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Logical Form in the Second Language: An Investigation into Quantification in Interlanguage

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LOGICAL FORM IN THE SECOND LANGUAGE: AN INVESTIGATION INTO QUANTIFICATION IN INTERLANGUAGE

by

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ABSTRACT

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In coping with variability in morphological production in L2 acquisition, which represents a challenge for the parameter (re-)setting theories, Lardiere (2008) proposed the *feature re-assembly hypothesis* in which sequential difficulty in L2 acquisition of morpho-syntactic features is captured by the processes of (re-)assembly and mapping of features onto their morphological realizations. Slabakova (2009, 2013) incorporated Lardiere's proposal in establishing a scale of difficulty in learning semantic properties (e.g. definiteness) which is based on whether reassembly is needed and whether the universal meaning is obtained by overt morphology or context (See also Ramchand & Svenonius, 2008). In considering the truth-conditional aspect of meaning, the feature-based framework is not powerful enough to account for the variability of interpretations that L2 learners come to learn. Take as an example the acquisition of English comparatives by Japanese L2 learners. We discuss the L2 acquisition of a special type of syntax-semantics mismatch in which in which a certain meaningprimitive (i.e., comparative and tense) is expressed using different truth conditions in the native and target language.

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Chapter 1:

Introduction

Therehas been a growing interest within second language acquisition in the question of how meaning is acquired and represented in the second language. The question of what L2 acquirers know about meaning is a broad one. It can be decomposed into two other narrower questions: the first is whether or not L2 acquirers show knowledge of the universal aspect of meaning.[1]The second is whether or not L2 acquirers are capable of acquiring the parameterized aspectof meaning, which represents a direct challenge in L2 acquisition(see Slabakova 2008 and the references therein).

On the assumption that all languages should be able to express the universal aspect of meaning (e.g., tense, definiteness or comparative) using both auniversal conceptual structure and a universal mechanism of calculating sentential meaning (Szabo 2000, von Fintel& Matthewson 2008, among many others), the answer for the first question is positive; meaning primitives come to learners for free regardless of how learners arrive at the target meaning in question.[2]This is the main conclusion of a great number of representative studies on L2 semantics which attest to the fact that the L2 acquisition of meaning is not a barrier to successful L2 acquisition and the blame for the difficulty of L2 acquisition is placed on the morphosyntax.[3]

The second question is muchmore interesting. It has been addressed by investigating different learning situations in which different morphosyntactic forms assemble and map different groupings of meaning. Most of these investigations point to the fact that L2 learners

[1] Which follows from the semantics module of universal grammar (Slabakova 2010).
[2]Throughout the dissertation, I will use the concepts "meaning primitive" and "universal meaning" interchangeably to refer to the primitives of meaning that follow from the universal conceptual structure of the universal grammar (Jackendoff 2002)
[3] For a comprehensive overview, see White (2003:ch. 6) and Slabakova (2008) and the references therein.

may arrive at the parameterized meaning at the end even though they experience difficulty in acquiring the morphosyntax (Slabakova 2008).

As such, the theoretical focus of an L2 theory of meaning is not mainly an investigation into meaning primitives and meaning composition in the empirical domain of linguistic contrasts by simply testing them against morphosyntactic knowledge. The theory also looks at how different languages arrive at some meaning by employing different mechanisms of syntactic composition with different morpho-lexical realizations. The task of L2 learners then is how to express particular meanings using the target-like mechanism of computation. We will use the standard term "syntax-semantics mismatch" to refer to this type of learning task. As succinctly defined in Slabakova& Cho (2013:2), a learning task of syntax-semantics mismatch refers to a situation in which an L2 learner has to learn the universal meaning using the target-like manner of expression when that meaning has a different mode of expression in the native language. The representative literature on L2 acquisition of meaning has investigated different cases of syntax-semantics mismatches with one common denominator: different linguistic forms map different meanings.[4]The representative literature, however,has suffered from two points of theoretical confusion:first, it takes the morpho-syntactic expression as the sole carrier of meaning,so that the interpretive properties of a structure are tested directly against morpho-syntactic knowledge.[5]Testing knowledge of these expressions may not reflect a complete picture of the L2 knowledge of native-like meaning in the second language, since compositional, truth-conditional meaning doesn't follow directly from the overt syntax, but from disambiguated logical forms,

[4]See Slabakova (2008) and the references therein. We will discuss some case studies in this chapter.

[5] The morpho-syntactic expression of meaning can be direct or indirect. It may also proceed overtly or covertly. An example of the former distinction is the expression of definiteness using dedicated morphology that encodes definiteness as its primary meaning, such as English *the* and*a*, or indirectly using word order permutations that involve information structure with (in)definiteness as secondary meaning. An example of the latter is the expression of past tense using the overtly inflectional morpheme-*ed* in English, or covertly as supplied by context or a periphrastic expression like a temporal adverbial (e.g. 'yesterday'), as in Chinese.

which are structures that are obtained from the syntactic structures using specialized rules of construal (Heim &Kratzer 1998).Second, the previous literature fuzzily conflates knowledge of lexical meaning with other types of meaning (namely, sentential meaning). As far as my background is concerned, no single studyhas investigated knowledge of the truth conditions of an utterance apart from syntactic and conceptual complexity.

In this dissertation, we will focus on the L2 acquisition of a special a type of syntax-semantics mismatch in which the universal meaning in question is expressed using a logical form with one set oftruth conditions in the native language and a different logical form with different truth conditions in the target language. This line of investigation has direct implications for the process of L2 acquisition of truth conditional sentential meaning. The task of L2 acquisition of meaning requiresan L2 learner to grasp the truth conditions of a structure regardless of whether or not such she is reported to acquire the morphosyntax of the structure in question. The acquisition of this type of mismatch does not entail the establishment of native-like morpho-syntax. It requires learners to construct the relevant logical form that encodes the target-like truth conditions of the meaning in question. The learning process reduces to the acquisition of the native-like typed meaning primitive which leads to the employment of the native-like subset of the universal rules of composition to construct the logical form of the target-like meaning.

This dissertation is mainly concerned with the acquisition of quantificational vs. non-quantificational meaning of the comparative and past tense. While the notions of comparison and past tense are universal, since they follow from the conceptual structure of the language faculty, they are expressed and perceived in two different ways.While English expresses comparison quantificationally, Japanese has a non-quantificational comparative. In English the expression of comparison involves a quantified logical form with particular truth conditions. As a result ofthe

construction of this type of logical form in the expression of comparison, a clustering of three interpretive properties emerges: the acceptability of degree subcomparatives, sensitivity to the negative island condition and availability of scopal interaction effects. Japanese, on the other hand, has a non-quantificational expression of comparison. The construction of a non-quantified logical form results in different truth conditions, in which degree subcomparatives are ungrammatical and neither the scopal interaction effect nor the negative island condition is in effect.

Similarly, Japanese has quantificational past tense. As a consequence, Japanese past tense prohibits past-under-past interpretation in 'before' clauses. This gives rise to the p-shiftability property, in which an embedded 'before' clause beneath a past-tense matrix clause is underspecified: the 'before' clause can be interpreted as past ornon-past depending on the context of use. English, on the other hand, has a pronominal expression of the past tense. This leads to a logical form whose truth conditions only allow the past-under-past interpretation in a'before' clause beneath a past-tense matrix clause, with the result that the structure ends up with a no-p-shiftability property: the past-under-past interpretation involves interpreting the'before' clause in the past tense.

In chapter2, we introduce the concept of quantification. Our point of departure is a brief historical overview of the evolution of this concept in the fields of philosophical logic and formal semantics. We explainrelevant terminology such as compositionality, truth, generalizedquantifiers, quantifier raising and abstraction and scope. We then introduce the concept of non-nominal quantification. We show that the semantics of comparison and past tense is subject to cross-linguistic variation as to whether they are interpreted as quantified or non-quantified expressions. We discusstwo interpretive parametric asymmetries in the expression of

comparatives and tense. The first asymmetry arises between English-type quantificational comparative vs. Japanese-type non-quantificational comparative. The second is between English-type non-quantificational (i.e., pronominal) tense vs. Japanese-type quantificational tense. We illustrate and exemplify a number of interpretive consequencesof the asymmetry between quantificational vs. non-quantificational meaning.

Chapter 3 reviews the differences between two theories of language architecture: the Minimalist Program and the Parallel Model. The chapter focuses on how truth-conditional meaning is construed in the Parallel Model. It does so by making explicit the question of how meaning is represented in the architecture of language and what information and operations are operative in the process of meaning perception. By the end of this chapter, we will have a well-defined working property theory that assists in understanding how an L2 acquisition theory of meaning may work out in explaining the phenomenon in question.

In chapter 4, we introduce a different level of linguistic variation at which the meaning primitives of different languages may be lexically categorized with logical type denotations in such a way that meaning is expressed differently using different logical forms with different truth conditions. We illustrate this point of variation by discussing the truth-conditional meaning of comparative and past tense in both English-like and Japanese-like languages. We show that in one set of languages, the meaning is expressed using a quantified logical form, and in another set using a non-quantified logical form. Such variation in logical type categorization and selection of universal compositional rules gives rise to two modes of composition, whichstands behind a number of striking interpretative differences in the two sets of languages.

Chapter 5 reviews two learning tasks involving meaning in second language acquisition. In one task, the morpho-syntax represents less difficulty in L2 acquisition and itsubsumes

different meaning primitives. In another task, the morpho-syntactic structure is less frequent and simple, and the sentential meaning associated with it is shown to be attainable whether or not its morpho-syntactic structure is acquired. The chapter shows that such a research agenda is far from representative and conclusive when it comes to making genuine reflections about L2 semantics *per se*. It also shows that what is at stake in learning meaning is the expression of different truth conditions as expressed by specialized,unambiguous, precise logical forms in different languages. On this view, we look at how the same unit of meaning, which is supposed to be universal as part of the semantics module, is expressed using different truth conditions, rather than how different linguistic forms map onto different grammatical interpretations.

In chapter 6, we describe an experimental study, which tests the acquisition of a syntax-semantics mismatch between quantificational and non-quantificational meanings of embedded tense and comparatives in English and Japanese. The experiment hasthree purposes: one is to investigate knowledge of non-nominal quantification in the second language, and specifically, whether L2 learners are capable of acquiring the quantificational meaning of tense in L2 Japanese and the comparative in L2 English. Another is to examine the directionality of ease/difficulty in acquiring the intended meaning given that tense and comparative are expressed using quantified and non-quantified logical forms in the two types of languages. The third is to offer an explanation for the experimental findings in terms of L1 transfer, input saliency, the subset principle, and the shallow processing hypothesis. These concepts will be explained in detail in the context of our discussion of the experimental findings. The final chapter discussesthe results of the study and their theoretical implications for the acquisition of meaning insecond language acquisition.

Chapter2

Quantification in Two Non-Nominal Domains: Comparison and Tense as Two Case Studies

2.1. Quantification and Generalized Quantifiers

2.1.1. Quantification: A Historical Overview

Around 2,300 years ago, Aristotleproposed the first well-recognizedformal deductive system that laid the foundations of the logical study of quantification. His system defined and analyzed the inferential properties of four quantifiers (all[6], some, no, not all)and theirlogical relations in terms of an axiomatic inventory of syllogisms and a relationalsquare of opposition (see figure 1.1).

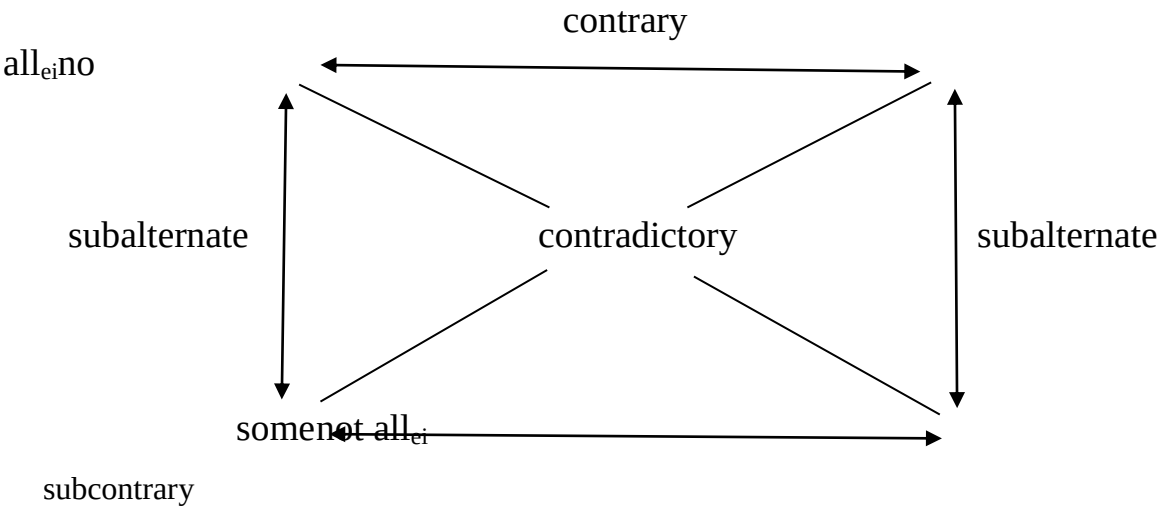


Figure 1.1: Logical relations of quantifiers

As Aristotle put it, a syllogism is an inference scheme that cannot be valid if the premises are true and the conclusion is false.[7]Aristotle listed hundreds of valid syllogisms that follow deductively from a limited number of other basic ones. He categorized the four quantifiers into two main dichotomies which stand in a relation of opposition as schematized in Figure 1.1: the

[6] With the presupposition of existential import!
[7] Regardless of the truth and falsity of the propositions that describe the premises and the conclusion.

set of *universals* that comprise the quantifiers *all*$_{ei}$ and *no* and the set of *particulars*that include *some* and *not all*. He further identified a set of (relational) logical properties that characterize this system. First, *all* and *not all* cannot have the same truth value.[89] Second, *all* and *no* cannot be simultaneouslytrue, and *some* and *not all* cannot be simultaneouslyfalse. Third, *all* and *no* imply *some* and not *all*, respectively. Fourth, quantifiers can express symmetrical relations: quantifiers like *no* and *some* are symmetrical in the sense that propositions "no α is β"and "some α is β"imply "no β is α" and "some β is α", respectively (see Peters&Westerstahl 2012).[10]

Although Aristotle's syllogistic system is powerful enough to account for hundreds of inferences by axiomatic methods, it falls short of inferences in which names of individuals andbinary relations with iterated quantifiers as their arguments play an essential role. His system is limited in terms of quantificational possibilities. Consider (1).

[8] Of course, the quantifiers themselves don't have truth values;it is the propositions that are built from them that have truth values.

[9] Similarly, *no* and *some*.

[10] Aristotle's square of opposition has been criticized by most 19th- and early 20th-century philosophers. They observed that *all*and*every* have a presupposition of existential import. With this understanding of universals, it is not clear how *no(A, B)* could imply *not all* (*A, B*). It is also not clear what it means for a predicate to be inherently non-empty (cf. Spade 2002:17; see Abelard 1956). The modern square of opposition captures the inferential facts about the four quantifiers in terms of three forms of negation:

i. Outer negation:
all: $\forall x\,(\alpha x \rightarrow \beta x) \Leftrightarrow$ **not not all**: $\neg\,(\neg\,\forall x)\,(\alpha x \rightarrow \beta x)$
no: $\forall x\,(\alpha x \rightarrow \neg\beta x) \Leftrightarrow$ **not some**: $(\neg\,\exists x)\,(\alpha x \wedge \beta x))$
$\Leftrightarrow \neg\,(\neg\,\forall x)\,\neg\,(\alpha x \wedge \beta x)$
$\Leftrightarrow \neg\,(\neg\,\forall x)\,(\neg\alpha x \vee \neg\beta x)$
$\Leftrightarrow (\forall x)\,(\alpha x \rightarrow \neg\,\beta x)$

ii. Inner negation: **all**:$\forall x\,(\alpha x \rightarrow \beta x)$, **no**: $\forall x\,(\alpha x \rightarrow \neg\beta x)$
Some: $(\exists x)\,(\alpha x \wedge \beta x)$, **not all**: $(\exists x)\,(\alpha x \wedge \neg\,\beta x)$,
$\Leftrightarrow (\neg\,\forall x)\,\neg\,(\alpha x \wedge \neg\,\beta x)$
$\Leftrightarrow (\neg\,\forall x)\,(\neg\alpha x \vee \beta x)$
$\Leftrightarrow (\neg\,\forall x)\,(\alpha x \rightarrow \beta x)$

iii. Dual negation: **all**: $\forall x\,(\alpha x \rightarrow \beta x)$,**some:** $\neg\,(\forall x)\,(\alpha x \rightarrow \neg\,\beta x)$
$\Leftrightarrow \neg\,(\neg\,\exists x)\,\neg\,(\alpha x \rightarrow \neg\,\beta x)$
$\Leftrightarrow \neg\,(\neg\,\exists x)\,\neg\,(\neg\alpha x \vee \neg\,\beta x) \Leftrightarrow (\exists x)\,(\alpha x \wedge \beta x)$

(1) a. John knows every professor
Mary is a professor
John knows Mary

b. No student knows every professor
Some student knows every assistant
Some professor is not an assistant

(Peters&Westerstahl 2012: 27)

These shortcomings were not seriouslyconsidered until late 19th century. The introduction of predicatelogicin Frege's*Begriffsschrift*(1879) led to revisiting the concept of quantification in the context of two assumptions. First, quantifiers stand for binary relations between sets of individuals as represented in (2).[11]

(2) a. all $(\alpha, \beta) \Leftrightarrow \alpha \subseteq \beta$
b. some $(\alpha, \beta) \Leftrightarrow \alpha \cap \beta \neq \emptyset$
c. no $(\alpha, \beta) \Leftrightarrow \alpha \cap \beta = \emptyset$
d. not all $(\alpha, \beta) \Leftrightarrow \alpha - \beta \neq \emptyset$

Second, quantifiers are unsaturated expressions whose meaning is determined by the application of second-order operators that apply to their arguments which denote sets of individuals. Such operators bind their variables in the syntax.[12]Frege's leading idea is to take predicates as *n*-ary functions from *n* object to truth values (i.e., True and False). He analyzed quantifiers as second-

[11] Another solution in terms of predicate logic is due to Pierce (1883). Pierce proposed a predicate logic system in which propositions contain either a Boolean expression that refers to an individual or a quantifying expression that says what individual this is. He suggested that *some*be iconized by an operator that resembles the sum operator $\sum$ and *all* by an operator that is like the product operator $\prod$ as represented in (i):

(i) $\sum ixi = x_i + x_j + x_k + \text{etc.}$
$\prod ixi = x_i x_j x_k$, etc.

Although Pierce's explanation is model-theoretic, it does not seem to have a clear-cut idea of how the binding of variables is implemented. On this account, the variables x_j, x_kseem to act as free variables that are assigned values by context or names of individuals.

[12] Although variable-binding takes place in the syntax, a semantic explanation is needed to account for the truth conditions of structures that contain bound variables.

level predicates which apply to first-level predicates and assert that those first-level predicates hold true of their object arguments. For example, (3b) and (3c) denote the value of a first and a second-level quantified expression, respectively:

(3) a. Donald is the father of Barron
b. the father of (x, y) abstracting away two proper names
c. Ω (x, y) abstracting away the 2-unary first level predicates
(A binary first-level function from the pair of object (x,y) to True iff the first object of the pair x is the father of the second object of the pair y)

(4) a. Every father slept
b. Every Ω (x)abstracting away the 1-unary first level predicate and its argument
c. ∀x Ω (x)
(A second-level function from those first-level functions abstracted away as Ω (x) to the truth value True iff those predicates are true of every object x).

An advantage of this theory is that we can now interpret as many quantifiers as we can in one sentence with their meanings beingexpressed in sequence as in (5):

(5) a. Everyone likes everyone: ∀x∀yL (x, y)
b. Someone likes everyone: ∃x∀yL (x, y)

Frege'stheory is based on two main underpinnings: the notion of reference and the principle of compositionality. He proposed that sentences refer to truth values, predicates to concepts and proper names and definite descriptions to objects. These denoting elements compose in such a way that a predicate should act as a function that applies to its object arguments in order to yield a sentence that refers to a truth value. This can be achieved if we take the meaning of complex expression as a function of the meaning of its parts and their syntactic composition (i.e., principle of compositionality).

Along these lines, Russell (1903) attempted to explain what quantifiers denote, building on Frege's insights.Russell's earlier account doesn't appear to employ the notion of syntactic binding in explaining quantifiers' denotations, as shown in (6).[13]

(6)

a. *All a's*denotes a_1 and a_2 and . . . and a_n.
b. *Every a* denotes a_1 and denotes a_2 and . . . and denotes a_n.
c. *Any a* denotes a_1 or a_2 or . . . or a_n, where *or* has the meaning that it is irrelevant which we take.
d. *An a* denotes a_1 or a_2 or . . . or a_n, where *or* has the meaning that no one in particular must be taken, just as in *all a's* we must not take any one in particular.
e. *Some a* denotes a_1 or denotes a_2 or . . . or denotes a_n, where it is not irrelevant which is taken, but on the contrary some one particular *a*must be taken.

(Russell 1903:59)

Later, Russell (1905/08) revisited his treatment of quantifiers in terms ofpropositional functions that are necessarily true or existentially true with a syntax that incorporates the free-bound variable distinction. Russelldifferentiated between those expressions that have meaning in isolation and hence assigned direct denotations and those denoting expressions that have no meaning in isolation (e.g., quantifiers). He further emphasized the necessity of avoiding self-reference of linguistic objects by arranging linguistic denotations into a hierarchy of types (e.g., individuals of type e, sets of individuals of type <e,t>and sets of sets of individuals of type <et, t>). With the introduction of types, a predicate applies only to objects that belong to the appropriate typedomain. This step provides an easy solution to the well-known Russell's paradox,which presented a theoretical problem for Frege's system.[14]

[13] Russell's definitions in (6) do not clearly differentiate between *all x*, which denotes the set { x_1, ……, x_2}, and the distributive universal *every x*. Similarly, they failto clearly differentiate between the indefinite article *a* and existential *some* (see Peters &Westerstahl2012:37).
[14] Such a move was motivated by a paradox discovered by Russell: sets should be constrained. Otherwise we run into a problem dealing with sets of all sets which are not members of themselves.Let R: = {x: x ∉ x}. If R ∈ R, it follows that R ∉ R; and if R ∉ R, it follows that R ∈ R. This problem is known as Russell's paradox.

For Frege and Russell, truth is absolute.[15]That is, all symbols have a given meaning and all objects belong to the universe of quantification. Alfred Tarski (1935) was the first to axiomatize truth predicates for natural language. Accordingly, a predicate can be characterized as a truth predicate for a language if it entails that for every object language sentence, it follows that such an object language sentence is true if and only if it bears its meta-language translation:

(7) (T) s is true iffp

T-sentence=: 'Snow is white' is true iff snow is white.

(where 's' stands for a structural description of the object-languagesentence and 'p' is a place marker for its meta-language translation.

