalar un llibre a la Gemma. (Tanmateix), ella no té per costum fer regals.

‘Elena gave a book to Gemma. (However), she does not usually give presents.’

c. L’Elena va regalar un llibre a la Gemma. (Tanmateix), ja el tenia.

d. L’Elena va regalar un llibre a la Gemma. (Tanmateix), ella ja el tenia.

‘Elena gave a book to Gemma. (However), she already had it.’

(14) a. El Toni va anar a escoltar el concert del Pau. (Després), va anar al gimnàs abans que acabés.

b. El Toni va anar a escoltar el concert del Pau. (Després), ell va anar al gimnàs abans que acabés.

‘Toni went to listen one of Pau’s concerts. (Afterwards), he went to the gym before it was over.’

c. El Toni va anar a escoltar el concert del Pau. (Resulta que) toca cada dijous.

d. El Toni va anar a escoltar el concert del Pau. (Resulta que) ell toca cada dijous.

‘Toni went to listen one of Pau’s concerts. ((It turns out that) he plays every Thursday.’

(15) a. El Miquel ha fet enfadar el Ramon. (Per això), li ha demanat disculpes.

b. El Miquel ha fet enfadar el Ramon. (Per això), ell li ha demanat disculpes.

‘Miquel made Ramon get angry. (That’s why), he apologized.’

c. El Miquel ha fet enfadar el Ramon. (Per això), no li parla quan el veu.

d. El Miquel ha fet enfadar el Ramon. (Per això), ell no li parla quan el veu.

‘Miquel made Ramon get angry. (That’s why), he does not talk to him when he sees him.’
(16) a. La Júlia ha enganyat la Maria més d’una vegada. (Resulta que) és molt mentidera.

b. La Júlia ha enganyat la Maria més d’una vegada. (Resulta que) ella és molt mentidera.

‘Júlia cheated on Maria more than ones. (It turns out that) she tells a lot of lies.’

c. La Júlia ha enganyat la Maria més d’una vegada. (Per això), ja no se’n refia.

d. La Júlia ha enganyat la Maria més d’una vegada. (Per això), ella ja no se’n refia.

‘Júlia cheated on Maria more than ones. (That’s why), she does not trust her.’

9.4 Appendix D. Materials for Experiment 4

List of the sixteen experimental items in the four conditions:

- Condition 1: null pronoun + svo.
- Condition 2: null pronoun + ovs.
- Condition 3: overt pronoun + svo.
- Condition 4: overt pronoun + ovs.

In parenthesis, the overt pronouns from Conditions 3 and 4.

(1) a. La Marta escrivia sovint a la Raquel. (Ella) vivia als Estats Units.

b. A la Raquel, l’escrivia sovint la Marta. (Ella) vivia als Estats Units.

‘Marta wrote frequently to Raquel. She lived in the United States.’

(2) a. El Robert va insultar el Carles. (Ell) estava borratxo.
b. Al Carles, el va insultar el Robert. (Ell) estava borratxo.

‘Robert insulted Carles. He was drunk.’

(3) a. La Gemma fa temps que no veu l’Anna. (Ella) s’ha casat fa poc.

b. A l’Anna fa temps que no la veu la Gemma. (Ella) s’ha casat fa poc.

‘Gemma has not seen Anna in a long time. She got recently married.’

(4) a. L’Adrià ha trucat a l’Albert. (Ell) estava a l’oficina.


‘Adrià called Albert. He was at the office.’

(5) a. La Montse ha convidat al teatre a la Marta. (Ella) no ha de treballar.

b. A la Marta, l’ha convidada al teatre la Montse. (Ella) no ha de treballar.

‘Montse has treated Montse to the theater. She doesn’t have to work.’

(6) a. La Sònia va trucar a la Sílvia. (Ella) estava arribant tard.

b. A la Sònia, la va trucar la Sònia. (Ella) estava arribant tard.

‘Sònia called Sílvia. She was late.’

(7) a. El Toni portarà de viatge el Marc. (Ell) sempre ha volgut anar a Londres.

b. Al Marc, el portarà de viatge el Toni. (Ell) sempre ha volgut anar a Londres.