In (7), the object language sentence is misquoted by its meta-language translation. For Tarski, every object language relates a particular state of affairs that makes the sentence true. Davidson (1967) built on Tarskian T-theory by reconstructing a theory of meaning that connects every sentence in the object language s with its meaning as represented by its translation p. Such a translation can be stated in terms of natural language or some mentalese language(e.g., Language of thought). That is, meaning is a specification of the truth conditions under which aparticular sentence is true.

[15] The standard assumption in the philosophy of language is to equate the concept of meaning with truth conditions (Frege 1884, Wittgenstein 1961). This understanding of meaning is motivated by the fact that we cannot hope to define meaning as a list of pairings of entities and meanings, but as a finitely axiomatized, recursively specified theory (Borg 2004:21).

2.1.2. The Theory of Generalized Quantifiers

Under compositionality, a syntactic category that may havedifferent expressionsshould be interpreted by the same semantic mechanism.[16]Take as an example the DP category. Expressions like *John*, *every student* or *more than one student* in (8) fall into the same syntactic category DP, given their syntactic distribution as subjects.

(8) a. John is asleep
b. Every student is asleep
c. More than one student is asleep

We would like to assign these DP expressions in (8) uniform self-contained interpretations. The point is that we generalize from the first order operators ∀and ∃to the range of DP expressions in (8)(Mostowski 1957, Lindstrom1966). Montague's (1974) seminal work implemented this idea. For example, we can think of the subject *John* as denoting the set of properties that John has. If John is asleep, then the property of being asleep belongs to that set of properties.

(9) $\{x: x \in \text{asleep}\} \in \{P: \text{john} \in P\}$

Similarly, *every student* denotes the set of properties that every student has. If every student is asleep, then the property of being asleep belongs to the set of properties denoted by *every student*, as represented in (10):

(10) $\{x: x \in \text{asleep}\} \in \{P: \text{student} \subseteq P\}$

[16] With the exception of reflexives and reciprocals and those expressions that do not denote, such as idiomatic expressions and expletives.

Finally, the DP in (8c) denotes the set of properties that more than one student has. If more than one student is asleep, then the property of being asleep belongs to the set of properties denoted by more than student.

(11) $\{x: x \in asleep\} \in \{P: |student \cap P| > 1\}$

The idea of generalized quantifiers makes it possible to have a unified semantics for almost all DPs. It also makes the notion of scope identifiable. As exemplified in (8), different DP expressions are assigned the same semantics (i.e., a relation between the set of properties denoted by the subject, which is the generalized quantifier, and the set of individuals denoted by the syntactic predicate). As for scope, we can now delineate the semantic scope of the structure: the part of the sentence that denotes a property that belongs to the set of properties denoted by the generalized quantifier. If this part of the sentence contains a scope-bearing element, we can account for the interpretive effects of having more than one scope-bearing element in the sentence. Consider (12).

(12) a. Every student read some book
b. Some book, every student read.
c. Every student read a newspaper or a magazine.

In (12a), the surface reading of the structure has a constituent that contains the existential quantifier as the scope argument of the universal quantifier (= the property that is asserted to belong to the set of properties denoted by the universal quantifier). The inverse reading is obtained by having the constituent that contains the universal quantifier within the scope of the existential quantifier. Similarly, the existential operator scopes over the universal in (12b) and the universal one scopes over the disjunction in (12c). The scope of the quantifier is simply that part of the sentence which denotes a property that belongs to the set of properties denoted by the

generalized quantifier. The different interpretations of the sentences in (12) can be accounted for by figuring out which scope-bearing element fallswithin the scope of which generalized quantifier.

2.1.3. Scope of Quantification

Central to any research agenda on the syntax-semantics interface is the question of whether the notion of scope is semantic, as represented by the property that belongs to the set of properties denoted by ageneralized quantifier, or simply syntactic, coinciding with the relationship of c-command domain(Reinhart 1979, 1983).[17]There are two main positions in the literature.[18] The first position argues that semantic scope is captured syntactically(Montague 1974; May1977, 1985). The secondposition entirely dissociates the notion of scope from the syntax (Hendriks 1993, Barker and Shan 2008).[19]

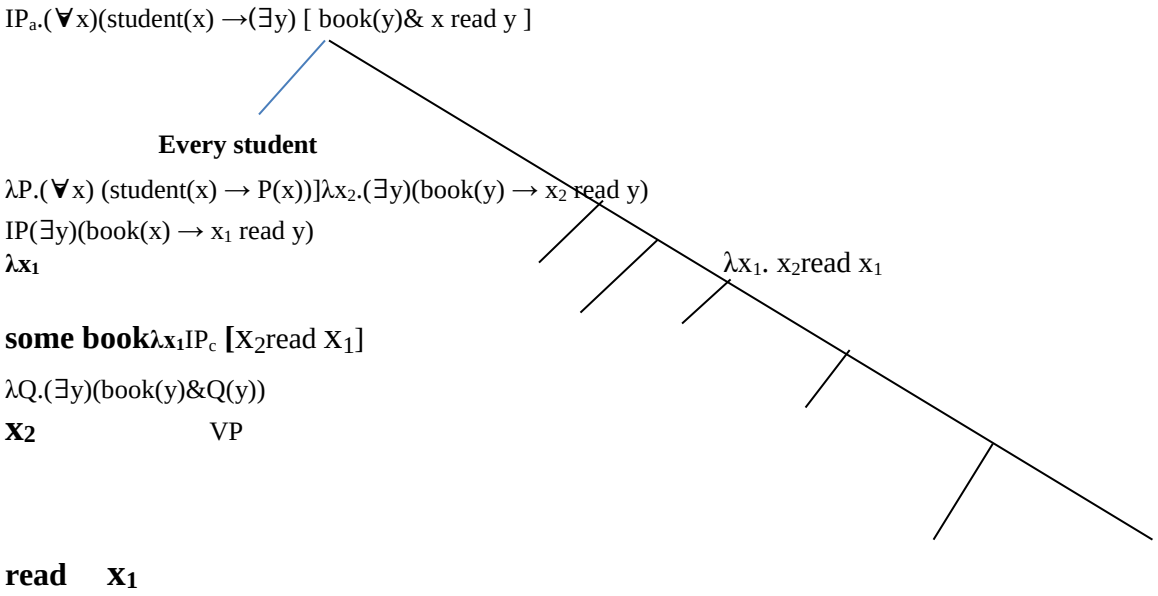
The syntactic approach attributes the scopal interpretive effects of quantified expressions to pure syntax. The first syntactic treatment of scope originates in the work of Montague (1974). For Montague, the structural ambiguity of (13) is derived by having two syntactic structures: the first structure is derived with subject wide scope and the second with object wide scope. To derive the two structures, Montague employed a syntax in a bottom-up fashion using three sequential derivational steps.First, free individual variables are introduced to saturate the VP,which denotes a property of type <e,t>.[20] Second, each free variable is abstracted over by a λ-

[17] C-(onstituent) command is a structural relationship between node N_1 and node N_2 such that N_1 and N_2 do not dominate each other and the lowest branching node that dominates N_1 also dominates N_2(Haegeman 1994:147).
[18] See Szabolcsi (2010:ch. 2) for an overview of different approaches, including the proof-theoretical approach along the lines of Jager (2005) and Barker (2007).
[19] It is worth mentioning that each position is conceptually and empirically motivated on independent grounds.
[20] Where $e \in D_e$stands for individual and $t \in D_t$standsfor truth value {TRUE, FALSE}.

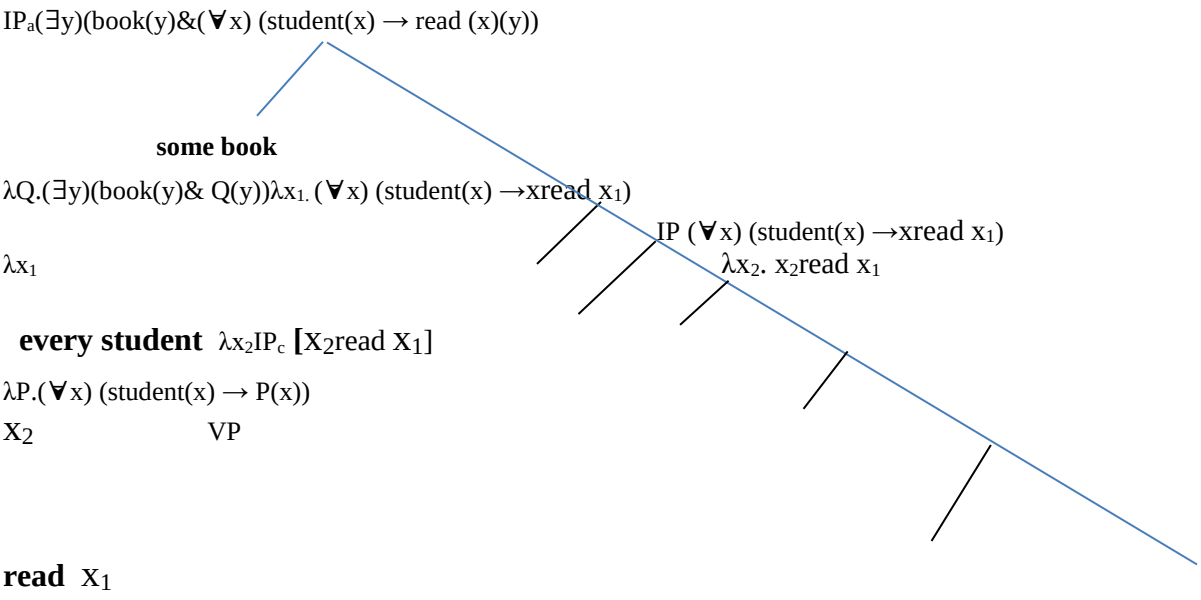
operator. Such an instance of abstraction introduces derived properties of type <e,t> at the sentence level. Third, those properties directly saturate related quantifiers, which denote sets of properties, one by one in sequence.

(13) Every student read some book

(14) a. Subject wide scope



b. Object wide scope

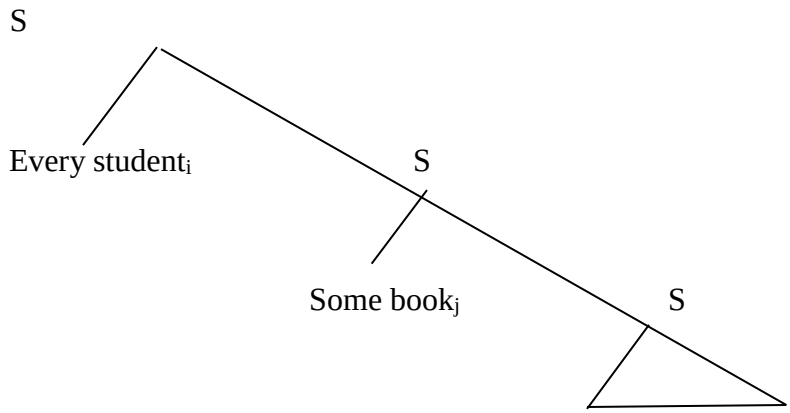


The second syntactic treatment of scope is that of May (1977, 1985). May derives the surface structure first, with quantificational expressions placed in argument positions. Such a structure serves as input to the syntactic rule of Quantifier Raising (QR), which takes place at the logical form (LF) level of representation. QR adjoins quantifiers to the Specifier of VP or TP, leaving behind traces that are bound by hidden lambda-abstracts. May's movement analysis reduces semantic scope to the c-command domain of the adjoined quantifier (see also Heim &Kratzer 1998). For May, LF representations are subject to the same conditions and constraints that govern the syntactic well-formedness of overt representations.[21]

[21] See Hornstein (1995) for an argument against QR in terms of Case assignment. See also Kennedy (1997) for evidence supporting QR in antecedent-contained VP deletion in which the postulation of QR is necessary to avoid infinite regression. For other syntactic treatments see Cecchetto (2004), Cooper (1983), Szabolcsi (2000) and Fox (2002). For non-syntactic treatments of scope, see Sportiche and Hendriks (1993) and Baker and Shan (2008).

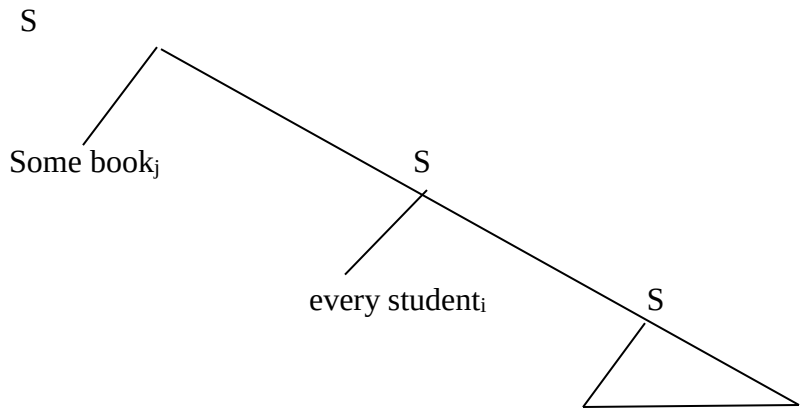
(15)

a.



t_i readt_j

b.



t_i readt_j

The claim that scope assignment is syntactic has been criticized on the grounds that QR does not operate under the same conditions that govern the well-formedness of overt syntactic movement (i.e., *wh*-movement or A-movement). First, QR ismore locally restricted than overt movement (e.g., *wh*-movement). QR only operates within the boundaries of clause-level structure. In (16), the pronoun *his* in *his mother* cannot be bound by the quantifier, since the quantifier is located in a separate tensed clause.

(16) a. That every boy was hungry surprised his mother
'for every boy, that he was hungry surprised his own mother'
(Szabolcsi2000:18)

Given the strictly local nature of QR, structural c-command may not be taken as a necessary condition for scope (Sportiche 2005). Unlike other feature-based motivated movement, Chomsky (1995) claimed that QRis not feature-driven. In the same vein, Hornstein(1995) proposed that QR is a species of Case-driven movement. The Case analysis, however, has been challengedby Kennedy (1997), who suggested that QR is not necessarily Case-driven since QR operates in the context of antecedent-contained deletion to avoid infinite regression, which is not driven by Case.[22]

2.2. Two Generalized Quantifiers with Non-Nominal Domains

Until recently, quantification has been an active area of mutual interest among logicians, linguists, and cognitive scientists. The logical study of quantification, originating in the work of Aristotle, has been mainly concerned with analyzing the inferential behavior of quantifiers over discrete individuals. Formalsemanticistshave extended the Aristotelian system and redefined quantification relative to non-nominal domains,[23] including events (Davidson 1967), times or time intervals(Bennett and Partee,1972, von Stechow 2004, Kusumoto 2005), possible worlds (Hintikka 1962; Kratzer 1989, 2002) and degrees or degree intervals(Kennedy 1999;Schwarzschild and Wilkinson 2002; Heim 2001, 2006), among many others (Szabolcsi 2010:33-44).[24][25]

[22]The ongoing debate on the syntactic status of scope has led to the evolution of another research agenda that takes scope as a semantic rather than a syntactic construct (Hendriks 1981, Barker and Shan 2006).
[23] Of both first-order domains (e.g., discrete entities) and higher-order domains (e.g. questions (Hamblin 1977) and (un) conditionals (Rawlins 2013)).
[24] Partee (1992) distinguished two types of quantifiers that are at variance relative to their domain of quantification. While D(eterminer)-quantification draws on individuals, A-quantification of adverbs, auxiliaries, affixes and argument-adjusters quantifies over cases, events and situations (cf. Bitter and Trondhjem (2008) on verbal affixes as

The standard practice among linguists is to analyze quantifiers as higher-order operators that quantify over domains of objects in two different ways: in nominal domains, quantification operates on explicitly realized objects by means of overt operator-variablebindingin the object language, as exemplified in the sentence in (17), which denotes an instance of universal quantification over individual students.

(17) Every student slept
(∀x) (student (x) → slept (x))

When it comes to non-nominal domains, quantification takes place implicitlyover objects that are not mentioned in the object language, but semanticallyrealized in the metalanguage, asexemplified by the deonticallymodalizedsentence (18), which isan instance of universal quantificationover the set of worlds accessiblefromthe worldofevaluationthat are compatiblewith the obligations specified in the universe of discourse.[26]

(18) Bill must be home
(∀w') (w Acc w' → Bill be home at w')

In this section, we will discuss two cases of non-nominal quantification—comparison and past tense—in two sets of genetically unrelated languages. First, we will discuss quantificational comparison in English and German. We will then discuss the non-quantificational, context-

quantifiers over any domain of objects and Balusu (2005) on numerals in Telugu that quantify over times and locations).

[25] It has been observed that quantification over nominal (e.g., individual) and non-nominal (e.g., temporal or modal) domains exhibit logical similarities that unify their domains under an ontological symmetry program (Szabolcsi 2010, Schlenker 2006). One systematic correspondence between nominal and non-nominal quantification is that they both make use of (extra) linguistic devices that indicate duality of strength (i.e., existential vs. universal force). See Schlenker (2006) for a characterization of such an ontological symmetry program in the domain of individuals, times and possible worlds.

[26]Kratzer (1977,1981, 1991, 2012) developed an extremely influential theory for modality that is based on quantification over possible worlds. Under this theory, modals as quantifiers over possible worlds involve a tripartite structure that comprises a modal operator, a set of possible worlds restriction and its propositional scope that is evaluated relative to the set of words in the restriction as schematized in (i):

(i) [S [α modal∃/∀ [β (possible-worlds restriction)]] P

dependent comparative in Japanese and Chinese. We will focus on the striking interpretive differences between these two sets of languages as the result of having two different logical forms for the same comparative structure: the quantified comparative structure of English and German vs. the non-quantified structure of Japanese and Chinese. Second, we will discuss the quantificational-pronominal past tense distinction between English and Japanese in the context of *before* embedding. We will conclude the section with the observation that universal meanings (e.g., comparison or past tense)may be interpreted differently by virtue of being expressed using different truth conditions.[27]

2.2.1. Comparative

2.2.1.1. The Standard Theory of Quantificational Comparative(von Stechow 1984)

Most degree-based semantic theories analyze comparative constructions as expressions that denote relations between degrees.[28][29] The standard analysisis based on an extensional language

[27]Universal meaning in the sense that it is represented in all languages as part of the uniform conceptual structure of universal grammar. See for example Ramchand& Svenonius (2008).

[28] In this section, we look at clausal comparatives in English-like languages. We leave aside the unnecessary discussion on equatives, superlatives, phrasal comparatives and intensional comparatives. Also, we are not discussing other irrelevant, theory-internal issues such the inferential relations among comparatives, scope issues and quantifiers within *than* clauses. This section serves as an introduction to prepare the reader for a more in-depth discussion on the cross-linguistic variation in the semantics of comparatives in English/German vs. Japanese/Chinese.

[29] The degree-based view has been motivated by two facts about comparatives.First,gradable adjectives (e.g., *tall*) denote relations between individuals and degrees (Seuren 1973; Cresswell 1976; von Stechow 1984; Heim 1999, 2001). The data in (i), for example, show that the gradable adjective *tall* incorporates a degree argument that is either quantified over or referred to as defined in the lexical entry in (ii):

(i) a. John is six feet tall
b. John is that tall
c. How tall is John
d. However tall he is (Heim 2001:214)

(ii) $[[\text{tall}]] = \lambda d.\lambda x.\text{height}(x) \geq d$

Second, subcomparatives, in which comparison involves more than one dimension sharing the same scale in the main and *than*-clauses (e,g. (iii)), indicate that the comparative operator utilizes sets of degrees or maxima of degrees in expressing comparison (see Kennedy 2006 and Bhatt and Takahashi 2011 for more information).

Lwith the basic types d, denoting degrees or intervals of degrees, along with other semantic types such type eand type t, which denoteentities andtruth values, respectively. The expressions of **L** are interpreted relative to a model M= {D_d, {0, 1}, F}. D_d consists of mutually disjoint degree sets SD (i.e., $D_d = \cap SD$) with elements of each set related by an ordering relation $>_d$ that is total, asymmetric, transitive and reflexive (see von Stechow 1995). {0, 1} are the truth values and F is a function that assigns interpretations to the lexical elements in composition. A typical example of the use of this function is with a gradable adjective, which denotes a relation betweenindividuals and degrees withan abstract scalar, downward monotonic property,as representedin (19) (von Stechow 1984).[30]

(19) a. $[[\text{tall}]] = \lambda d \lambda x.\text{height}(x) \geq d$

b. For all x and d, if height(d)(x) =1, then height(d')(x) =1 for all d' < d.

Analyzed along the lines of the standard theory (Stechow 1984, Heim 2000, Bhatt & Takahashi 2011;Beck 2012), the English comparative structure (20) has an LF with the following semantic composition.First, the comparative morpheme [[-er]] with the lexical entry in (21a), which is a quantificational expression of thehigher type <dt,<dt,t>>, composes directly with the

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(iii) Jim is shorter than the fridge is long.

[30] Kennedy (1997) proposed an alternative semantics in which gradable adjectives denote partial measure function from individuals into degrees:

(iv) Height = λx. x's height (i.e., a measure function of type <ed>)

This semantics presupposes that comparatives involves no degree quantifiers that moves for interpretability. Heim (2001) presented facts from scope and ellipsis that evidences the presence of degree-quantifiers that move for scope-taking. Heim (2001) analysis supports the semantics for gradable adjectives as denoting relations between individuals and degrees as first proposed by von Stechow (1984) as defined in (2).

than clause of type <d,t> as its first argument.[31] The result is the generalized quantifier DegP of type <dt,t> as represented in (21c).

(20) Bill bought more cars than Jim did

(21) a. $[[\text{-er}_{\textbf{clausal}}]]=\lambda P_{<d,t>},\lambda Q_{<d,t>}.\max(Q) > \max(P)$
b.Bill bought [$_{AP}$ [$_{DegP}$ -erthan Jim did ~~buy t1 many cars~~] many cars
c. [[DegP]]=λQ [max(Q) > max(λd.Jim bought d-many cars)]

Second, the generalized quantifier DepP in (21c) undergoes QR into a clause-level position (say SpecIP) since the DepP in-situ is not an element with an appropriate type to compose directly with the adjective. QR leaves behind a trace of type d that saturates the gradable adjective as in (22a) and subsequently creates degreeabstraction in the main clause as in (22b). Finally, the correct truth conditions in (22c) are derived, in which the comparison holds between two sets of degrees or two maxima of degree sets in case that the max operator applies to each argument as in (22d).

(22)

a. [[IP[$_{DegP}$–erthan Jim did ~~buy t1 many cars~~][1 [Bill bought [d-many cars]]].
b. [[DegP]]=λQ [max(Q) > max(λd.Jim bought d-many cars)] (λd.Jim bought d-many cars)
c. [[IP]]=1iffmax(λd.Bill bought d-many cars) >max (λd.Jim bought d-many cars)]
d. where max(P)= ιd: P(d)=1 &∀d' [P(d') =1 → d'≤ d]

[31] There have been different semantic representations for the [[-er]] in the literature, including the A/¬A analysis Seuren (1973) as defined in (i.a) and the subset-based semantics (Bhatt and Takahshi, 2011) as in (i.b):

(i) a. $[[\text{-er}]]=: \lambda g_{<d,et>}.\lambda c_{<d,t>}\lambda x.\exists d\ [g(x,d) \wedge \neg\ c(d)]$
b. [[er]]=: λPλQ [P ⊂ Q]

I will stick with the maximality definition in (7). The choice of the lgical representation is not crucial here. What is at issue is to have a quantifier with 2 arguments of degree predicates as standardly assumed for clausal comparatives in the literature.

This analysis presupposes a uniform architecture for the standard of comparison (i.e., *than* clause): the *than*-clause has an (elided) CP complement with the denotation of a set of degrees. On this analysis, the *than* clause CP complement necessarily involves operator movement whichserves to bind the degree variable of the gradable predicate.This amounts to saying that the standard of comparison in English-like languages necessarily engages degree abstraction (i.e., $\lambda d \in D_d$. P(d)), rather than individual abstraction (i.e., $\lambda x \in D_e$. P(x)) (Chomsky 1977; von Stechow 1984; Heim 1985, 2001;Pancheva 2006; Bhatt and Takahshi 2011), as illustrated as (23):

(23) [DegP -er [$_{CP}$than Op_1 Jim did ~~buy d_1 many cars~~]

To derive the surface structure for the comparative with the LF structure in (23), we need tointroduce some more assumptions about the syntax of the structure. Following Bresnan (1973), we may assume that the adjective undergoes head movement into the Degree head *–er* to form the suppletive form (e.g.,*taller*).[32]As for the surface structure, the representative literature on comparativesofferstwo solutions.The classical one is to assume that the *than*clause obligatorily extraposes in the phonology(Chomsky 1965, Selkirk 1970, Bresnan 1973, Heim 2000). Such an analysis is criticized on the grounds thatrightward movement lacks motivation beyond the need to derive the surface structure. The other solution is to let the *than*clause merge counter-cyclically via late merge after the QR-ed *-er* morpheme has undergoneright-adjunction into a scope position at a node of type t(Bhatt&Pancheva 2004).[33]

[32]Similarly, the dummy *much* is inserted with *many* to form the suppletive*more*.

[33] A different syntax for the structure is for the degree head to combine directly with the gradable adjective and for them to form a constituent together and compose with the *than*clause (Abney1987, Larson 1988, Kennedy 1999). This analysis is more compatible with theories that assume strict compositionality and the unavailability of scope interaction and QR-ed comparative operators (Kennedy 1999). We adopt the quantificational analysis (Heim 2001) for English-like comparatives.

Given this semantics, the quantificational behavior of the comparative head gives rise to a set of interpretive properties that are peculiar to comparative structures in English-like languages. We discuss three main properties[34]: the acceptability of degree-based subcomparatives, sensitivity to the Negative Island Condition (NIC),and exhibiting scope interaction effects. Let us see how the quantificational analysis of comparatives, as sketched above,can explainthese interpretative properties of the comparative in English and German.

English and German permit subcomparatives of degrees (Beck et al. 2009).[35]Consider the example in (24).

(24) The desk is higher than the door is wide.

The acceptability of(24) shows that the *than*clause introduces a set of degrees, rather than a set of individuals. This set needs to compose in the same way as the differential comparative in(20) with the exception that there is no genuine deletion process that targets the*than*clause in (24). Following standard practice, we take the acceptability of subcomparatives of degrees as an indication that the comparative in English is a quantified structure.

(25) a. $[[\text{-er}_{\textbf{clausal}}]] = \lambda P_{<d,t>}, \lambda Q_{<d,t>}.\max(Q) > \max(P)$
b. [$\text{-er}_{\textbf{clausal}}$ than [2 [the door is t2 wide]]] [1 [the desk is t1 high]]
c. [$\text{-er}_{\textbf{clausal}}$than [[λd'.the door is d'-wide]]] [λd.the desk is d-high]
= 1iffmax(λd.the desk is d-high) > max (λd'.the door is d'-wide)

The second property is that English/Germancomparativesshow negative island effects,as exemplified by the ungrammaticality of (26).

(26) #John bought a more expensive book than nobody did

[34] Other properties such as the accessibility of direct measure constructions, degree questions (see Beck et al. 2009).
[35] We will discuss quantificational comparatives in English. We will assume the same analysis applies to German (Beck et al. 2009).

(27) a. [[-er]] =[[-er**clausal**]] = $\lambda P_{<d,t>}\lambda Q_{<d,t>}$.max(Q) > max(P)
b. [-er**clausal** than [1 [than nobody did ~~buy a t1 expensive book~~]]]
[1 [John bought a t1 expensive book]]]
c. [-er**clausal**than [[λd.nobody bought a d-expensive book]]]
[[λd'.John bought a d'-expensive book]]
= 1 iffmax (λd'.John bought a d'-expensive book) > max (λd.nobody bought a d-expensive book)

The sentence in (26) is semantically ungrammatical. The standard quantificational analysis may account for the ungrammaticality of (26) in a straightforward way.[36] Assume that the degree head in (26) is a quantifier relating two maximaof degree sets. Assume further, following Rullmann (1995), that the standard of comparison, max(λd.nobody bought a d-expensive book),is undefined.[37]The infelicity of (26) arises when we have aquantifier that relates the maximum degree given by the associate of comparison with an undefined degree given by the standard of comparison.

The final property under consideration is the fact that intensionalizedcomparative structures as exemplified in (28) areambiguous:

(28) (This paper is 10 pages long). The paper is required to be exactly 5 pages longer than that.
(29) a. required> -er:[38]
required [[exactly 5 pages -er than that]1 [the paper be t1-long]]

[36] The standard quantificational analysis encounters a big problem with other quantifiers inside *than*clause (especially universals) (see Fleisher 2016). Other quantificational approaches have been developed.
[37]Rullmann's idea is that the maximality operator is incompatible with downward entailing contexts. In (20), if nobody bought a book that costs $10, it follows that nobody bought a book that costs $20, and so forth. We end up with no maximum degree to serve as the standard of comparison.
[38]Assume a simplified version of the modal theory that is based on quantification over worlds or situations. Under Kratzer (1977, 1981, 1991), the theory has witnessed two major developments. Thefirst is that the set of worlds that is quantified over by the modal is not inherent. It's determined by twoconversational backgrounds that specify the set of accessible and maximal worlds. This set is determinedby two contextually-determined parameters: modal base **f** and ordering source **g.** The former is a function from worlds to propositions that describe the facts or circumstances surrounding the modalexpression. The resulting propositions are intersected to introduce the set of accessible worlds ∩f(w) in question. The latter is another function from worlds to propositions that order propositions by means ofthe binary relation $\geq_{g(w)}$ in selecting the best worlds to be quantified over as defined in (i):

(i) **BEST** (f,g,w)= {v | v ∈∩f(w) ∧¬∃v' ∈∩f(w): v' $>_{g(w)}$ v}
[[must β]]= 1 iff∀u : u ∈**BEST** (f,g,w) → u ∈β
[[might β]]= 1 iff∃u: u∈**BEST** (f,g,w) ∧u ∈β

$\forall w \in Acc$: max {d: $long_w(p,d)$} = 15 pages
(where Acc = the set of accessible worlds)

b. –er> required:
[exactly 5 pages -er than that]1 [required [the paper be t1-long]]
max {d: $\forall w \in Acc$: $long_w(p,d)$} = 15 pages

The example in (28) has two readings: either the paper is exactly 15 pages in all accessible worlds (i.e. worlds in which the requirements hold true) or the paper is exactly 15 pages in the accessible worldswhere it is shortest (Heim 2000,Bhatt &Pancheva 2004). The first reading is obtained by having the degree head in the scope of the modal and the second reading by having the modal in the scope of the degree head. This amounts to saying that the ambiguity is a scope issue in which readings(29a) and (29b)involve inverted and surface scope structures, respectively. This scope-based ambiguity is predicted under the quantificational analysis of comparatives: the second reading arises when we have a logical form in which the degree head is a quantifier that interacts scopally with other scope-bearing elements (such as*required*) viaQR.

The clustering of these three properties indicates that the comparative in English is quantificational, meaning that it involves a second-order functor relating sets of degrees. German also aligns itself with English in having quantificational means of expressing comparatives. German has the three interpretive properties that cluster together in quantificational comparatives: the acceptability of subcomparatives of degrees, sensitivity to negative islands,and scope interaction effects (see Beck et al. 2009). Not all languages, however, have this quantificational semantics for comparison.[39] In what follows, we will discuss differential comparatives in two other languages: Japanese and Chinese. We will show that these two languages, despite having degree-based differential comparatives, express comparison non-quantificationally. The non-quantificational behavior of comparatives straightforwardly explains

[39] Even though every language has a grammatical means to express comparison (Beck el at. 2009, Bochnak 2015).

the fact that Japanese and Chinese, in contrast to English, do not permit subcomparatives of degrees,their indifference to the negative island condition in differential comparatives, and their failure to show scope interaction effects in intensionalized comparatives as exemplified in (29).[40] The next subsection will shed more light in this type of comparative in Japanese and Chinese.

2.2.1.2. Non-Quantificational Comparison: the case of Japanese/Chinese

Japanese has comparative constructions with degree semantics analogous to theirEnglishcounterparts.[41] The comparatives in (30a) and (31a) correspond to the English comparatives in (30b) and (31b),as *yori*- clauses and *yori*-phrases in Japanese correspond to *than*-clauses and *than*-phrases in English (Beck el at. 2004).

(30) a. Mary-wa[John-yori] (motto)takusan-noronbun-o kaita
Mary-Top John-YORI (more) many-Genpaper-Acc wrote
'Mary wrote more papers than John'

b. Mary wrote more papers than John.

(31) a. Mary-wa[John-gakaitayori] (motto) takusan-noronbun-o kaita
Mary-Top[John-Nom wrote YORI] (more)many-Genpaper-Acc wrote
'Marywrote more papers than John did'

b. Mary wrote more papers than John did.
(Beck et al. 2004:289)

Chinese also has differential comparatives like English and Japanese. Consider the Chinese comparative in (29)

(32) Lisi bi Zhangsangao.
Lisi BIZhangsan tall
'Lisi is taller than Zhangsan.'
(Krasikova 2008:266)

[40]Although subcomparatives of numbers are grammatical, as we will see in the next subsection.
[41] As well as Chinese (see Krasikova 2008)

Japanese/Chinese comparatives, however, exhibit striking differences from English comparatives. First, Japanese/Chinese only permit subcomparatives of numbers, since they lacksubcomparatives of degrees. Consider the Japanese and Chinese data in (33) and (34), respectively (see Beck et al. 2004, 2009 for Japanese and Fu1978, Xiang 2006, and Krasikova 2008 for Chinese).

(33) a. *Tana-wa[doa-gahiroi (no) yori (mo)] (motto) takai
shelf-Top [door-Nom wide NO YORI (mo)] (more) tall
'The shelf is taller than the door is wide.'

b. Hanako-wa [Taroo-garonbun-o kaita (no) yori]
Hanako-Top [Taroo-Nom paper-Acc wrote (one) YORI]
takusan hon-o kaita
many book-Acc wrote
'Hanako wrote more books than Taroo wrote papers.'
(Beck et al. 2004:312)

(34) * Zhegezhuozi bi nage men kuangao.
This CL table BI this door wide tall
'The table is taller than the door is wide.'

(Krasikova 2008:269)

Another difference is that Japanese and Chinese comparativesare indifferent to the negative island condition,as shown in the acceptability of the comparative constructions inJapanese and Chinese in (35) and (36), respectively. Recall that the Japanese/Chinese comparatives in (35) and (36) are ungrammatical in English (37).The *than* clauses in these structures refer to an individual-denoting standard of comparison that is represented by 'the book that nobody did'.

(35) John-wa[dare-mokawa-naka-tta no yori]takaihon-o katta
John-Top anyone buy-Neg-Past NO YORI expensive book-Acc bought

‘*John bought a more expensive book than nobody did.’

(36) Lisimai de shu bi [Zhangsanmeimaide] gui
Lisi buy DE book BI Zhangsan NEG buy DE] expensive
‘Lisi bought a book that is more expensive than the book that Zhangsan didn’t buy.

(37) *John bought a more expensive book than Zhangsan didn’t.

Finally, modalizedcomparatives in Japanese and Chinese do not show scope interaction effects, as predicted under the standard analysis of English comparatives of (26). For example, the Japanese modalized comparative in (38) is unambiguous. It lacks the minimum requirement reading in which the modal ‘required’takes scope below the comparative. The only reading available is the surface scope reading (39a) in which the modal scopes over the comparative.

(38) a. Sonoronbunwasore yori (mo) tyoodo 5 peeji
That paper Top that YORI(MO) exactly 5 pages
Nagakunakerebanaranai.
long-be required
‘The paper is required to be exactly 5 pages longer than that.’

(Beck et al. 2004:331)

(39) a. required> -er:
required [[exactly 5 pages -er than that]1 [the paper be *t1*-long]]
$\forall w \in Acc$: max {d: $long_w(p,d)$} = 5 pages
(where Acc = the set of accessible worlds)
b. # -er> required:
[exactly 5 pages -er than that]1 [required [the paper be t1-long]]
max {d: $\forall w \in Acc$: $long_w(p,d)$} = 15 pages

Similarly, the Chinese modalized comparative in (40) lacks the wide scope reading of the comparative head, in which the comparative head takes wide scope relative to the modal verb ‘had to’. The example in (40) is true in a situation whereLisi had to buy from 5 to 10 candles and Zhangsanhad to buy from 8 to 10 in order to meet the requirement. It does not mean that the minimal number of candles that Zhangsanhad to buy exceeds the minimal number of candles that Lisi had to buy.

(40) Lisixuyao bi Zhangsan shao maiyixielazhu.
Lisi must BI Zhangsan little buy some candles
'Lisi had to buy less candles than Zhangsan.'

(Krasikova 2008:269)

As indicated, the differential comparative construction in Japanese/Chinese does not have the interpretive properties of the quantified comparative structure.In the absence of independent constraints on scope-taking in Japanese/Chinese, it would be surprising to find these restrictions if comparatives were quantificational. On this analysis, the *yori*-clause (i.e., the standard of comparison) is given a relative-clause analysis. It denotes an individual or a setof individuals. It does not denote degrees or sets of degrees. Therefore, the *yori*-clause may involve maximization of individuals (i.e., free-relative-clause-like interpretation) or it may involve a variable that corresponds to individuals and is bound by an individual binder (i.e., a relative-clause interpretation). In either case, the *yori*-constituent combines directly with the adjective, giving rise to the comparative interpretation as represented in (42).

(41) Sally wa Joe yorikasikoi.
Sally Top Joe YORI smart
'Sally is smarter than Joe'

(42) a. $[[\text{se-ga }]]^g = \lambda x.\max(\lambda d.x \text{ is d-tall}) > g(u)$
b. $[[\text{Sally wa se-ga}]]^g = 1$ iff $\max(\lambda d.\text{Sally is d-tall}) > g(u)$
c. u= the standard of tallness made salient by comparison to Joe
= Joe's degree of height

(Beck et al. 2009:17)

This analysis correctly predicts the behavior of Japanese comparatives. First, Japanese does not permit subcomparatives of degrees. Japanese, on the other hand, does permit subcomparatives of numbers.

(43) a: *Tana-wa [doa-gahiroi (no) yori (mo)] (motto) takai
shelf-Top [door-Nom wide NO YORI (mo)] (more) tall

b: The shelf is taller than the door is wide.

(Beck et al. 2004:293)

The intended correct explanation of (44) is represented as follows:

(44) max(λd.the shelf is d-tall)> max(λd.the door is d-wide)

The context-dependent analysis as sketched above would assign a relative-clause interpretation to the *yori* constituent. The semantic contribution of the*yori*-clause is as follows:

(45) a. $[[takai]]^g$= λx.max(λd.x is d-tall) > g(u)
b. $[[Tana\text{-}wa\ [doa\text{-}gahiroi\ (no)\ yori\ (mo)]\ (motto)\ takai]]^g$
= 1 iffmax (λd.the shelf is d-tall) > g(u)
u= the standard of width made salient by comparison to the door
= the door's degree of width

(46) "# Compared to the wide door, the shelf is tall"

(Beck et al. 2004:312)

We expect that the intended subcomparative of degrees is not interpretable in this way. Subcomparatives of degrees involve more than one dimension of degrees that can be measured by the same measurement system, as in (46). As Kennedy (1999) put it, the scalar predicates representing these dimensions need to be commensurable (e.g., height and width). It is far from clear how the semantics in (47) may encode this meaning, given itsoddity. Syntactically, internally headed relative clauses do not accept adjectival predicates of the type used in (47):

(47) a. John-wa [NP [CP [IP Mary-ga hon-o kaita]] no-o] katta
John-Top Mary-Nom book-Acc wrote NO-Acc bought
'John bought the book that Mary wrote'/ 'Mary wrote a book andJohn bought it.'

b. * Watasi-wa [doa-gahiroi/ookii]-no-o aketa
I-Top door-Nom wide/large-NO-Acc opened
'I opened the door that was wide/large.'

(Beck et al. 2004:313)

Be it semantic or syntactic, the non-quantificational, context-dependent analysiscorrectly rules out the ungrammatical subcomparative of degrees ofdegrees(45). The quantificational analysis, on the other hand, wrongly rules in this construction.

Interestingly, subcomparatives of number (Ishii 1991) are permissible in Japanese.

(48) a. Hanako-wa [Taroo-garonbun-o kaita (no) yori]
Hanako-Top [Taroo-Nom paper-Acc wrote (NO) YORI]
takusan hon-o kaita
many book-Acc wrote

b. Compared to the papers Taroo wrote, Hanako wrote a lot of books.

c. ∃d [Hanako wrote d-many books & d >u]
u= the number made salient by the utterance context
[Taroo-garonbun-o kaita (no)] = THE_u[42] (λx.paper (x) &Taroo wrote x)[43]

(Beck et al. 2004:313)

On this analysis, we can safely assume that the subcomparative of numbers in (50a) hasthe interpretation in (50b). Notice that the subscomparative in (50) does not involve comparison of degrees. It can be given a relative clause interpretation, with the*yori*-clause analyzed as an internally headed clause, closed by the definite clause operator. The outcome directly saturates the adjective.

[42] Japanese lacks overt definite descriptions. This analysis assumes the covert application of the definite description THE_u as defined in (i) (Heim &Kratzer 1998).

(i) $[[THE_u]] = \lambda P.$there is a unique $x \in C$ such that $P(x)= 1$

According to Grosu& Landman (1998), the relative clause contributes the property of individuals (λx.paper(x) &Taroo wrote x), and this property serves as the argument saturating the definite description, yielding an expression of type e, which saturates the adjective:

(ii) THE_u[42] (λx.paper(x) &Taroo wrote x)

[43] An alternative analysis is that of Shimoyama (2001), who analyzes the internally headed relative clause as an independent clause that raises out of the matrix clause at LF. Accordingly, the matrix clause contains an E-type pronoun that relates the two clauses (for more information, see Shimoyama 2001).

Second, the context-dependent analysis can explain the fact that the differential comparative in Japanese/Chinese is indifferent to the negative island condition.

(49) John-wa [daremokawa-naka-tta no yori] takai hon-o katta.
John-Top [anyone buy-Neg-Past NO YORI] expensive book-Acc bought
'*John bought a book that is more expensive than the book thatnobody bought.'

The absence of negative island effects in the Japanese comparative (50)receives a straightforward explanation under the context-dependent analysis.

(50) i.daremokawa-naka-tta no yori
anyone buy-Neg-Past NO YORI
ii. [Op_i [[daremoe_ikawa] naka-tta]] -no

iii. THE_C (λx.nobody bought x)
'the one that nobody bought'

(51) i. than nobody did ~~buy a d-expensive book~~

ii. max(λd.nobody bought a d-expensive book)
'the maximal degree d such that nobody bought a d-expensive book'

(Beck et al. 2004:315)

The quantificational analysis wrongly rules out the grammatical Japanese (51). Accordingly, the standard of comparison represented by (52ii) is undefined (see subsection 3.2.1.2).[44]By adopting the context-dependent analysis, we avoid this problem by having a *yori*-standard interpreted as a relative clause closed by a definite description operator with the presupposition that there is aparticularbook that nobody bought.

Third, as we can see in (52) the intensionalized comparative is unambiguous, with the reading in which the intensional verb takes wide scope relative to the comparative head. This fact

[44]The interpretation we get in Japanese is different from the one that people usually describe as being unavailable in English negative island violations. It constitutes nice independent evidence for the very different syntactic/semantic derivation in this language.

is predicted if we assume that the comparative is not quantificational, withthe conclusion that Japanese does not make use of a quantificational degree operator that undergoesQR and creates degree abstraction.

(52) Laura-wa Pete yori(mo) sukunaikazu-no roosoku-o
Laura-Top Pete YORI(MO)small number-Gen candle-Acc
kawa-nakerebanaranai:
buy-required
'Laura is required to buy a smaller number of candles than Pete.'

(53) a. Laura needs to buy a smaller number of candles than Pete.

(54) a. need to > -er:
∃d [Laura needs to buy a d-small number of candles & d >u]
u= the number made salient by the utterance context
[than Pete buy candles] = THE_u (λx.candle(x) & Pete wrote x)

(The minimal number of candles that would satisfy therequirements imposed on Laura is smaller than the minimalnumber of candles that, would satisfy the requirementimposed on Pete.)

b. # -er> need to:

[er- than Pete]1 [need [Laura buy d-small number of candles]]
max {d: ∀w ∈Acc: small(c,d)}

In conclusion, English-like comparativesand Japanese-like comparatives havedistinct semantics. The former involves a truth-conditional composition in which a higher-order degree quantifier relates sets of degrees. As a consequence, English permits subcomparatives of degrees, shows negative island effects, and exhibits scope interactions in intensionalized comparatives. The latter involves a truth-conditional composition in which an inherently comparative adjective is interpreted as a lower-typed predicate of individuals that takes a contextually determined standard of individual type and an individual-denoting associate.

2.2.1.3. Degree Abstraction Parameter

The discussion in the previous subsection attests to the fact that degree semantics of comparatives is subject to cross-linguistic variation (seeBeck et al. 2004, 2009 and references therein). We discussed three interpretative differences between English-like and Japanese-like languages. We saw that English-type languages permit subcomparatives of degrees, exhibit scope interaction effects in modalized comparatives and show sensitivity to negative islands. Japanese-like languages, on the other hand, behave differently: they do not permit subcomparatives of degrees,do not exhibit scope interaction effects and are insensitive to negative islands in comparatives.

To explain the source of the contrast between these two types of languages, Beck et al. 2004, 2009) and Kennedy (2007) propose a parameter that differentiates between those languages that have degree quantification and those languages that do not. The major difference between the two versions of the parameter is this: whileBeck et al.(2004, 2009) claim that languagesdiffer in whether or not they have degree binding and degree abstraction in the syntax, Kennedy (2007) suggests that they differ in whether or not they have degree binding and abstraction in *than*-clauses.[45]

(55) a. Degree abstraction parameter (DAP)(Beck et al. 2004)
A language does/does not have binding of degree variables in the syntax.

b. Comparison type parameter (CTP) (Kennedy2007)
A language either has both individual and degree comparison or has only individual comparison. (A language has both 2-place and 3-place comparative morphemes or has only the latter.)[46]

[45] See Shimoyama (2012) for assessment and refinement of those parametric settings in the context of Japanese-English differences.