‘Toni will travel with Marc. (He) has always wanted to visit London.’

(8) a. El Josep dóna classes de tennis al Martí. (Ell) té la tarda lliure.

b. Al Martí, li dóna classes de tennis el Josep. (Ell) té la tarda lliure.

‘Josep teaches tennis to Martí. He is free in the afternoon.’

(9) a. La Roser va anar a veure la Marina. (Ella) tenia problemes.
b. A la Marina, la va visitar la Roser. (Ella) tenia problemes.

‘Roser went to see Marina. She had problems.’

(10) a. El Jordi va avisar el Gabriel que tindrien problemes. (Ell) està espantat.
b. Al Gabriel, el va avisar el Jordi que tindrien problemes. (Ell) està espantat.

‘Jordi warned Gabriel that they would have trouble. He is scared.’

(11) a. El Germà va insultar el Pere. (Ell) el va pegar.
b. Al Pere, el va insultar el Germà. (Ell) el va pegar.

‘Germà insulted Pere. He hit him.’

(12) a. La Lali va a buscar la Jordina per anar d’excursió. (Ella) disfruta caminant.
b. A la Jordina, l’ha vingut a buscar la Lali per anar d’excursió. (Ella) disfruta caminant.

‘Lali always goes hiking with Jordina. She likes walking.’

(13) a. L’Andreu ha trucat el Ricard per anar a l’òpera. (Ell) n’és molt aficionat.
b. Al Ricard, l’ha trucat l’Andreu per anar a l’òpera. (Ell) n’és molt aficionat.

‘Andreu called Ricard to go to the opera. He is quite an expert.’

(14) a. L’Estel ajuda amb l’anglès a la Blanca. (Ella) s’hi esforça molt.
b. A la Blanca, l’ajuda amb l’anglès l’Estel. (Ella) s’hi esforça molt.

‘Estel helps Blanca with her English language skills. She puts a lot of effort.’

(15) a. La Núria troba molt a faltar la Rosa. (Ella) ha marxat a viure lluny.
b. A la Rosa, la troba molt a faltar la Núria. (Ella) ha marxat a viure lluny.

‘Nuria misses a lot Rosa. She has moved far away.’

(16) a. El Víctor s’ha enfadat molt amb el Rubén. (Ell) és molt tossut.
b. Amb el Rubén, s’hi ha enfadat molt el Víctor. (Ell) és molt tossut.

‘Víctor got very angry with Rubén. He is very stubborn.’

9.5 Appendix E. Materials for Experiment 5

List of the nine experimental items.

(1) a. El Joan va trucar al Jaume. Era ell qui aniria a París.

‘John called Jaume. It was him who was going to Paris.’

(2) a. La Cèlia va anar a buscar la Sònia a la feina. Era ella qui havia insistit per quedar.

‘Cèlia went to Sònia’s office. It was her who insisted in meeting.’

(3) a. La Maria va trobar-se amb la Clara a la biblioteca. Era ella qui havia volgut que estudiessin juntes.

‘Maria met Clara at the library. It was her who insisted on them studying together.’

(4) a. La Pepa va parlar amb la Marina. La responsable del que havia passat era ella.

‘Pepa talked to Marina. She was the one who was responsible of what had happened.’

(5) a. El Carles li va escriure una carta al Marcel. El guanyador del concurs era ell.

‘Carles wrote Marcel a letter. He was the one who won the competition.’

(6) a. El Lluc volia parlar seriosament amb en Joan. El millor candidat per la feina era ell.

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‘Lluc wanted to talked to Joan. He was the one who was the best candidate for the job.’


‘Pep travelled with Màrius. Only he can do such wonderful pictures as the ones he showed us.’

(8) a. L’Anna va sortir de festa amb l’Eli. Al final de la nit només ella estava borratxa.

‘Anna went out with Eli. At the end of the night, only she was drunk.’

(9) a. L’Aina va quedar amb l’Eva per anar a un concert. Fins i tot ella creia que s’ho passaria bé.

‘Aina met Eva to go to a concert. Even she thought she would have a good time.’
Bibliography