[46] According to CTP, the *-er* morpheme may have a 2-place predicate semantics as represented in (i), which is the quantificational standard representation. Such an operator relates sets of degrees.

i. $[[\text{-er}_{\textbf{clausal}}]]=\lambda P_{<d,t>}\ \lambda Q_{<d,t>}.\max(Q) > \max(P)$

Or it may have a 3-place predicate that takes individuals as their arguments:

If we are to decide on the two versions of the parameter, I think there is good reason to favor DAP over CTP. First,iflack of scope interaction effects is to be attributed to a lack of the QR-ing of degree quantifiers over another scope-bearing element (e.g., a modal), it is far from clear how confining the unavailability of degree binding to *than*-clauses can explain the scope-driven ambiguity. Proponents of CTP may respond to this objection by postulating that the 3-place operator may not undergo QR to create such a scope effect. But it is also unclearwhya language with 2-place and 3-place degree headswouldbe restricted to using the 2-place predicate in intensionalized comparatives, as would be requiredin order to account for the scope interaction ambiguity in these constructions.[47]

Second, if we find that a language like Japanese lacks degree binding in a larger empirical domain than comparatives, it follows that the language in question lacks degree binding quite generally in the syntax, not solely in *than*-complements.

One empirical domain that involves degree abstraction is what Grosu& Landman (1998) call amount relatives. Consider example (58).

(56) a. It will take us the rest of our lives to drink the champagne theyspilled on the floor.
Reading 1: # They spilled champagne on the floor. It will take us the rest of our lives to drink it. (i.e., to drink the very champagne that they spilled)

Reading 2: It will take us the rest of our lives to drink as muchchampagne as they spilled on the floor. (i.e., to drink that amount of champagne)
(Beck et al. 2004:333)

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ii. a. $[[\text{-er }]] = \lambda G_{<d,et>}\lambda y_e \lambda x_e.\ \max(\lambda d.G(d)(x)) > \max(\lambda d.G(d)(y))$ (Kennedy 1999) (with no parasitic scope)
b. $[[\text{-er}]]=\lambda y_e \lambda G_{<d,et>}\lambda x_e.\max(\lambda d.G(d)(x)) > \max\ (\lambda d.G(d)(y))$ (Heim 1985) (with parasitic scope)

[47]It is worth mentioning that the response would be that it needn't be the default; it's simply the only one that can generate the appropriate LF. But the LF in question can be generated as long as the 2-place variant is available.

In English, (58) can only be interpreted with Reading 2. Reading 1 is pragmatically odd. The correct reading indicates the amount of champagne, rather than the substance of champagne. Grosu& Landman (1998) suggest that the relative clause in (58) is a special kind of relative that involves degree abstraction, rather than abstraction over individuals.

Interestingly, the Japanese equivalentdoes not have the amount reading. It only supports the pragmatically odd substance reading. In order to express the amount reading, a noun phrase meaning‘amount’ or ‘degree’must be introduced.

(57)

a. Karera-gayuka-nikobositashanpan-o nomuni-waissyookakarudarou:
They-Nom floor-on spilled champagne-Acc drink-Top all-life take will
‘It will take us the rest of our lives to drink the champagne thatthey spilled on the floor.’

b. Karera-gayuka-nikobositaryoo-no/dake-no shanpan-o
They-Nom floor-on spilled amount-Gen/degree-Gen champagne-Acc
nomuni-waissyookakarudarou
drink-Top all-life take will
‘It will take us the rest of our lives to drink the amount of champagne that they spilled on the floor.’

Reading 1: They spilled champagne on the floor. It will take us the rest of our lives to drink it (i.e., to drink the very champagne that they spilled).

Reading 2: # It will take us the rest of our lives to drink as much champagne as they spilled on the floor (i.e., to drink that amount of champagne)
(Beck et al. 2004:333)

The facts in (59) show that Japanese-type languages lack degree abstraction in the syntax in general. Japanese does not show evidence of degree abstraction even in non-comparative constructions (e.g., amount relative clauses), meaning that lack of degree abstraction in the syntax is not restricted to *than*-clauses in comparatives (contra Kennedy 2007).We may conclude that Japanese-type languages differ from English-type languages in not allowing degree abstraction in the syntax. Suppose that a Japanese learner of English comes to the task of

acquiring English comparatives. The learner should figure out that such a language has degree abstraction in the syntax. Such a task represents a severe poverty of stimulus situation in which the mechanism of degree abstraction is neither employed in the native language (Japanese) nor explicitly and directly detectable from the second language input (English).

In this section, we have examined a case of semantic variation in which the same universal meaning (i.e., differential comparison) is represented differently in twotypes of language: a quantificational higher-order meaning expression in English-type languages vs. a non-quantificational lower-order meaning expression in Japanese-type languages. We now turn to another case with a similar distinction: the quantificational vs. pronominal past tense in English and Japanese. We discuss the distinction in the context of *before*-clause adjunction. A common thread between the two empirical domains (i.e., the past tense and comparative) is the distinction between quantificational and non-quantification expressions of the same meaning.

2.2.2. Tense

2.2.2.1. Tense in Formal Semantics

Tense is a crucial component of human language. Every language has a grammatical means to convey temporal information or distinctions by locating the reference time with respect to the utterance time in oneway or another (von Fintel& Matthewson 2008).[48]Within formal semantics, present tense is standardly assumed to indicate speech time. The past tense, on the other hand, has been approached in three different ways:by analyzing it as an existential quantifier that

[48] Languages may differ in whether or not they overtly mark tense distinctions. English, for example, has a temporal morpheme *-ed* that encodes temporal anteriority. Many languages, however, have been reported to be superficially tenseless (i.e., lacking overt tense morphology). Recent research that has been conducted on a set of superficially tenseless languagesshows that bare predicates in those languages may carry temporal information and indicate temporal distinctions (e.g., a bare predicate in Okanagan can be interpreted as past, present or future; Dunham2011). For more information see resources such as Matthewson (2006), Bohnemeyer (2002, 2009), Bittner (2002), Lin (2006), Silva & Matthewson (2007) and Tonhauser (2011).

locates the time of its prejacentto some time preceding speech time (Prior 1967,Ogihara 1989,Kusumoto 1999), as a referring pronominal object that denotes a definite contextually determined time preceding speech time (Partee 1973, Kratzer 1993,Abusch 1994), or as a predicate that takes a time *t* as its argument and says that *t*precedes speech time (Dowty 1979,von Stechow 1995,Musan 2002). Each of these analyses was independently motivated on theoretical and empirical grounds. Therefore, not all languages have their past tense interpreted uniformly in one way or another. Consider for example the past tense in English and Japanese. It has been argued that the past tense in Japanese-like languages behaves likean existential quantifier and thatthe past tense in English-like languages behaves like pronominal referring element (see Sharvit 2014 and references within).

The behavior of tense in embedded clauses (e.g., relative clauses, attitudinal verbs and temporal adjuncts) represents an area of active research. An embedded tense is interpreted differently depending on the environment: as an anaphor in relative clauses, a null PRO in attitudinal complements, or a referring pronominal or quantifier. In this section, we will discuss the meaning of past tense in *before*-clause constructions in Japanese and English. We will show that the quantificational vs. non-quantificational past tense distinction has theoretical and empirical implications for thetruth-conditional meaning of the structure.

Before delving into this issue, let us digress briefly and explain the relevant key concepts about the ontology of time and tense. Following the tradition, I assume that time is an abstract line that is composed of ordered intervals containing points of moments with the features outlined in (59).

(59)

i. The time line consists of the set of all moments M, which is represented by the big interval (-∞, ∞). M comprises the set of closed intervals t such that t ⊆ T (Bennett & Partee 1972). We can think of a temporality model α = [M, T, <, ⊆, t*], where M is a set of time points, T is a set of

closed intervals comprised from M, < is a precedence left linear relation for times and intervals, ⊆ is a subinterval relation and t* is the utterance time interval (see von Stechow 2010).

ii. For every t ⊆ ({M}∪T), t is dense such that for every m_1, m_2 in t such that $m_1 < m_2$ there is an $m_1 + \varepsilon$ such that $m_1 < m_1 + \varepsilon$ and $m_1 + \varepsilon < m_2$ (Fox & Hackl 2006, Sharvit 2014).

iii. Tense is a deictic notion. It is related to a deictic center which is the utterance time t* (von Stechow 2010).

2.2.2.2. Past Tense: Pronominal vs. Quantificational

Consider the temporal properties of the *before*-clause construction in English andJapanese as exemplified in (60) and (61), respectively:

(60) a. John left the meeting before [Mary arrived].

b. *John left the meeting before [Mary arrives].

(61) a. *Taroo-wa [Hanako-ni at-ta mae-ni]denwa-o si-ta
Taro-TOP Hanako-DAT meet-PAST before phone-ACC do-PAST
Lit: 'Taro phoned before (he) met Hanako'

b. Taroo-wa[Hanako-ni au mae-ni] denwa-o si-ta
Taro-TOP Hanako-DAT meet-PRES before phone-ACC do-PAST
Lit: 'Taro phoned before (he) meets Hanako'

(Sharvit 2014:263-264)

The data in (60) shows that amatrix clause with past tense in English cannot embeda *before*-clause that is inflected for non-past(i.e.present tense). It can only embed a *before*-clause with past tense. In contrast, Japanese only allows the matrix past tense to embeda 'before'-clause with the non-past,asexemplified in (61).Matrix past tense in Japanese cannot embed past tense in a 'before'-clause. This crosslinguistic variation in past-tense embedding in'before' constructions represents a puzzle thatcalls for an explanation (see Ogihara 1996, Arregui&Kusumoto 1998,Sharvit 2013).

As shown in the previous section, debate persists in the formal semantics literature over whether the past tense may be interpreted as a predicate of times, a pronominal or an existential quantifier. On the uniformitarian line of analysis, the past tense has one unified semantic structure with a fixed meaning component in the truth-conditional composition. For example, the(past)tense may be expressed pronominally, referring to acontextually-determined time (Partee 1973).[49] Accordingly,the past tense denotes anelement of type i, which is a low-type meaning that denotes a closed time interval andserves as a direct argument for verbal predicates,as represented in the lexicalentries in (62).

(62) a. $[[past_{j,k}]]^c$ is defined iff c(k), c(j) $\in D_i$ and c(k) < c(j).
When defined, $[[past_{j,k}]]^c$= c(k)
a. $[[present_{j,k}]]^c$ is defined iff c(k), c(j) $\in D_i$ and c(k) $\geq$c(j).
When defined, $[[past_{j,k}]]^c$ = c(k)
(j is an index for the evaluation time and k is an index for the reference time)
(Sharvit 2014:274)

Alternatively, it may be interpreted quantificationally(Prior 1967,von Stechow 2009)as an operator that denotes an element of type <it,it>, which is a higher-type meaning that denotes an instance of existential quantificationrelatingtwo sets of closedtime intervalswitha non-empty intersection,as represented by the following lexical entry:

(63) For any K, t $\in D_i$, $[[past]]^{K,g}(p)(t)$ is defined only if K < t and there is a t' $\in D_i$ such that t' $\subseteq$K and p(t') is defined. When defined,$[[past]]^{K,g}(p)(t)$= 1 iff there is a t'$\in${t'' $\subseteq$K: p(t'') is defined} such that p(t') =1.

(Sharvit 2014:274)

[49] This analysis was motivated by a well-known empirical puzzle that has to do with interpreting sentences like *I didn't turn off the stove*. The intuitive reading of this example is that it is not the case that the speaker turned off the stove at a contextuallydetermined definite time. The quantificational analysis is problematic for this case. It yields one of two counterintuitive readings: with the negative taking scope over the existential quantifier, it generates the unattested reading that it is not the case that the speaker has turned off the stove (probably false), and with the quantifier taking scope over the negative it means that at some past time, the speaker did not turn off the stove (trivially true).

On the transparent view, however, the past tense may be interpreted either way: as a pronominal or as a quantifier, within or across different languages (Sharvit 2014). Assume thatthe past tense has different lexical semantics in English and Japanese: the pronominal and quantificational denotations, respectively. The variation in the behavior of past tense in the *before*-clause construction in the two languages may be explained in a straightforward way (Sharvit 2014). In what follows, we bring this transparent view to the table. This view is consistent with another transparent analysis in which the comparative meaning has different denotations in the two languages in a crucial respect: it is the higher-typed quantificational vs. lower-typed non-quantificational meaning that describes the variation.

Consider once again the *before*-clause pattern in English and Japanese in (60) and (61), repeated as (64) and (65).

(64) a. John left the meeting before [Mary arrived].
b. *John left the meeting before [Mary arrives].
(65) a. *Taroo-wa [Hanako-ni at-ta mae-ni] denwa-o si-ta
Taro-TOP Hanako-DAT meet-PAST before phone-ACC do-PAST
Lit: 'Taro phoned before (he) met Hanako'
b. Taroo-wa [Hanako-ni au mae-ni] denwa-o si-ta
Taro-TOP Hanako-DAT meet-PRES before phone-ACC do-PAST
Lit: 'Taro phoned before (he) meets Hanako'

(Sharvit 2014:263-264)

The transparent analysis of Sharvit (2014) accountsfor the pattern in a straightforward way. Assume a universal semantics for [[before]]: a temporal operator of type <it,it> that takes as its argument the temporal adjunctof type <i,t> which is represented by the embedded

*before*clause and yields an element of type <i,t>. Assume further that the lexical meaning of [[before]] obeys the condition in (66):[50]

(66) for any $t \in D_i$ and $P \subseteq D_i$, if $P^t = \{t' \subseteq t: t' \in P\}$,
a. $EARLIEST_t(P) = MIN(\cup P^t)$,
where MIN(S) is the unique $m \in S$ such that for all $m' \in S$, $m' \leq m$.

b. For any contextuallysupplied $C \in D_i$, any $t \in D_i$ and any $p \in D_{<i,t>}$, $[[before]]^{C,g}(p)(t)$ is defined only if:(i) $t \subseteq C$, (ii) $EARLIEST_C(\{t' \in p(t): p(t')=True\})$ is defined, and(iii) $MIN(C) < EARLIEST_C(\{t' \in p(t) : p(t')=True\})$.

c. When defined, $[[before]]^{C,g}(p)(t) = 1$ iff $t < EARLIEST_C(\{t' \in p(t): p(t')=True\})$
(von Stechow 2009:31, Sharvit2014:274)

As represented in (66), the operator [[before]] involves another operator, $EARLIEST_t(P)$,which takes the set of times denoted by the embedded clause and returns the leftmost moment of the set. The meaning of [[before]] presupposes that there is such a time and it follows the leftmost moment of C (a contextually supplied element). [[before]] first composes with its complement, which is the embedded clause of type <i,t>, and then it composes with the matrix clause of type <i,t> by predicate modification.Byway of illustration, consider the truth-conditional representation of the *before*-clause in(64), repeated as (67). Since we have two lexical entries for the past (i.e., quantificational vs. pronominal), we would have two different Logical Forms with different truth conditions for the same syntactic structure, as represented in (68a) and (68b).

(67) John left the meeting before Mary arrived.

(68) a. [[before [$PAST^{English\text{-}Pronominal}$ Mary arrive]]
There is a timet < speech time such that $t < EARLIEST_C(\{t' : Mary arrive at t'\})$

[50] This semantics was proposed in Beaver &Condoravdi (2003).It interprets "q before p" as true iff some q-time precedes the first p-time (for more information,see Sharvit 2013).

(Where t⊆C andMIN(C) <EARLIEST$_C$ ({t': Mary arrive at t'})

b. [[before [PAST$^{Japanese\text{-}Quantificational}$ Mary arrive]]
There is a time t <speech time such that t <EARLIEST$_C$ ({t':∃t'' [t'' < t' and Mary arrive at t'']})
(Where t ⊆ C and MIN(C) <EARLIEST$_C$ ({t':∃t'' [t'' < t' and Mary arrive at t'']})

In (68), we want the intended meaning in which theEARLIEST$_C$operator takes as its argument the set of times denoted by the *before*-clause complement (i.e. before Mary arrived) and returns the leftmost time in which Mary arrives within C. On the quantificational analysis, there would be no such leftmost time that follows the leftmost moment of C. If we assume that the proposition {t < C : Mary arrive at t } = Ø , it follows that for every t ∈ {t ⊆ C : t ∈{t': there is a t'' < t' such that the plant dies at t"}}, there is another t''' ∈ {t ⊆ C : t ∈{t': there is a t'' < t' such that the plant dies at t"}} such that t"' < t.[51]If we assume that the proposition {t< C : Mary arrive at t } ≠ Ø, it follows that the leftmost time of C equals EARLIEST$_C$ ({t': there is a t'' < t' such that the plant dies at t"}). Again, there would be no leftmost time that follows the leftmost time of C. On the pronominal analysis, this problem does not arise. Since the past tense is a pronoun, there would be a leftmost time that follows the leftmost moment of C, since EARLIEST$_C$ ({t': Mary arrive at t'}) is defined.

This analysis correctly predicts the pattern of variation between Japanese on the one hand and English on the other hand in (64) and (65). The fact that the past tense is quantificational in Japanese makes (65a) ungrammatical. When [[before]] embeds the quantificational past tense, it fails to express the suppositions that follow from [[before]]'s meaning(namely thatthere is a leftmost time that follows the leftmost moment of C). Japanese therefore involves an underspecified present tense under [[before]]. English, on the other hand, has a pronominal past.

[51] By density (see (59ii)).

It can be embedded under [[before]] without violating such a presupposition. With the meaning of past as a pronoun, there would be a leftmost time that follows the left most time of C.

Although the *before*-clause construction is syntactically the same in both types of languages, the fact that past tense is interpreted as a quantifier in Japanese and as a pronoun in English leads to an interpretive difference between (64) and (65b). Japanese exhibits the property of p-shiftability. English on the other hand exhibits a no-p-shiftability property (Kaufmann & Miyachi 2008,Kubota et al. 2011,Sharvit 2014). Let us explain this notion in the context of past tense embedding in (64) and (65). As we can see, the past-tense matrix clause can embed a *before*-clause that is only marked for past tense. Neither present nor future are allowed in this context. Therefore, (64b) is ungrammatical, with an odd reading. On the assumption that the present tense denotes speech time, the meaning of **John left the meeting before [Mary arrives]* is that the time at which John leaves precedes speech time, which comes before the earliest time at which Mary arrives, which is the speech time itself. This is pragmatically odd since the meaning of (64b) is predictable without the temporal contribution of [[before]](Stump 1985). English cannot avoid this effect since it exhibits a no-p-shiftability property: English restricts the meaning of the present to speech time and the meaning of the past to a time preceding speech time. Japanese, however, can avoid the effect by having an underspecified present under the *before* clause that can be interpreted as a time that occurs before speech time or after speech time. In this way, Japanese exhibits a p-shiftability property. The meaning of (65a), for example, is that the time at whichTaro phones precedes the speech time, which may come before the earliest time at which he meets Hanako, which may be a time that precedes or follows the speech time. In this way, the temporal meaning of [[before]] is not vacuous and we avoid the Stump

effect, thanks to p-shiftability. In this way, English exhibits the property of no-p-shiftability. Because English exhibits a non-p-shiftability property, it gives rise to the Stump effect.

2.2.2.3. Conclusion

In this chapter, we presented and analyzed the meanings of comparison and past tense in Japanese and English. We showed that the meanings of comparison and past tense, though conceptually realized across languages, are expressed differently in different languages. We focused on two modes of expression: the higher-typed quantificational mode of the comparative in English and the past tense in Japanese vs. the lower-typed, non-quantificational mode of the past tense in English and the comparative in Japanese. We showed that the quantificational vs. non-quantificational classification gives rise to striking interpretive differences between the two types of language. In English, the fact that the comparative is quantificational allows the expression of subcomparatives of degrees, induces a negative island effect and gives rise to scope ambiguity in intensionalized comparatives. On the other hand, the fact that the comparative is expressed non-quantificationally in Japanese makes subcomparatives of degrees unacceptable, leadsto insensitivity to negative island effects and a lack of scopal interactions in intensionalized comparatives. Similarly, since the past tense is quantificational, it is barred from occurring in a *before* clause under a past-tense matrix clause in Japanese. The embedded tense gives rise to a p-shiftability property, in which the underspecified embedded tense may occur before speech time or after it, a property that makes Japanese obviate the pragmatic oddness of past under present in a *before* clause. English, however, allows past-tense embedding in *before*-constructions with a no p-shiftability that makes present under past in a *before* clause pragmatically odd.

The empirical observations discussed in this chapter leave unanswered two questions: How to explain the variation between the two languages in terms of the difference in the typed structure of the same conceptual meaning (i.e. comparison or past tense)? What theoreticalimplications does this sort of variation have for second language acquisition?

Chapter 3

Meaning in the Architecture of Language

3.1. The Parallel Model vs. The Minimalist Program

Generative grammar aims at explaining the phenomenon of language byaddressing questions that are related to the characterization of knowledge of language: how is knowledge of language internalized and represented in the mind of the speaker-hearer? What does it take for the process of language learning to take place under the conditions and constraints that are afforded by the system?[52]Most generative-based theories of second language acquisition (SLA) seek to define and delineate those aspects of language that are to be learned by L2 acquirers and those aspects of linguistic knowledge that may come to learners for free.[53]

A central assumption of this line of theorizing is to take language as a recursive system which generates infinite pairings of sound and meaning.[54] Recursion, as a distinctive property of human language, allows humans to produce an infinite number of expressions by utilizing the finite resources of the lexicon and the computational system. A structural reflex of this property is the cross-linguistic infinitude of syntactic embedding (Chomsky1957). Recursion also affords humans the capacity of understanding the meaning of an infinite numberof complex expressions by means of a finite lexicon and a restricted set of compositional principles (Partee et

[52]The rationale of the generative school of language acquisition is based on two main views. The first view defines language as a representation of an inborn faculty which facilitates acquisition (Chomsky1965 and subsequent work). This view is commonly referred to as "linguistic nativism". It was firstintroduced as a reaction to behaviorism, which attributed acquisition to a process of habit formation motivatedby empiricist procedures such as stimulusreinforcement (see Chomsky 1959). The second view takeslanguage as a cognitive ability which is identified with an innately determined and function-specificmodule that deals with input of linguistic kind. This view is called "linguistic modularity". Research inthis direction was heavily influenced by the modularity of Fodor (1983), who defended the idea that the mindcomprises distinct systems connected with different domain-specific, fast, localized andinformationally encapsulated input systems which process linguistic or sensory information ininteraction with internal systems. I will return to the issue of modularity later in this section.

[53] See White (2003) for an overview of different generative-based theories investigating L2 acquisition.

[54] Everett (2005:622) claims that Piraha, a Mura language spoken in Amazonas Brazil, does not allowembedding.

al.1990,von Fintel & Matthewson 2008). Given this property of human language, there emerged a need to differentiate between those questions that are concerned with language as a communicative system and those questions that have to do with the computational processes underlying the recursive structure of language. Since the inception of the cognitive revolution in the middle of the last century, linguists, philosophers and psychologists have attempted to come up with an explanation for the mystery of the computational device of language[55] and the conditions and properties it possesses by which language manifests itself as a neat, recursive, hierarchical and generative system (Hauser, Chomsky&Fitch 2002:1569).

Among the many other theories of language, two representative models have been constructed to characterize the architecture of the computational device of language: Noam Chomsky's (1995, 2004) Minimalist Program (MP) and the Parallel Model, which was developed by Ray Jackendoff (2002). The common denominator in the two models is the generative and modular view of language. The two models, however, differ as to the theoretical and conceptual technicalities of representing the architecture of language.

As a syntactocentric model of grammar, the Minimalist Program (Chomsky 1995) centralizes the job of generating structures in the syntax, with the interfaces being responsible for assigning sound and meaning forms to syntactically generated raw structures.[56] In this way recursion is syntactic and the role of other linguistic submodules is dramatically trivialized. The Parallel Model (Jackendoff 2002), on the other land, elaborates the system by postulating other generative levels of grammar, namely the submodules of phonology and semantics, which are argued to integrate other processes that generate module-specific structures,

[55] Known as the Faculty of Language (Chomsky 2001).

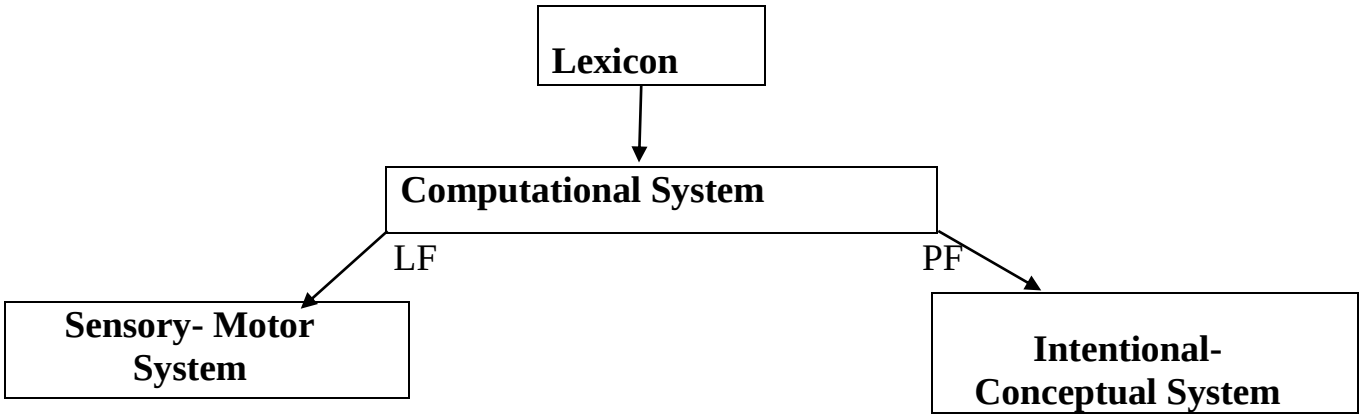
[56]To use Chomsky's terminology, these external systems are the Intentional-Conceptual and the Sensory-Motor systems. The external systems are not part of Language per se, but their interfaces with Language are integral in assigning sound and meaning realizations for the crude syntactic structures generated by the syntax of Language.

such as phonological and semantic structures (see Jackendoff 2002 for an argument motivating this move). By postulating other generative modules along with the syntax, the Parallel Model attributes a more articulate and more well-defined role for the interfaces than the one that is assigned to the interfaces under the Minimalist Program. The Parallel Model is based on two major underpinnings that enrich the system. First, interface processes are introduced as qualitatively independent from the integrative ones, with the former being operative at the interfaces of each linguistic submodule and the latter being at work within submodules (Jackendoff 2002). Interface processes operate insofar as structures from different linguistic submodules get correlated. For example, assigning meaning to structures involves correlating the syntactic structure with its corresponding semantic structure at the syntax-semantics interface by virtue of deriving its truthconditions (Frege 1884, 1892, 1923; Heim & Kratzer 1998). The syntax-semantics interface utilizes processes which only correlate the syntactic tree as generated by the syntactic processor (i.e., categorical trees which are built up using operations such as internal/external merge) and the semantic tree which is constructed out of logical types by rules of construal (Chomsky 1981, 1995, 2001; Montague 1973; Heim & Kratzer 1998; von Fintel & Mathewson 2008). Interface processes concern themselves with this kind of job (see Jackendoff 2002:ch.5).

Second, the Parallel Model is distinguished from the Minimalist Program in attributing to the phonology and semantics a no less generative power than the syntax. The Parallel Model is thus an anti-syntactocentric view of the grammar in which all linguistic levels, including phonology, syntax and semantics are generative, with their module-specific integrative processes and conditions interacting to derive module-specific structures. In this way, the Parallel Model manifests itself as a processing model which is more apt for psycholinguistic and neurolinguistic

research by employing psychological notions such as working and long-term memory, interface and integrative processors, etc.[57] Unlike the Minimalist Program, the Parallel Model is designed to meet the logical requirements of processing theories of language comprehension and production by presenting a richer processing system of linguistic structure that moves in two main directions:[58] while production involves a processing direction that proceeds from semantics to phonology, comprehension is directed from phonology to semantics as schematized in Fig. 3.1.

Fig. 3.1: **The directional model of MP**

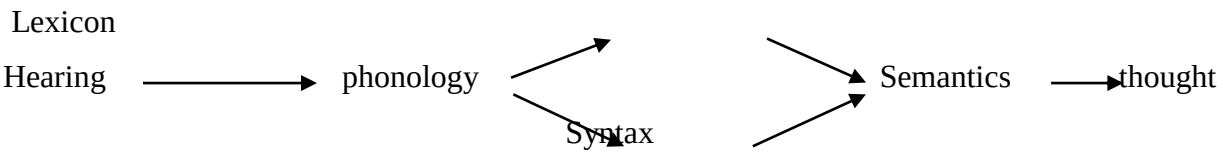


[57] This assumption of Jackendoff (2002) is based on empirical evidence from how certain expressions get interpreted beyond the way their syntactic composition proceeds. In this dissertation, I argue that the interpretation of quantification is one domain that requires further semantic processing.

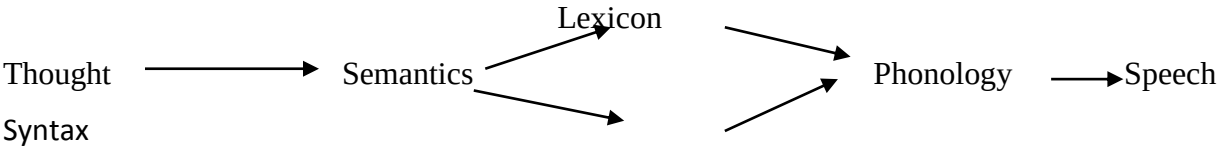
[58] The Minimalist Program, by contrast, is a one-way directional system that derives structures through the interaction of lexical insertion and phrase-structure rules and then submits them to the phonological and semantic interfaces to be assigned sound and meaning realizations (Chomsky1995).

Fig. 3.2: **The bi-directional Parallel Model of Language**

a. **Comprehension**



b. Production



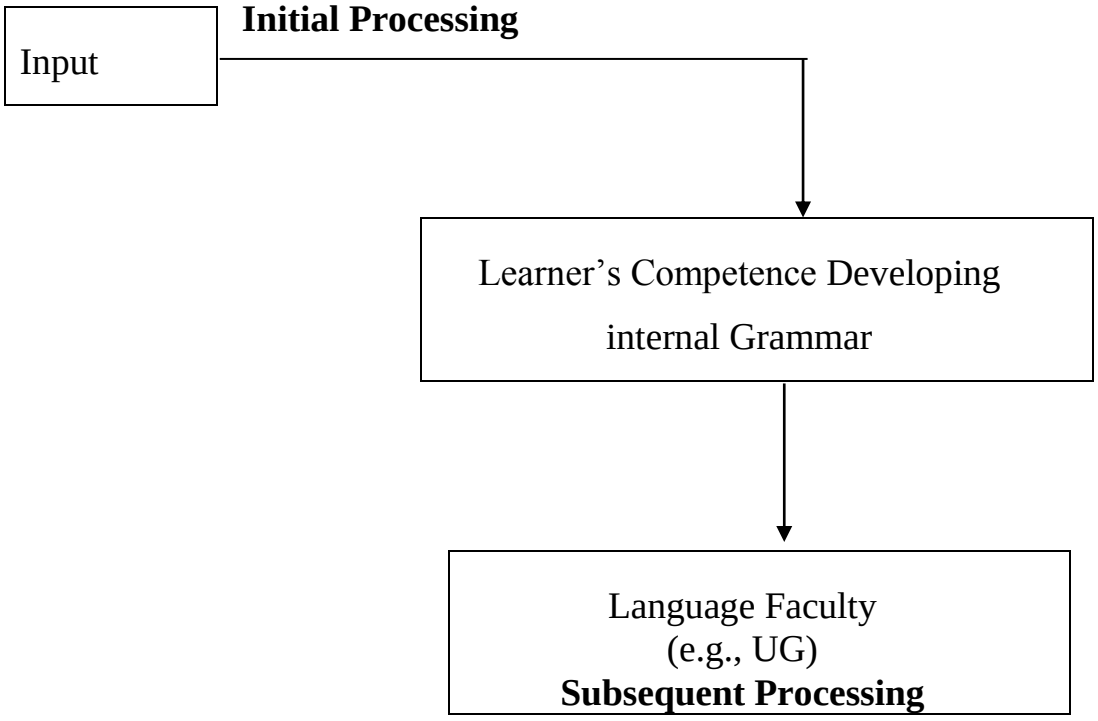
Since our focus is on the characterization of truth-conditional meaning, I will adopt anarchitecture of language that draws on minimal assumptions abouthow meaning is processed and modularized in the faculty of language.[59] My model utilizes ideas from the generative module of grammar (i.e., the Parallel and Minimalist models) and the processing mechanism of form-meaning connection theories (vanPatten 2004). In what follows, I will paint a complete picture of the model that will be used in our investigations of L2 acquisition of non-nominal quantification. Our exposition will focus attention on the comprehension direction of linguistic processing.

First, the intended model is designed to meet the demands of a processing theory of comprehension, in which language users perceive a range of sentences in real time. Starting with the input, a comprehension task involves multiple stages of processing, beginning with an initial processing of linguistic exposure by registering a form-meaning structure at the interface with the sensory-motorsystem and terminating with a fullyinterpreted structure that comes under

[59]Ignoring for the sake of simplicity other conceptual and cognitive aspects of meaning, which in principle can be investigated under the current model.

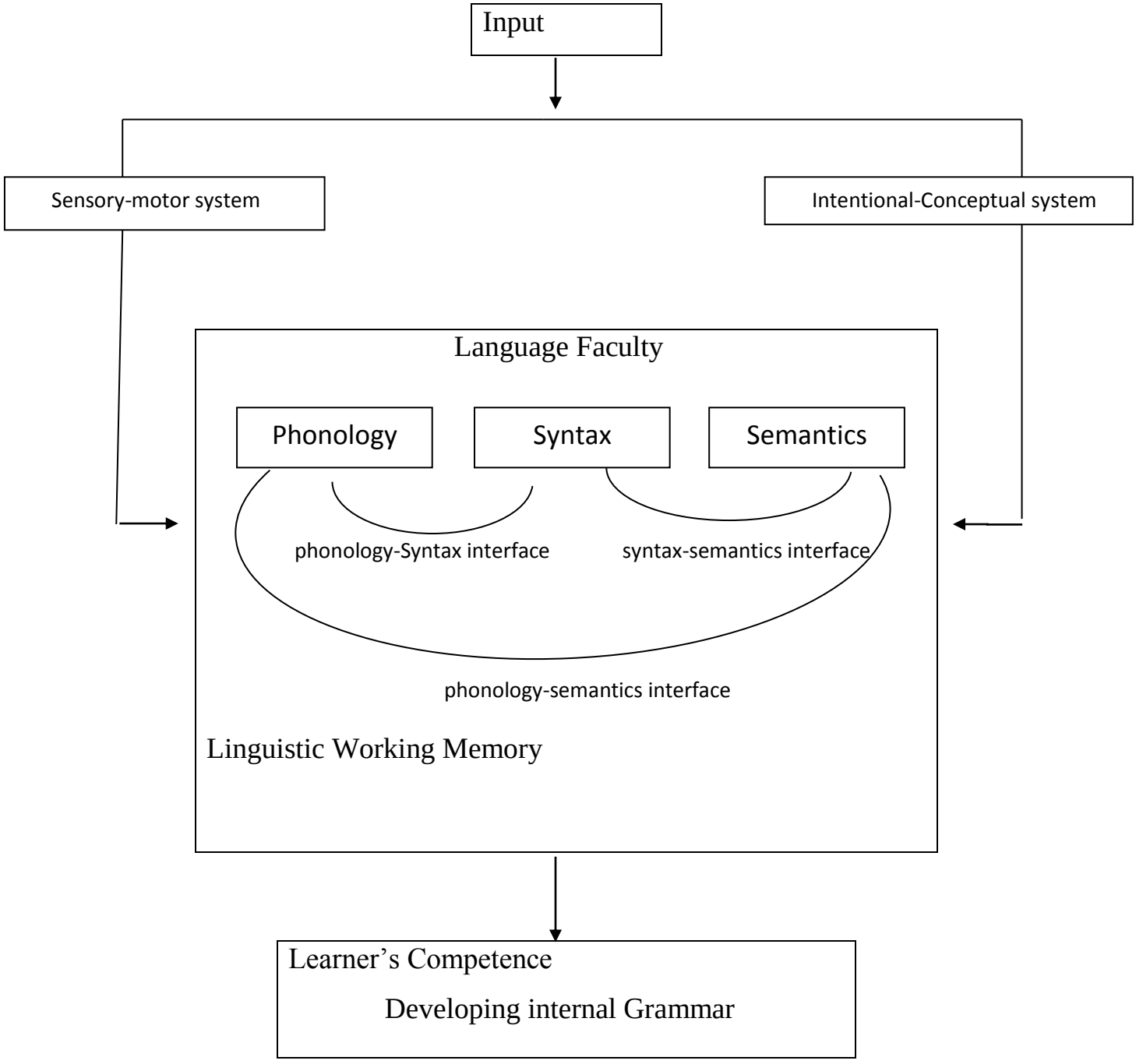
further processing within the internal system of language (see, for example, vanPatten 2004b), as schematized in Fig. 3.3.

Fig. 3.3: **The Processing Model**



Second, we elaborate the system by incorporating two main notions from Jackendoff's (2002) framework. The first is that the phonology and thesemantics along with the syntax make independent recursive systems that buildup their own structures using integrative processes. The second is that theinterfaces between these submodules integrate other processes which help construct the syntactic structures generated (see Fig. 3.4).

Fig. 3.4: **The Parallel Model adopted from Jackendoff (2002:199).**



To make this picture clearer, let us consider an example that shows how meaning is assigned to an utterance by connecting its categorial syntactic structure with its corresponding typed semantic structure. In hearing the meaningful sentence *Bill likes Mary,* for example, the rational hearer first establishes an instance of initial processing (IP) that mediates the external world and the internal language system by registering some linguistic form as connected with some meaning (vanPatten 2012).IP sends the form as a raw sequence to the language faculty for further processing. The sequence stops first at the phonological part of the working memory[60] to be processed by the integrative phonological processors by assigning syllabic and word boundary structures to the sequence. At this point, the lexicon is consulted by the phonology to activate the lexical items of the structure. The sequence then proceeds to the phonology-syntax interface to be processed by being assigned a richer structure with the aid of interface processors (e.g., intonational structure). The structure as it stands is not a complete syntactic structure, so it proceeds to the syntax to undergo further processing by the integrative processes there. The integrative processes of the syntax employ a recursive mechanism of structure-building that includes operations such as internal and external merge, which interact to produce categorial syntactic trees (Chomsky 1995 andsubsequent work). I will assume that the syntactic module is mainly concerned with syntactic operations such as fixing language-specific word order, Case and thematic endings etc. (Jackendoff 2002:27). The structure as produced in the syntax needs to be assigned meaning, so it is sent to the syntax-semantics interface for further processing. At this point, meaning is derived by correlating the syntactic and semantic forms at the interface through the non-trivial process of Form-Meaning Connection (FMC) (vanPatten et al. 2004). At the

[60] Our understanding of the concept of working memory is that it is just a workbench that stores temporary information for online processing. The stored information may come directly from input or retrieved from long term memory. Working memory is limited in its capacity and resources. It deals more efficiently with automatic processes than with controlled processes that require more attention. (For more information about the detailed model of working memory see Gathercole and Baddeley 1993.)

syntax-semantics interface, the interface processes serve as a linking mechanism that connects the syntactic and semantic forms by deriving argument structures. By argument structure, we mean the syntactic structure that involves syntactic predicates and arguments which are marked for thematic and Case relations, such as [$_S$[$_{NP}$ Bill] [$_{VP}$ likes [$_{NP}$ Mary]]]. The corresponding semantic argument structure uses *n*-place semantic functions that stand for predicates ([λxλy.x likes y]∈ $D_{<e,et>}$) applying to semantic arguments of any of the denoting logical types (e.g. ⟦Bill ⟧∈ D_e) (Heim & Kratzer 1998). Since the interface is restricted to linking mechanisms of the syntactic and semantic forms, surface compositionality is performed at the interface, resulting in what we will later dub categorematic structures, in which contribution to truth is indirect as constructed relative to the categorial composition of the syntax.[61] Put differently, the semantic-syntactic interface processing results in the production of simple compositions in which the syntactic and semantic structures are tightly correlated. This argument implies that surface compositions are processed atthe interfaces, with their truthconditions derived by one-to-one mapping between the syntactic and semantic structures (Jackendoff 2002). This type of composition draws on lexical items that supply "matter" and whose meanings consist in their reference (May 1991:336,MacFarlane 2000).[62]

We do not want to assume that meaning as a complex cognitive organization is solely captured by means of surface compositionality at the syntax-semantics interface, in the way we have just envisaged.[63] Take for example quantified constructions. Quantified constructions are complex structures whose interpretive properties do not only depend on the categorial syntactic

[61] See the next subsection for more discussion on this point.

[62]On the assumption that the derivation of truth conditions is something that happens purely internally to the (recursive) semantic structure (Jackendoff 2002).

[63] Expressions that involve transfer of reference and coercion attest to the fact that simple compositionality is not always sufficient for interpretability (for a comprehensive overview see Jackendoff 2002:ch. 12).

structure.[64] But they incorporate, as an integral part of their meaning, invariant logical information that relates sets of objects[65] either universally (by placing the set of objects that comprise the quantifier's restricted domain in a subset relation with the set of objects comprising the nuclear scope) or existentially (by putting the two sets in a non-empty intersection relation) (May 1991,Szabolcsi 2010, MacFarlane 2000). In the next section, we will argue that quantified structures should be viewed as enriched compositions that follow a processing path in the grammar different from that of surface compositions. This is because they involve additional structural prerequisites for the application of the quantifier's semantic rule, whose meaning imposes further requirements on the truthdefinition of language that go beyond the truthconditions assigned relative to syntactic composition (e.g., surface semantic compositions). I will also explain the terminology that is associated with the distinction between surface and enriched quantified compositions. I will argue that these two modes of composition have different representational and processing statuses in the grammar within our minimal model of language (contra Slabakova 2008). After that, I will shed more light on the semantics component from a linguistic standpoint.[66]

3.2. Quantified Structures in Natural Language

Given the versatile application of quantification in natural language semantics, quantification has been employed as a central tool to account for many semantic phenomena in recent generative investigations (see chapter 2, section 2). The standard practice among formal semanticists is to

[64]We view quantification from a linguistic standpoint which looks at both nominal and non-nominal quantifiers. The focus of this work is on non-nominal quantifiers (see the next subsection).
[65] Whether nominal, as with objects, or non-nominal, as with worlds, events, degrees or times (Szabolcsi 2010).
[66] As construed by Jackendoff (2002), the semantics as a generative submodule is not defined in terms language per se. It is defined in terms of thought. Jackendoff uses the cover term "conceptual structure". We understand thought as a complex cognitive organization which includes language as well as non-linguistic cognitive skills, instincts and general knowledge such as heuristics, color, metrical size and species. We limit ourselves to the linguistic aspect of conceptual structure. More specifically, we focus on the truth-conditional aspect of meaning.

analyze quantifiers as higher-order operators that quantify over domains of objects in two different ways.In nominal domains,quantification targets explicitly realized objects by means of overt operator-variable binding in the object language as exemplified by the sentence (69a), which denotes an instance of universal quantification over individual students. When it comes to non-nominal domains, quantification takes place implicitly over objects that are not mentioned in the object language but semantically realized in the metalanguage, as in the deontically modalized sentence (69b), which involves universal quantification over the set of worlds accessible fromtheworldofevaluation, worlds which are compatible with the operative obligations.[676869]

(69) a. Every student slept.
(∀x) (student(x) → slept(x))
b. Bill must be home.
(∀w') (w Acc w' → Bill be home in w')

In contrast to simple composition structures, the derivation of quantified structures involves a more complex and more enriched mode of composition. Using cover terminology that is due to May (1991:336) and MacFarlane (2000), I will differentiate between items that can compose with their sisters via direct function application anditems that require further syntactic manipulation in order to get interpreted. I will dub the simple composition structures "categorematic structures" (henceforth non-quantificational): structures whose elements of composition mainly comprise non-logical, lexical expressions whose meaning is based on their reference and the matter they supply. Such structures have their truthconditions articulated

[67]Adverbs of quantification (such as *always*) are an exception. They count as object-language non-nominal quantifiers in our terminology.
[68] The object language just contains the various morphosyntactic formatives. We use the term "individuals" to refer to those individual-denoting objects in the target language.

[69]It is worth mentioning that there are proposals that place things like world variables directly into the object language, as silent pronouns (e.g., Percus 2000).

relative the corresponding syntactic composition. I will also refer to quantified expressions as "syncategorematic structures", which are structures that involve as part of their overall meaning logical constants of invariant meaning such as quantifiers. Their truth-conditional structure cannot be determined by the syntax, but is determined by the application of the semantic rule whose application yields a semantically interpretable structure. The interpretation of a quantifier involves two types of properties: syntactic properties that hold at LF, such as QR and binding,whichcreate abstracts, and semantic properties that determinethe quantificational domain restriction in nominal quantifiers (Stanley and Szabo 2000) as well as the flavor and force of quantification in non-nominal quantifiers (e.g., modals) (Kratzer 1991).

Taking this distinction as non-trivial to the grammar, I find it expedient to reconsider the representational and derivational statuses of the non-quantificational andquantified structures in the architecture of language. We can think of non-quantificational structures as a consequence of the interface linking processes that operate at the syntax-semantics interface, which should suffice to derive the truth conditions of categorematic structures by virtue of their contribution to truth relative to the syntactic composition, with all non-logical elements assigned meaning by reference in the semantics.Syncategorematic quantified structures, on the other hand, must satisfy the structural and semantic prerequisites of their interpretation by having logical information encoded and retrieved to create the relevant syntactic structure that relates meaningful objects at a higher-order level. Such structures should not be treated on a par with categorematic structures in the grammar. Before elaborating more on this point, let us consider the syntactic and semantic properties involved in deriving quantified expressions.

Under generative approaches to grammar, we take it as a standard assumption that syntactic structures generated by the computational system (CS) need to be assigned meaning at

the syntax-semantics interface between the CS and the Intentional-Conceptual System (I-C) (Chomsky 1981, 1995, 2004; von Stechow 2012).[70] Assigning meaning to the syntactic structure is the determination of its truth conditions as derived under a recursive, compositional mechanism that determines the truthdefinition of language (Frege 1892/1980; see also Heim & Kratzer 1998). The assignment of truth conditions is completed under a set of constraints that are imposed by the Intentional-Conceptual System at the interface (Chomsky 1995). Two sets of constraints are relevant: derivational constraints,which are imposed by the semantic interpretation of syntactic structures and which facilitate the application of semantic rules relevant for the interpretation of quantifiers, such as QR and binding, and grammatical constraints,which ensure the semantic well-formedness of LFstructures, such asthe determination of the flavor and force of quantification as well as the quantifier domain restriction (Stanley & Szabo 2000, May 1991:336).[71] Logical terms, such as quantifiers, which have direct implications for the truth-definition of language, have fixed invariant meanings which stem from the application of the semantic rules. Other non-logical terms, such as predicates and entities, contribute indirectly to the truth-specification of language through the grammatical constraints that map them directly onto the categorical composition of syntactic structures (May 1991).

To the extent that these constraints are operative in correlating the syntactic and semantic structures at the interface, grammatical constraints should be sufficient for the interpretation of categorematic structures, which requires aone-to-one mapping between the categorial structure that represents the syntactic form and the typed structure that encodes the semantic form. This

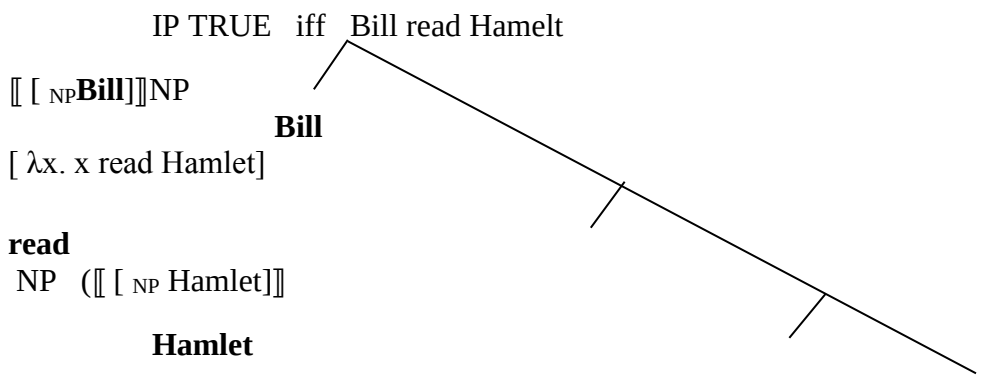
[70] Be it the LF representation in the sense of Chomsky (1981) or the Conceptual Structure in terms of Jackendoff (2002), regardless of which model is adopted for characterizing the architecture of language (e.g., the Minimalist Program of Chomsky 1995 or the Parallel Model of Jackendoff 2002). See Slabakova (2008) for a review.
[71] To borrow terminology from May (1991:336), we need to differentiate between extrinsic constraints,which place formal requirements on the semantic interpretation, and intrinsic constraints, which determine the form of the syntactic structure of LF.

view was adopted by Slabakova (2008:21-29), who showed how the syntax-semantic equivalence captures non-quantificational structures by matching the recursive mechanism of the syntax with that of the semantics. Correlating the syntactic structure in (70a), for example, with the semantic structure in (70b) proceeds by simply relating the recursive mechanism of the syntax (based on syntactic operations that build the syntactic tree, such as internal and external merge and subcategorization) with the recursive mechanism of the semantics (in which compositionality rules, mainly Function Application, apply to derive the truth conditions of the structure as represented in (70b)).[72] The correlationproceeds in such a way that for every syntactic constituent that participates in the syntactic recursion, there is a corresponding semantic interpretation that is built recursively to compose the overall structure with the truth value of TRUE or FALSE, depending on the utterance situation in the universe of discourse (Slabakova 2008, among many others). Therefore, (70) is an example of a categorematic semantic structure whose contribution to truth depends on the way its elements compose relative to the categorial syntactic structure in (70b).[73][74]

[72] Note that this is a simple example. More complex structures are derived using additional composition rules (for more information, see Heim & Kratzer 1998).
[73] Ignore syntactic enrichments such as the vP shell and the CP and its other cartographic divisions, and other syntactic operations such as the Case-driven and head-movement associated with them.
[74] Ignore further semantic enrichments such as the application of temporal and other intensional operators that may be applicable.

(70) a. Bill read Hamlet.

b.



When it comes to quantified structures, things are more complicated. Such structures incorporate logical terms like quantifiers whose contribution to truth is direct. Interpreting logical terms does not follow from their equivalence to syntactic categorial composition, but rather from the application of semantic rules which are determined by the structural constraints of LF. That is, logical terms have the property of invariance. Their meaning respects logicality, which is a fixed integrative feature that is fixedly defined at the LF level of representation (Chomsky 1975,May 1991). For the ambiguous quantified structure in (71a), we might propose two distinct logical form structures in the syntax-semantics interface, as illustrated in (71b) and (71c).[75]

[75] Invariance is an inherent property of logical terms. By invariance, we mean that their meaning is fixed across contexts since it has a functional meaning (May 1991).

(71)

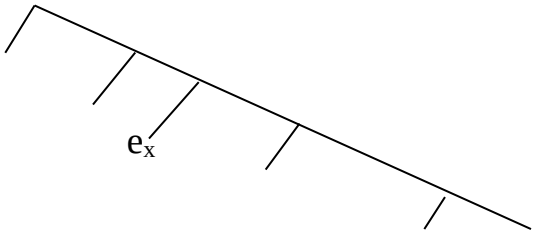
a. IP

Every student VP

λx V

read NP

some book



b.

IP_a.(∀x)(x is a student →(∃y) [y is a book& x read y]]

Every student

[λPλQ.(∀x)(P(x) → Q(x))] (λy. y is a student)λx.(∃y) ((y is a book)& (x read y)]

[λQ .(∀x)(x is a student → Q(x))]IP_b(∃y) ((y is a book)& (x read y)]

λx λv. x read v

some book λvIP_c **[** x read y]

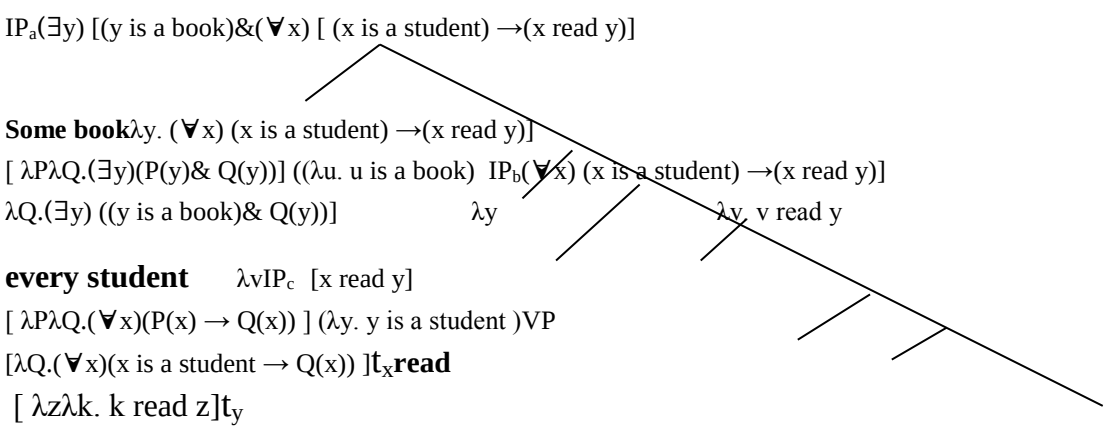
[λPλQ.(∃y) (P(y)& Q(y))] ((λu. u is a book)

[λQ.(∃y) ((y is a book)& Q(y))]t_xVP

read t_y

[λzλk.k read z]

c.



Explaining the ambiguous structure in (71a) through one-to-one mappings between two syntactic structures (LFs), derived by QR and binding and their corresponding semantic typed structures, is not the whole story about the representation and interpretation of (71a). Quantified structures represent a case of enriched composition in which context plays a crucial role in their interpretation. Therefore, quantified structures are complex in the sense that they integrate extrainformation that cannot be predicted by the syntactic composition.[76] In what follows I will discuss two main purely semantic and pragmatic requirements that suffice to conclude that the quantified structure is among those data that lend supporting evidence to Jackendoff's claim that the semantics is generative[77] (contra Slabakova 2008). These two requirements are *the problem*

[76] This is a highly debated issue in the field. Early generative theorists along the line of Chomsky (1957) claim that meaning follows directly from the syntax. Later on, the claim has been subjected to more theoretical scrutiny with the conclusion that meaning should be somehow independent by cognitive semanticists such as Lakoff (1970), government and binding theorists(Chomsky 1981) and conceptual theorists (Jackendoff 1996).

[77] A typical example of those enriched compositions is the sentence *The ham sandwich over there in the corner wants a cup of coffee*, which is due to Nunberg (1978). This example is an instance of transfer of reference that involves what Jackendoff (2002) calls rich composition,which is assigned its natural interpretation by the interaction

of quantifier domain restriction and the *context-dependency of interpreting non-nominal quantifiers.*[78]

Consider the following sentence.

(72) Every bottle is empty.

The natural interpretation of (72) is not that every bottle in the universe is empty. (72) communicates a proposition that every member in a contextually-determined restricted class of bottles is empty. The fact that (72) has reference to additional contextual information which restricts the domain of thedeterminer *every* shows that (72) is not just a simple composition derived by the syntactic operations of QR and binding, but it is further enriched with extra information that is not directly read off the syntax. Whether this reference to context is implemented grammatically or semantically is a debatable issue. To say that the phenomenon of domain restriction in quantified expressions can be resolved in the syntax amounts to saying that there is a syntactically unpronounced one-place predicate whose interpretation depends on context and that this object predicate-modifies the overt restriction of the quantifier. The domain of quantification is then derived syntactically by predicate modification (i.e., intersecting the set of individuals denoted by theexplicit noun*bottles* with an unpronounced contextually determined predicateF (e.g., 'that I bought') that also denotes a set of individuals and whose value depends on context.

One problem facing this syntactic approach is what Stanley & Szabo (2000) call "underdetermination". If domain restriction involves an elliptical predicate in the syntax, the

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of the syntax, conceptualization and context: the interpretation of the sentence is something like 'The person that is associated with the ham sandwich over there in the corner wants a cup of coffee'.

[78] We view the phenomenon of quantification from a linguistic standpoint which looks at both nominal and non-nominal quantifiers. The focus of this work is on non-nominal quantifiers (see the beginning of this section).

context should provide a specifiedsyntactic predicate that further restricts the restriction of the quantifier. It is far from clear what features of contextselect the specified elliptical predicate whose extension contributes to the interpretation of the domain of quantification. For example, why not havethe unpronounced predicate ‘that was purchased by me’instead of ‘that I bought’?Both predicates perfectly fit the context and can be supplied as syntactically specified predicates that intuitively resolve the problem of domain restriction in (72).[79]

The problem therefore is not syntactic, but altogether semantic. Instead of taking the covert material that restricts the domain of quantification as an elliptical unit in the syntax, we can take it as a semantic unit in the form of a semantic parameter that is assigned a value by context. Taking this approach, we avoid the problem of underdetermination that the syntactic approach faces. The idea of implementing the parameter approach is simple.In maintaining a generalized quantifier analysis for (72), we should think of the quantifier domain as a set of individuals. This set arises from intersecting the set of individuals denoted by the noun *bottle*with a set resulting from applying the value of function *f*to an object *i*. Context assigns a value to *f*, which is a function from objects to sets. It also assigns a value to *i.* The value of *f(i)* is a variable that is assigned a value by context. The set that results fromthis function restricts furtherthe domain of the quantifier by predicate modification, regardless of the syntactic realization of the restrictor.[80]

Another case of quantification that shows heavy dependency on context is modalized expressions. Consider (73).[81]

[79] Alternatively, one may get around the underdetermination problem by assuming an indexical reading of the ellipsis (something like indexical predicates such as ‘one of that’). However, a semantic mechanism will ultimately settle the problem (Stanley & Szabo 2000).
[80] This analysis is due Stanley & Szabo (2000).
[81] Given the parallel logic between modals and quantifiers (Horn1975) as exemplified in (i) and (ii), we view linguistic quantification as one unified phenomenon that draws on nominal and non-nominal domains.

(73) a. Carlos must/may be the criminal.
b.Carlos must/may go to court.

*Must/may*in (73) may have different interpretations: the modal can be read epistemically as in (73a) ordeontically as in (73b). The only difference is that *must*has universal force,with the meaning of epistemic knowledge and obligation in (73a) and (73b), respectively, and*may*bears existential force, with the meaning of possibility and permission in (73a) and (73b), respectively. That is,modal auxiliaries in English have their modal bases dependent on context and their force lexically encoded.[82]

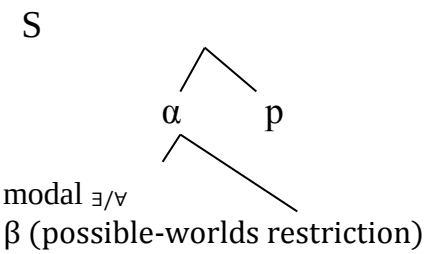
Kratzer (1977, 1981, 1991, and 2012) has developed an extremely influential theory for modality that is based on quantification over possible worlds. Under this theory, modals as quantifiers over possible worlds involve a triplet structure that comprises a modal operator, a set of possible worlds as restriction, and a propositional scope that is evaluated relative to the set of words in the restriction, as schematized in (74).

(i) a. must p ⇐⇒ not [may [not p]**]**
b. must [not p] ⇐⇒ not [may p]
c. may p ⇐⇒ not [must [not p]]
d. may [not p] ⇐⇒ not [must p]

(ii) a. ∀x p⇐⇒not ∃x not p
b. ∀x notp⇐⇒ not ∃x p
c. ∃x p ⇐⇒ not ∀x notp
d. ∃x not p ⇐⇒ not ∀x p

[82]A parametric variation arises: whether the language in question has the quantification force of modality encoded in the lexical entry of the modal or contextually determined. Similarly, languages differ in whether the modal flavor (e.g., epistemic, deontic, etc.) is encoded contextually or lexically (Matthewson 2010). Indo-European languages lexicalize the quantificational force and contextualize the modal flavor. Some non-Indo-European languages (e.g., St'át'imcets), however, lexicalize the force and leave the modal flavor to the context (see Matthewson 2010 for an investigation into this parameter).

(74)



Kratzer's innovation is to let the interpretation of the modalized structure be orchestrated by two contextual parameters that determine the set of worlds quantified over. The first parameter is a conversational background **f** which is formalized as a function from worlds to sets of propositions underlying the modal base of the structure. These propositions express consistent facts surrounding the modal use in such a way that they determine the flavor of modality (e.g., epistemic, deontic, circumstantial, etc.) as determined by context. For example, modal *must/may* in (73a) has an epistemic modal base that includes propositions that correspond to the body of established knowledge that is known by the speaker as exemplified in (75).

(75) $F_{epis}(w)$ ={p : p is a proposition that is known by the speaker in w}

On the assumption that the set of propositions in (75) denotes a set of sets of worlds, a generalized intersection yields the set of worlds in (76):

(76) $\cap f_{epis}(w)= \{w \in W : \forall p \in f(w) \rightarrow [p(w)=1]\}$

The set of worlds in (76) can be expressed in terms of an accessibility relation R_{epis} :

(77) w **Acc**$_{epis}$ w' = {w' : w' is a world in which all the propositions known by the speaker in w hold}

The other parameter is an ordering source**g** which is a stereotypical function from worlds to propositions that represent operative ideals or morals.[83] The ordering source is used to order the set of worlds produced by the conversational background **f** in such a way that the modal ends up quantifying over the best ranked worlds in a partial ordering $\leq_{g(w)}$. To illustrate this precedence relation, for every uand vand the set of propositions derived by **g** describing ideals in w, uis ranked at least as high as v(i.e., $u \leq_{g(w)} v$) if and only if the set of **g** propositions which are true in uis a superset of the set of **g**propositions which are true in v, as shown in (78).

(78)
for all u, v∈ W and for any p ∈ g(w): $u \leq_{g(w)} v$ iff {p ∈ g(w) :p(u)=1} ⊇{p ∈ g(w) :p(v)=1}

We can see that the interpretation of non-nominal quantifiers (i.e., modals) is heavily dependent on context. They require conventionalized units of meaning that are identified as contextual parameters that determine the flavor of modality (e.g., being epistemic, deontic etc.).

Details aside, this sectionhas shown that quantification in natural language is more complicated than Slabakova (2008) argued. Quantified expressions are context-sensitive objects and may draw on nominal and non-nominal domains as well. They are enriched compositions whose meaning cannot be simply determined by the syntax proper.[84] The interpretation of quantifiersmakes an appeal to context in both restricting the domain for nominal quantifiers and assigning the context-dependent restriction to non-nominal quantifiers.

[83] The postulation of an ordering source prevents the inference from a modalized structure (e.g. *The key must be available*) into the corresponding non-modalized structure (*The key is available*) by restricting the set of accessible worlds that is quantified over to those worldswhich are in best conformity to some relevant stereotypical ideal.Since the actual world $w_0$does not need to be among this set of best accessible worlds, the inference is blocked.
[84] There have been many attempts to derive meaning from the syntax. SeeHale & Keyser (1993), Perlmutter & Postal (1984) and Baker (1980).

3.3. The Role of Context

Meaning is a multifaceted cognitive organization with variously communicativepurposes. Meaning properties such as metaphorical and ironical interpretations,metonymy and transfer of reference are not semantic properties in the strict senseof the word. Only conventional and literal meaning of words and sentences arethose meaning properties which are rigorously semantic. We understand thesemantic properties of an expression as those properties which describe the sentence meaning regardless of what is implicated by the utterance and thepersonal associations of the interlocutors in the contextual setting (see Grice1975 for a distinction between these levels of meaning).

This line of reasoning lends itself to a theory of meaning that is articulated in terms of Borg's (2004) Minimal Semantic Theory. According to this theory, the literal meaning ofan utterance must be kept detached from other pragmatic and communicative considerations. Borg (2004) finds this enterprise worth undertaking for many reasons.First, meaning is compositional in nature. This is clear in the productivity and systematicity of linguistic comprehension. Linguisticcomprehension is productive in such a way that language users are capable of understanding expressions as iterated from time to time in different utterances. Linguistic comprehension is alsosystematic since the overall meaning ofstructures must be built up out of the meanings of their parts. Second, theorganization of meaning is obviously modular,incorporating a module-specificinventory of information and computational processes (see Borg 2008 for more information).

In adopting a strong position that severs the content-level dimension of meaning from context, one cannot trivialize the role of context as an extra-sentential source that assigns meaning to (parts of) linguistic expressions. Consider for example contextually sensitive

expressions. Context plays a major role in both interpreting deictic expressions such as demonstratives and pronouns and deriving implicatures andspeechacts. The role of context, therefore, can be viewed as either postulating a distinctlevel of meaning that is beyond the truth-conditional level (e.g., implicatures or speech acts[85]) or contributing directly to the truth conditions that underlie utterance meaning.[86] In either case, suffice it to say that there is a strong reason to maintain a theory of formalsemantics,[87] which is powerful enough to accommodate the intrusions ofcontext without losing its explanatory force.[88] Such a theory is not meant to address questions about strictlycontext-invariant utterances that mainly rely on linguistic features to the exclusion of context. It, however, makes an appeal to some features of context that can be accommodated within a theory of literal meaning. Borg (2004:30-31) suggests that such an accommodation is possible when an appeal to the features of context, which are objectively relevant to the literal meaning, is syntactically mandated.

What about quantified structures? As we saw in the previous section, quantified structures involve covert material that cannot be recovered without the speaker's sensitivity to the features of context. They are context-sensitive objects that are not syntactically mandated. The interpretation of quantified constructions involves an appeal to formal linguistic features as well as contextual features. This means that we should give room to pragmatic processes along with the formal ones in deriving the truth-conditional structure of these constructions. We adopt

[85] See Krifka (2014) for an attempt to analyze speech acts as non-embeddable operators that apply to other truth-conditional objects.
[86] This is a very controversial issue that has attracted a great deal of heated debate. We are not tackling this issue here.
[87]Borg (2004) argues that a theory of formal semantics is not only good at explaining the fact that the literal meaning of some utterances can be grasped by language users independently of contextual or pragmatic factors, but also needed to address issues such as the compositionalnature of meaning and its connection to modularity.
[88] Context operates on the truth-conditional meaning by directly contributing to the truth-conditional structure (e.g., assigning values to pronouns, which compose further with other expressions to yield the truth conditions of the overall structure).

a contextualist view in which context may play a role in the assignment of the truth-specification of the literal meaning (Sperber and Wilson 1987; Recanti 2002,2004). The kind of pragmatic processes in quantified expressions are those that are capable of operating on sub-propositional objects (e.g., the assignment of the value of restrictor in nominal quantifiers as well as the assignment of the values for the contextual parameters that make up the restriction of the quantifier in non-nominal modalized quantifiers). These processes should be different from the other pragmatic processes that operate on completely truth-valuable propositions (to derive implicatures; see Recanti, 2004:260-266).

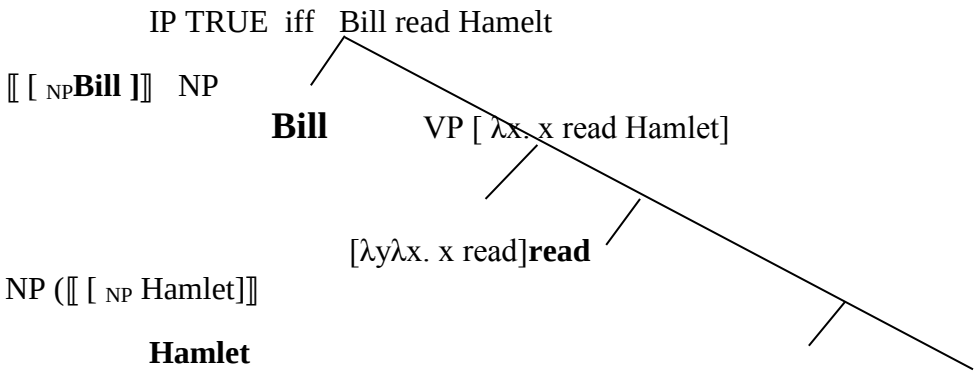
3.4. Two Modes of Composition

The question of whether the syntax is sufficient for the determination ofmeaning is an unresolved issue. Proponents of syntactocentric model of grammar would argue that the semantic interpretation is directly read off the output of the syntax.[89] The idea is that just as there is a recursive mechanism in the syntax that builds up sentences by means of external and internal merge (Chomsky 1998), there is a recursive semantic mechanism that maps the syntactic structure onto a meaning / semantic value(Heim and Kratzer 1998).[90]Byway of illustration, consider the derivation of sentence (79).

[89] Including Perlmutter and Postal (1984), Baker (1988) and Hale & Keyser (1993), whose work attempted to derive the thematic structure within the syntactic structure of the vP shell.

[90]Inspired by the the Fregean conception that takes the meaning of a complex expression as a function of the meaning of its parts and their syntactic composition.Accordingly, an unembedded sentence denotes a truth value and an embedded sentence denotes a proposition (Frege 1879).

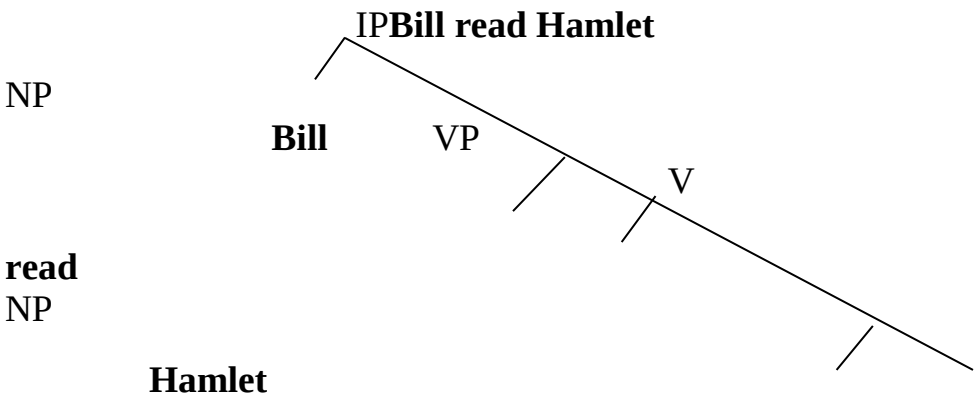
(79) a. Bill read Hamlet.



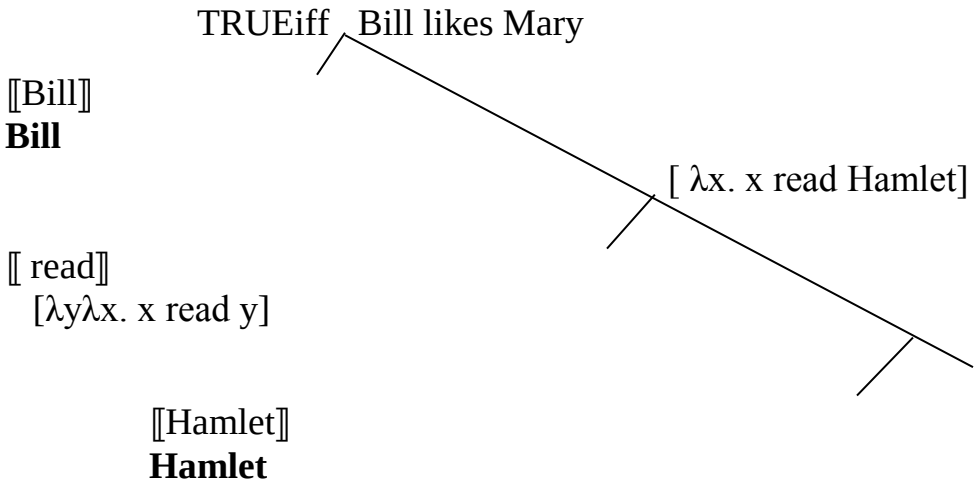
In deriving the simple structure in (79) (ignoring tense), acorrespondence is established between the phonological, syntactic and semantic structures by combining the lexical entries of the three words (Bill, read, Hamlet) in such a way that the argumental variables of the verb *like* are satisfied (i.e., Bill, Hamlet) by a general linking mechanism. Satisfaction of argumental variables is achieved by unifying these variables with linguistic elements of appropriate types (i.e., subject NP and object NP in the syntactic structure and $object_1$ and $object_2$ in the conceptual structure; see Jackendoff 2002).

For simple compositioncases like (79), the correspondence between the syntax and the semantics and their interface is a one-to one mapping, as schematized in (80):

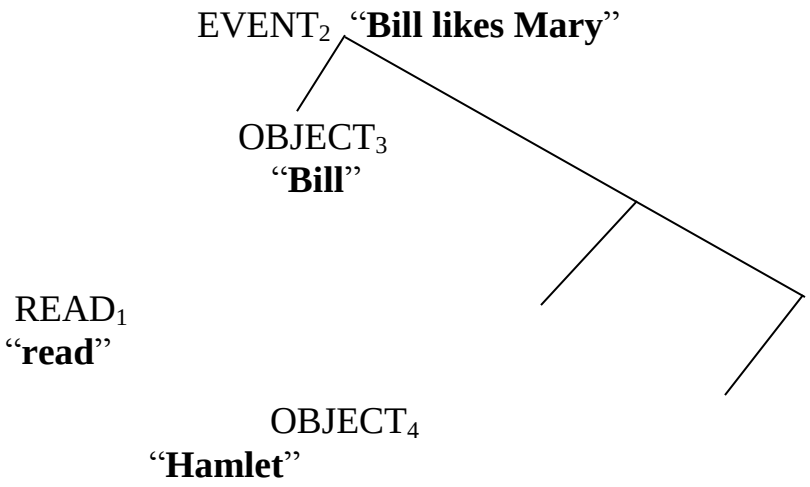
(80) a.Syntax



c. Syntax-Semantics Interface



d. Semantics



The syntactic structure of (80) is represented by the categorial tree in (80a). The syntactic head V *read* subcategorizes for two syntactic arguments (Bill, Hamlet) to satisfy thematic and Case considerations (Chomsky1981). (80b) represents the syntactic-semantic interface structure with the verb ⟦read⟧acting as a functor of primitive type <e,et>, determiningthe combinatorial conditions under which the verb's arguments (of type e) compose in hierarchical, functor-argument relation to yield the sentence meaning (its truth value). The semantic structure is formed by assigning to the functor READ the field feature [EVENT] which determines the conceptual character of its arguments andthe sorts of inferences associated with them (Langacker 1987; Jackendoff 1976,1983,1990).[91] In this case, READ is assigned an event feature that takes an animate entity of conceptual type < HUMAN> as its first object and the entity that represents the read entity as its second object.

[91] For more information about the different families of conceptual functions, see Jackendoff (2002:ch.11.8.1). For example, *The little dog is behind me* involves a conceptual function BE(x,y) that bears the field feature "special", which specifies x as an object and y as the location where x is located.

Notice that the correlation between the three structures is a one-to-one mapping.[92] We have established a tight correspondence between the configurations of the lexical items in the syntax, the interface and the semantics. The different structures make use of the same reference skeleton[93]which involves head-complement subcategorization in the syntax, function application atthe interface, and argument satisfaction in the semantics.[94]

What about quantified structures? Since quantified structures are more complex than cases of simple composition such as (80a), there is no clear consensus among researchers on their status in the grammar. Most linguists are divided over the question of whetherthe quantified structure represents a case of simple composition in which there is a one-to-one mapping between the syntactic and semanticstructures or is an example of syntax-semantics mismatch in which the semantic interpretation is not completely predictable from the syntax. Proponents of the first view, especially those who built on the tradition of Government & Binding theory and the early Minimalist Program after the introduction of LF as an independent level of linguistic representation, favor the first position[95](see for example Slabakova 2008, among many others).Early generative and conceptual semanticists (e.g., Lakoff 1970; Jackendoff,1972, 1996) are more skeptical about the strong thesis of the one-to-one mapping between the syntax and the

[92] We may choose to conflate the syntactic-semantic structure with the conceptual structure by simply getting rid of the primitive logical types e and t in favor of the more elaborate conceptual types that are determined by the field feature of their conceptual function. Nothing hinges on postulating a structural level mediating the syntactic and conceptual structure. We just choose to do that in order to make it clear that the interface and module-specific operations belong to different realms in the grammar. Primitive logic types define the combinatorial expressions of lexical items. We view them as the ontological components of the linking mechanism that operate in the syntax-semantics interface. Conceptual types in the spirit of Jackendoff define the conceptual character of lexical items. We view them as the ontological components of the integrative processes operating in the descriptive tier of the semantics.

[93] We use the cover term "reference skeleton" to refer to the unified tree with hierarchical organization that is made of primitives in each submodule of the grammar. The case at hand represents a simple composition with the same inference skeleton that undergoes processing in the syntax, the syntax-semantics interface and the semantics using their own primitives and grammatical processes.

[94] Other compositional devices are predicate modification and lambda extraction (Heim & Kratzer 1998, Jackendoff 2002).

[95]Under this view, the scope interaction ambiguity is derived by postulating covert syntactic operations such as QR and lambda abstraction (Partee 1995,Heim & Kratzer 1998).

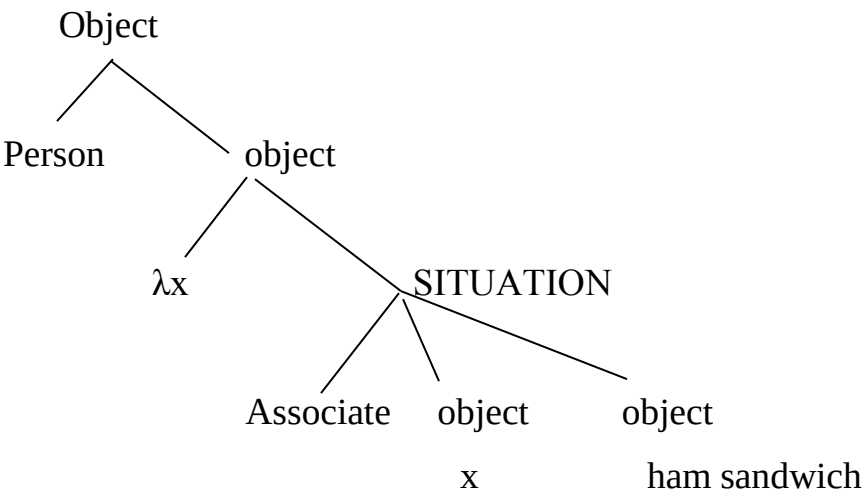
semantics. They argue that the semantic content of some linguistic expressions does not necessarily equate with anythingin the syntax. Deriving these expressions is the rich interaction between the well-formedness conditions in the submodules of the grammar.

A well-known example of these expressions is *reference transfer* (Nunberg 1979,Jackendoff 2002). The conceptual well-formedness of reference transfer requires the incorporation of extra information in the semantics that is not represented in the syntax. Consider the following well-known example of reference transfer(Nunberg 1979).

(81) The ham sandwich over in the corner wants more coffee.

The correct interpretation of the sentence is that the person contextually associated with the ham sandwich wants more coffee. The linguistic constituent 'the person contextually associated with'is not represented in the syntactic structure. Since the conceptual well-formedness condition of the sentence requires an animate subject [+HUMAN], a reference to an animate subject should be recovered in the semantics. Jackendoff (2002:389) proposesthat such a reference involves a conventionalized piece of language that directly applies to the conceptual structure as schematized in(82). Such a piece of language has no syntactic or phonological reflexes and it applies directly given interlocutors' construal of context.

(82)



The reference transfer structure in (82) exemplifies a syntax-semantics mismatch in which the semantics may generate its own structure that is different from the one that is generated by the syntax. Deriving semantic structures is subject to conditions of conceptual well-formedness and the construal of context. This lends supporting evidence for the anti-syntactocentric view of the Parallel Model (Jackendoff 2002).

As for quantified structures in natural language, we have good reason to argue that they are among those cases of the syntax-semantics mismatch that represent enriched compositions. The simplistic view of the one-to-one mapping thesis between the syntax and the semantics would derive the structure by simply proposing covert syntactic operations such QR and lambda abstraction. This is a very simple and elegant view. The picture is not actually so simple and elegant (contra Slabakova 2008). Quantified expressions are heavily context-sensitive elements. They involve bits of information in the semantics that do not map onto anything in the syntax. Just aswith reference transfer structures, the conceptual well-formedness of quantified structures draws on extra information that isnot determined in the syntax.In nominal quantified structures, for example, context plays a crucial role in determining the domain restriction of the quantifier.

As argued in the previous section, the determination of the domain restriction does not follow from the syntax. It involves a rich interaction between the grammar and context in such a way that an extra piece of language is added to the conceptual structure as a requirement of conceptual well-formedness.[96]

Consider the quantified sentence in (83):

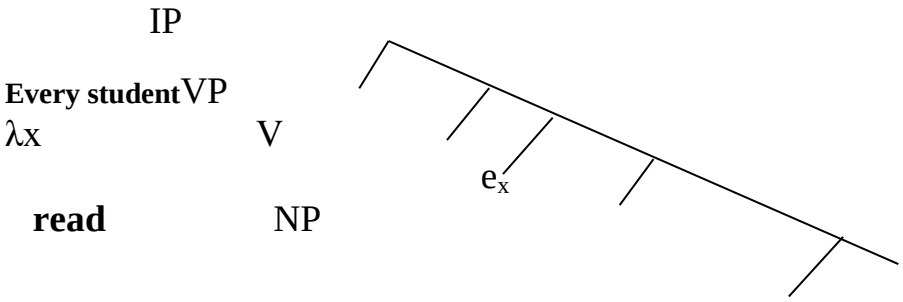
(83) Every student read some book.

The correct interpretation of (83) is that every member in a contextuallydetermined restricted class of students read some member in a contextually determined class of books. The fact that (83) has reference to additional contextual information that relativizes the domain of the quantifier *every* to a contextually restricted class indicatesthat (83) is not just a simple composition derived by the syntactic operations of QR and binding, but it draws on extra information that is not directly read off the syntax. We argued in the previous section that quantifier domain restriction is represented semantically with the use of a contextually determined variable that co-habits the syntactic node with the explicit restriction of the quantifier (e.g., the NP node of *student* or *book* in (83)). The idea of implementing the semantic variable approach is simple. The domain of the quantifiers in (83) arises as the result of intersecting the set of individuals denoted by the noun ⟦book⟧ with a set that results from applying the value of function *f* to an object *i*. Context provides the value of theobject *i* and the value of the function *f*, which is a function from objects to sets denoted by quantifier's domain. The value of *f(i)*then is a variable that is assigned value by context. The set that results from this function restricts further the domain of the quantifier to a contextually-restricted set by predicate modification, regardless

[96] Of course, such an addition is not syntactic (e.g., elliptical or indexical). See the previous section for an argument against the syntactic approach to quantifier domain restriction. Alternatively, the interested reader is invited to look at Stanley & Szabo (2000).

of the syntactic realization of the restrictor.[97]In computing quantified enriched structures, every submodule (namely, the syntax andthe semantics) makes use of a distinct reference skeleton. Consider the derivation of the quantified structure *Every student read some book* in the three submodules of the grammar. In the syntax, we will have the structure (84) with the syntactic head V c-selectingfor thequantificational NPs to satisfy the Case and thematic requirements.

(84)



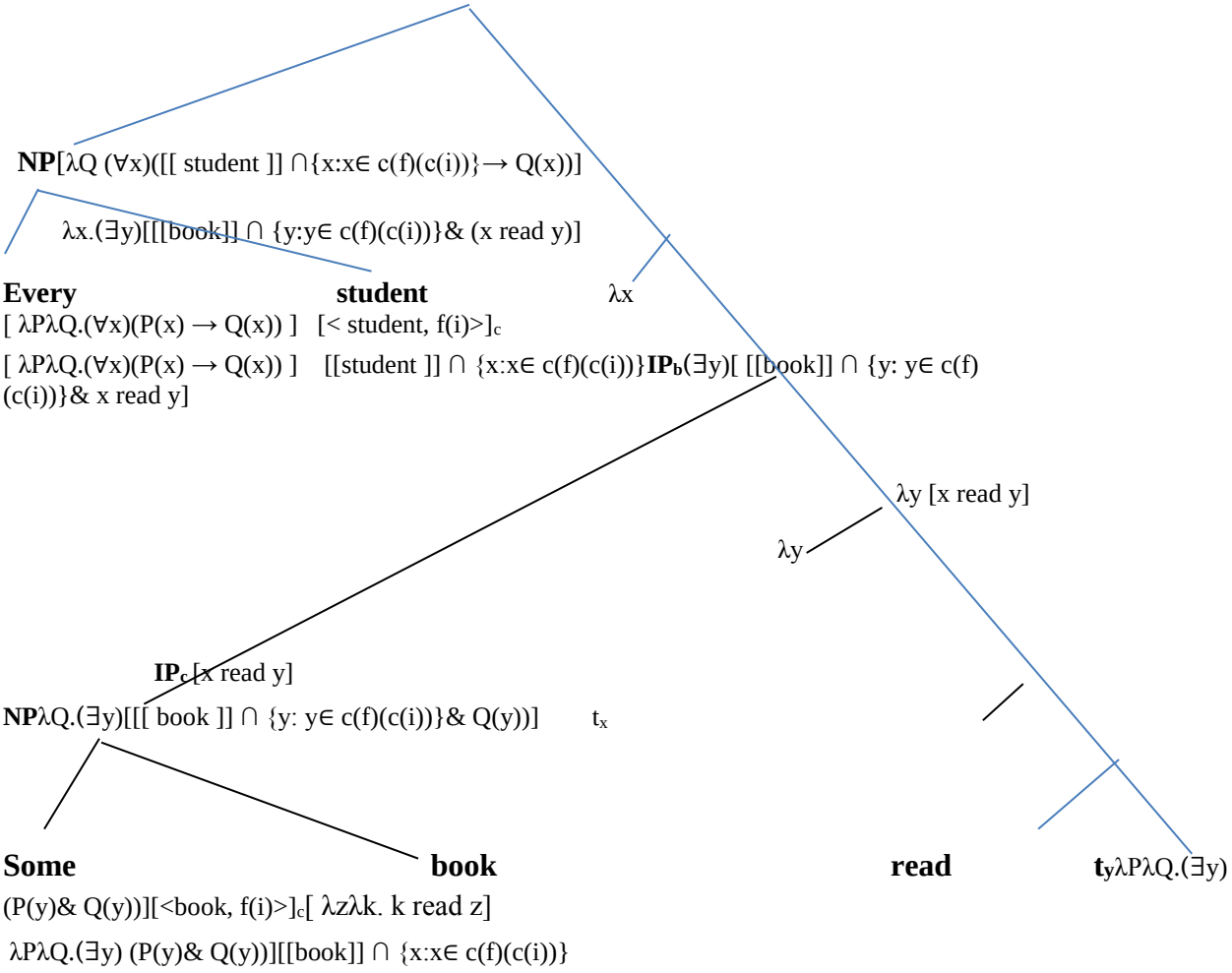
The structure then proceeds to the syntax-semantics interface to be assigned its logical form: a structurallytyped disambiguated ordered sequence of words that encodes its interpretation. The correct interpretation of (84) is that every studentin a contextually-determined restricted class of students read some book, rather than every student in the universe having done so. The semantic structure of (84) draws on a piece of language that freely connects online relative to the relevant lexical entries. This piece of language restricts further the restriction of the quantifier to make it compatible with the universe of discourse. Thereference to this 'contextually-determined restricted class of students'should be integrated in the semantic structure of (83) as an additional linguistic unit to (83). In the previous structure, we argued that

[97] This analysis is due Stanley & Szabo (2000).

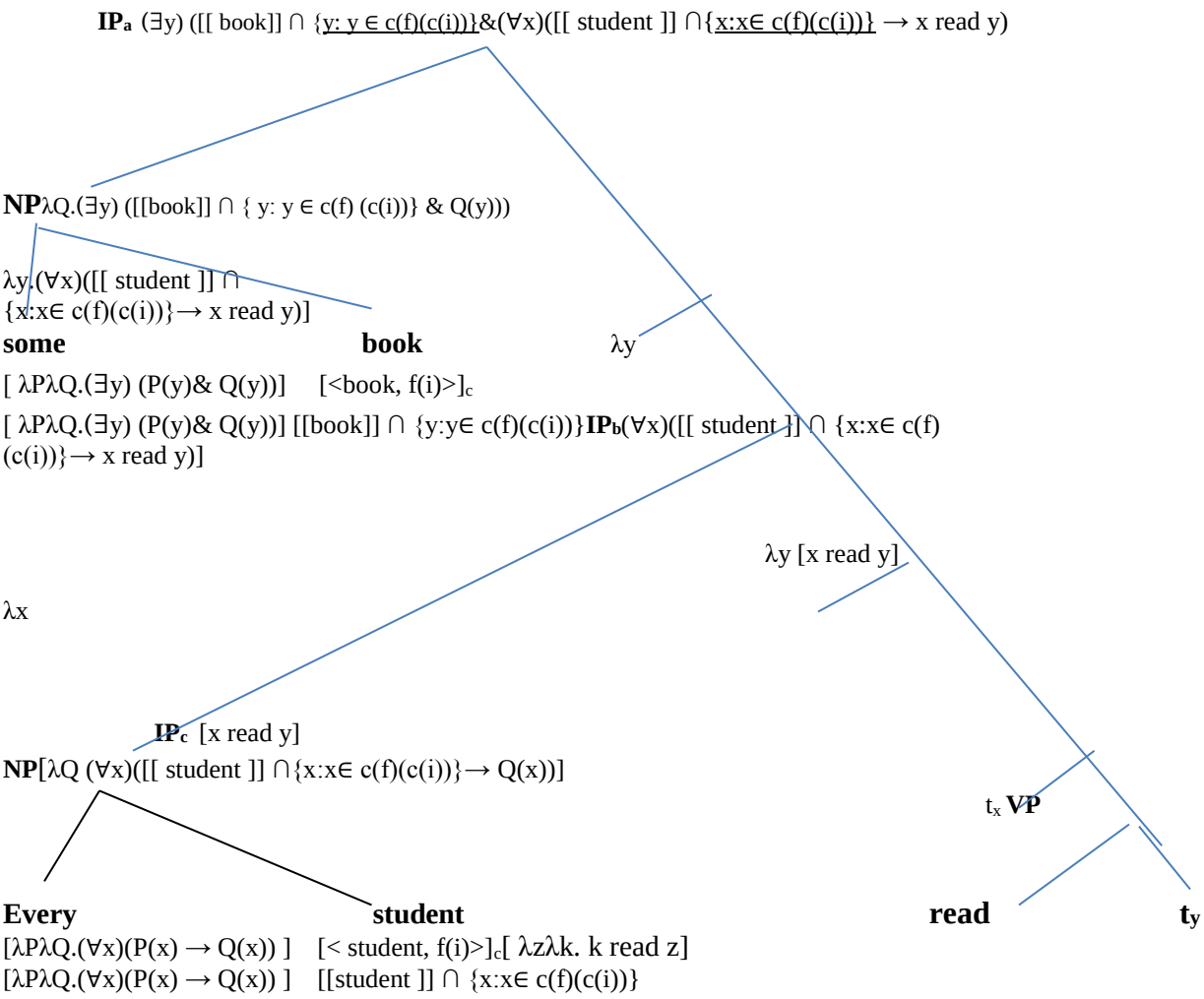
the syntactic and pragmatic solutions to the problem of quantifier domain restriction are untenable.We have just showed, following the semantic approach of Stanley & Szabo (2000),that this piece of language is a contextual parameter that denotes the property that further restricts the explicit restriction of the quantifier. It is a function *f(i)*that is derived by applying the value of function *f*of type <e,et> to an object *i* of type e. The resulting type <e,t> predicate modifies the set of individuals denoted by the restriction of the quantifier. Consider the derivation of the quantified structure at the interface, which is represented by the two logical forms in (85):

(85)

a. **IP$_a$**∀x)([[student]] ∩ {x:x∈ c(f)(c(i))}→(∃y)[([[book]]∩ {y:y∈ c(f)(c(i))}y isa book & x read y]



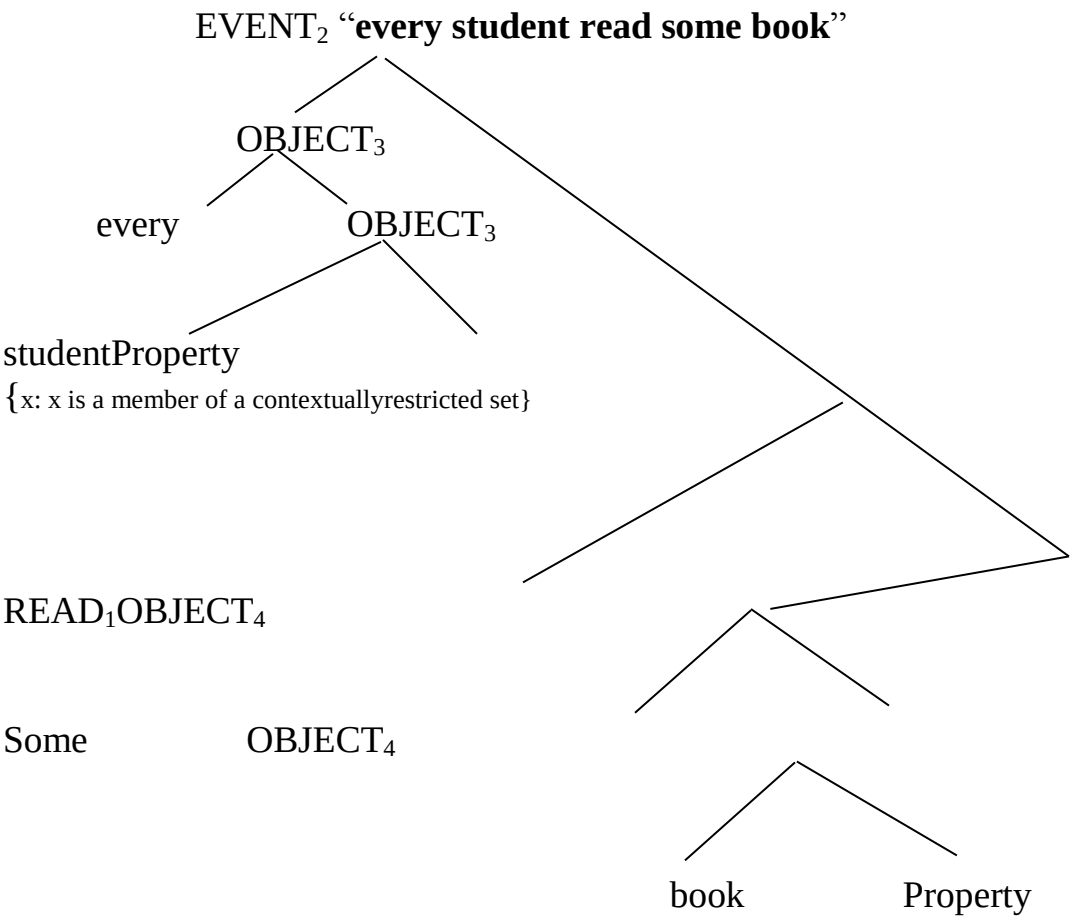
b.



The two logical forms in (85) incorporate two contextual parameters as an additional enrichment to the structure. This addition reduces the domain of the quantifier to a restricted contextuallydetermined class. Without incorporating this piece of language, we would have a quantified structure that says that every student in the universe read some book in the universe. This is an odd reading since it violates conceptual well-formedness. The conceptual structure,

therefore, would involve an additional property that relativizes the domain of the quantifier to a restricted contextual class.

(86)



Consider now non-nominal quantification in natural language. Non-nominal quantified expressions represent a clear case of syntax-semantics mismatch. It has been argued, since the seminal work of Kratzer (1977, 1981, 1991), that modal quantifiers are heavily context-sensitive

objects. The modal quantifier *must* in English has a range of interpretations depending on context as exemplified in (87):

(87) a. Michl must be the murderer. (Kratzer 1991:643)
EPISTEMIC (in view of what is known about the crime)
b. Jockl must go to jail. (Kratzer 1991:640)
DEONTIC (in view of what the law dictates)

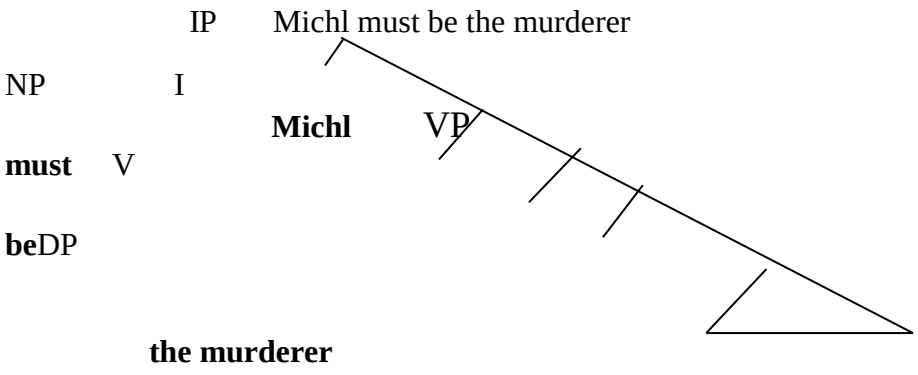
The different readings of *must*are disambiguated by context. Kratzer proposes that modal auxiliaries are quantifiers with contextual parameters representing their restriction. Kratzer attributes the ambiguous use of must in (87) to these parameters, which she calls conversational backgrounds. According to Kratzer, the two crucialconversational backgroundsare the modal base and the ordering source.[98]

The specification of conversational backgrounds is crucial to the interpretation of modals in English-like languages. They specify the flavor of modality depending on context (e.g., epistemic, deontic, etc.). The incorporation of such a piece of language does not follow from the syntax. The syntactic structure of (87) is represented in (88).

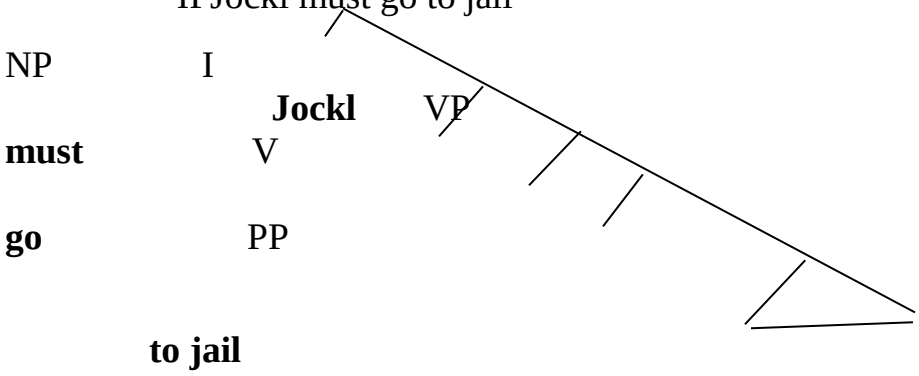
[98] See section 3.2 or alternatively, the interested reader is invited to look at Kratzer (1977, 1981, 1991).

(88)

a.



b.



The syntactic structures in (87) are not articulated enough to convey the epistemic and deontic meanings associated with the modal auxiliary in (87a) and (87b), respectively. The standard generative analysis of modality in natural language takes the following working assumptions as crucial to the interpretation of modals.First, modalized structures have displacing effects. They are evaluated true or false relative to a world in such a way that its truth depends on the truth of its propositional complement in other possible worlds. Second, they are quantifiers over possible worlds, given the patterns of logical entailments and equivalences that modality of

necessity and possibility exhibit, which are similar to the nominal quantifiers *every* and *some*(Horn 1972), as exemplified in (89):

(89) a. John must be home ⇒John may be home

b. John must be home≡ It is not the case that it may be the case that John is not home.

c. John maybe home ≡ It is notthe case that it mustbe the case that John is nothome.

(90)

a. Every student is home⇒ Some student is home
b. Some student is home ≡ It is not the case that every student is not home
c. Every student is home ≡ It is not the case that some student is not home

(Hacquard 2012:1486)

Third, given thismultiplicity of modal meanings, the use of a modal must be disambiguated in someway or another relative to context. To capture the relativization of modals to a particular type of meaning as well as theircontingency relative to the world of evaluation, it should be the case that modals quantify over a particular set of worlds. This set is supplied by an accessibility relation. An accessibility relation is a function that picks for every world w a set of accessible worlds quantified over by the modal. Various types of accessibility relations correspond to different modal meanings. Take (90) as an example. Since modal *must* has two readings, it should be the case it is defined in terms of two accessibility relations, as defined in (91):

(91) $R_{epis}(w,w') = \{w' | w'$ is a world in which all of the facts known in w hold$\}$
$R_{deontic}(w,w') = \{w' | w'$ is a world in which all of laws of w are obeyed$\}$

(Hacquard 2012:1488)

A question arises: does the integration of the accessibility relation as a crucial ingredient in the interpretation of modals take place in the syntax or is it a condition imposed on the structure to satisfy conceptual well-formedness?Assuming that it is syntactic, this amounts to

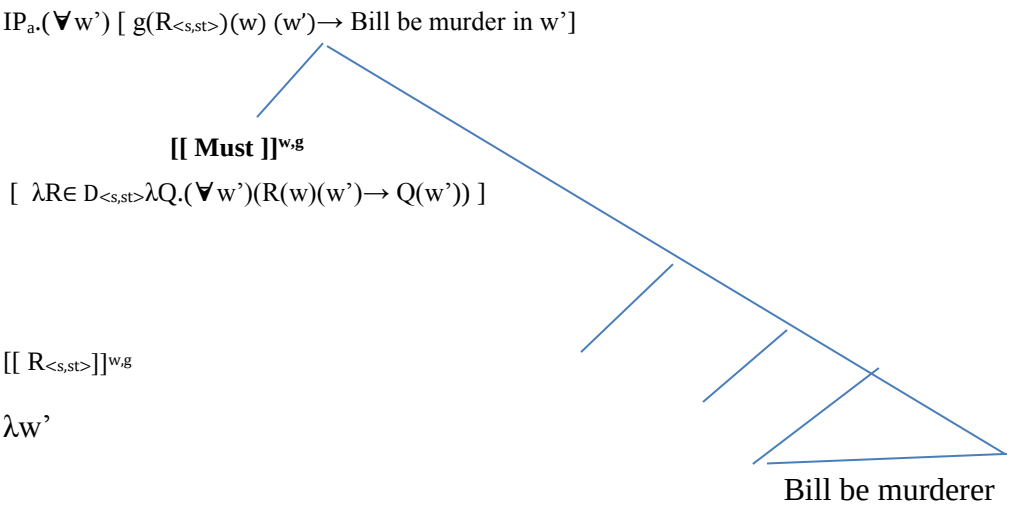
saying that modals (e.g., *must*) involve lexical ambiguity: two different *must*s as homonyms in the lexicon (Groenendijk& Stokhof 1975,Kamp 1975). That is to say, accessibility relations are hardwired in the lexical entry of modals. Under this view, the lexicon provides two *must*s with two lexical entries that involve two distinct accessibility relations to the syntax.

The problem with this view lies in the improbability of extending the ambiguity to other languages. Many languages, especially the Indo-European family, have the same modal with multiple interpretations. It is far from clear how the lexical ambiguity found in English can be systematically extended to other languages (Kratzer 1991). Another problem facing the ambiguity account isunderdetermination.[99] Each modal not only involves a determined flavor (e.g., deontic), but also sub-flavors depending on the facts surrounding the context. For example, the interpretation of (87a) involves anepistemic accessibility relation. Such an accessibility relation specifies the set of worlds in which evidential facts surrounding Michl's committing the murder hold true. This is an underdetermined specification since we do not know which evidential facts come as supporting evidence indicting Michl: physical evidence, confessions, etc.

We can see that the interpretation of non-nominal quantifiers (i.e., modals) is heavily dependent on context. They require conventionalized units of meaning that are identified as contextual parameters that determine the flavor of modality (e.g., being epistemic, deontic, etc.). Without specifying this information, the structure would be conceptually ill-formed. As the modalized structure proceeds to the interface and the semantics, it is enriched by having an additional conventionalized piece of language, embodied by contextual parameters as schematized in (92):

[99]Notice that this is the same problem facing the syntactic approach to the phenomenon of quantifiers domain in nominal quantification (Stanley & Szabo 2000).

(92)



3.5. A Loose End

In this chapter, we discussed two models of grammar: the Minimalist Program (Chomsky1995) and the Parallel Model (Jackendoff 2002). We showed that the two models share two main working assumptions about the representation of language.First, the content of meaningand the computational mechanism of composition are universal.[100] Second, linguistic variation is captured by differences in the featural content of lexical items, meaning that the task of acquisition reduces to learning morphology which may have an identical or a partially or completely different featural configuration in the native language.

[100] As represented by the Conceptual-Intentional Systems in Minimalism and the conceptual Structure in the Parallel Model. See also Ramchand & Svenonius (2002) for a slightly different model in which the interpretation of expressions is achieved directly by the Conceptual-Intentional systems, with no need to postulate a distinct semantics module for interpretability.

The two models, however, differ along two dimensions.First, the minimalist program is a tightly syntactocentric model in which the generative capacity of the grammar is exclusively confined to the syntax. The Parallel Model, on the other hand, postulatesother levels of the grammar that are generative, including the phonology and semantics. Second, the Parallel Model gives more weight to the interfaces than the Minimalist Program does. I claim, along the lines of Jackendoff (2002), that the availability of linguistic expressions in which the syntactic structure is not sufficient for interpretability counts as supporting evidence for the Parallel Model's anti-syntactocentric view is. Such syntax-semantics mismatches show that the structure should undergo further processing at the interface and the semantics to ensure its conceptual well-formedness and complete interpretability.

Quantification in natural language represents a typical case of syntax-semantics mismatch. We showed that quantified structures are a special case of reference transfer in which additional covert piecesof information are integrated in the semantics to satisfy theirconceptual well-formedness. In nominal quantified structures, for example, such a piece of knowledge is represented semantically by a contextual parameter that restricts the domain of quantifiers. In non-nominal quantified expressions, it is semantically represented by the conversational background that is divided into a modal base and an ordering source, which are two contextual parameters defining the set of accessible worlds quantified over. The incorporation of such a semantically represented reference is crucial to the interpretation of modalized expressions as determining their flavor of use. The gist of the discussion is that the grammar deals with expressionswith two modes of composition: simple composition in which the syntax-semantics mapping is tight and hence the syntax is sufficient for interpretability, and enriched composition

in which the correspondence is not one-to-one so that the syntax is not sufficient in determining meaning as further requirements of well-formedness are met in the semantics.

On the assumption that the conceptual structure along with the computational mechanism of grammar is universal,we expect that meanings such as past tense, definiteness, andcomparisonare universal primitives which are available in all languages as part of the universal conceptual structure of the semantics. We also expect that the compositional principles in each level of grammar are also universal. Learners in principle should not encounter a problem in arriving at the universal meaning in question. The difference between languages is how toarrive at the meaning in question. Two languages, for example, may follow two different routes towards the same universal meaning. Such a difference may have theoretical and empirical implications for language acquisition. Apart from the morpho-syntactic difference in world languages and their featural configurations, a learning task may arise if the same meaning is expressed differently using simple composition in one language and enriched composition in another language. Such divergence in the mode of composition may involve the satisfaction of a set of grammatical prerequisites such as retrieving items from the lexicon or the employment of extra computational and lexical resources to express the meaning in the target language. In the next chapter, we will discuss two case studies. One isthe past tense, which is expressed quantificationally in Japanese-like languages and pronominally in English-like languages. The other is the comparative, which is expressed quantificationally in English-like languages and non-quantificationally in Japanese-like languages.

Chapter 4

Neither Parameters Nor Features, but Types

4.1 Parameters vs. Features

Any theory of L2 acquisition should base its assumptions on some understanding of the limits and possible range of cross-linguistic variation in the second language. The traditional view of the Government and Binding theory (Chomsky 1981) and early Minimalist Program(Chomsky 1995) holds that linguistic variation is parametric and the (re)-setting of parameters triggers the acquisitionof a bundle of linguistic properties that are subsumed under specified featural matrices. A slight variant of this approach ascribes the cross-linguistic variation to differences in thefeatures that make up inflectional morphology in the lexicon (Chomsky 1995, Aoun 2013).[101]Accordingly, the task of L2acquisitionreduces to figuring out thefeatural configuration of functional categories in the target language,which may be selected and assembleddifferently fromhow they are selected and assembled in the first language (Borer 1984, Chomsky1995, Fukui1995, Lardiere 2008).

The standard view of generative-based theories is simple. L1 acquisition employs a universal computational mechanism along with a limited inventory of universal principles and language-specific parameters. L1 learners make their choiceon a finite set of parameters that restricts the range of cross-linguistic variation on the basis of L1 input(Chomsky1981,Haegeman 1988). L2 acquirers, on the other hand, enter the task of acquisition with relevant universal principles being utilized and the L1-driven parameters being valued. Their task is to reset those parameters of the target language that are different from the already L1-valued ones on the basis

[101] Accordingly, cross-linguistic variation, be it syntactic or semantic, is the consequence of differences in the (re-)assembly of featural contents that make up functional categories (e.g., C, T or D) (Borer 1984, Chomsky 1995, Fukui 1995, Lardiere 2008).

of linguistic input. Each instance of parameter (re-)setting is associated with the emergence of a cluster of linguistic properties that indicate the successful(re-)setting of the parameter. This simplistic view has been at the heart of the research agenda in language acquisition.[102]

Thoughhaving some explanatory power to account for aspects of cross-linguistic variation, standard parametrization has been criticized as a conceptually vague and empirically unconstrained process (Baker 1996, Lightfoot 1997, Kayne2005). The literature has witnessed a great number of different parameters of different character. Some parameters are directional (e.g., the head directionality parameter). Some are binary (e.g., the pro-drop parameter) and others are confined to the existence or absence of certain features, constructions or processers (e.g., noun-noun compounding).The theory of parameters, therefore, started to lose its generality and simplicity with more and more parameters of different character being proposedto capture more cross-linguistic (superficial) differencesin such a proliferated and uncontrolled direction (see Kayne 2005 for an extensive review).

Another problem facing parameter-resetting theories lies in itsincapacity tocover cross-linguistic differences inempirical domains with high variability (e.g. inflectional morphology)(Lardiere, 2008, 2009). Byway of illustration, Lardiere (2009) discusses plural marking in Mandarin Chinese, Korean and English in the context of Nominal Mapping Parameter (Chierchia 1998).[103]She shows that the plural morpheme is assembled differently in each of these three languages, with each morpheme selecting a different set of features (e.g., definiteness, specificity and human/non-human animacy). In Chinese, the plural morpheme is

[102] For a comprehensive overview, see Haegeman (1988) and White (2003:ch. 4).

[103]The Nominal Mapping Parameter proposes that nouns across languages may be interpreted as predicative objects of type <e,t>, which denote properties and directly saturate a higher-order functor denoted by D, or as argumental objects of type e, which denote kinds and may appear as bare nouns. English-like languages have both predicative and argumental nouns. Therefore, they have a count/mass distinction, overt plural marking and bare nouns. Chinese-like languages, on the other hand, have only argumental nouns. As a result, Chinese-type languages do not have a mass/count distinction or overt plural marking, and they do not have direct counting without classifiers.

tightly associated with the features [+definite] and [+human]. English nominals, on the other hand, arenot constrained in this way; plural marking in English may co-occur with definite or indefinite, human or non-human nominal expressions. Korean represents a grey area. It has, unlike English, bare nouns that are underspecified for number. Korean also has overt plural morphology (i.e., *tul*); unlike inChinese, it does not need to co-occur with definite and human nominal expressions,butcan co-occur with indefinite and non-human expressions as well. Lardiere (2009) convincingly shows that the Nominal Mapping Parameter falls short of capturing these interpretive differences inplural marking in thethree languages. The Nominal Mapping Parameter draws a strict distinction between Chinese-like languages, which havea classifier system for direct counting, use bare nouns that are underspecified for number andlack a mass/count distinction, and English-like languages,which have pluralization, direct counting without classifiers and amass/count distinction. Given this parameter, it is far from clear how toaccount for the NP facts in Korean, which resembles Chinese in having a classifier system for direct counting with no mass/count distinction and at the same time behaves like English in encoding pluralized expressions with definiteness and animacy.

To cope with discrete variability of this sort, Lardiere (2008, 2009) responds to the deficiency of the theory by eliminating parameters in favor of abstract features as theoretical units of equivalence or comparison between languages. For Lardiere, cross-linguistic variation is now restricted to the selection and assembly of features, and the task of language acquisition is redefined as a process of figuring out the different (re-)configurations of features that make up functional categories. Lardiere (2008) proposed the Feature Reassembly Hypothesis,in which sequentialdifficulty in L2 acquisition of morphosyntactic features is captured by theprocesses of mapping and (re-)assembly of features onto their morphologicalrealizations. Along these lines,

Slabakova (2009, 2013) adopts Lardiere's proposal in establishing a cline of difficulty that makes concrete predictions of relative ease and difficulty forlearning semantic features (e.g. definiteness), based on whether reassembly is needed and whether the universal meaning is obtained by overt morphology or context (see also Ramchand&Svenonius 2008).

On the Lardiere-Slabakovaapproach, the concept of "linguistic feature" is central tothe theory of acquisition and it calls for clarification within the process ofacquisition. One standard definition is to take "semantic feature" as a synonym foruniversal grammatical meaning (Alexiadou et al. 2007:56, Lyons 1999, Slabakova and Cho 2013). The claim is that semantic features, though cross-linguistically conceptualized, are not uniformly realized across languages (Slabakova and Cho 2013). Every language, for example, expresses thesemantic feature [+definite], but languages vary in how to express definiteness.Some languages express definiteness in a direct way using overt morphologysuch as English (e.g., definite/indefinite articles). This case involves one-to-onemapping of the feature and morpho-lexical structure.Other languages have indirectand covert ways ofexpressing definiteness.In those languages that lackovert (in)definite articles (e.g., Russian), (in)definiteness is expressed indirectly byother morpho-lexical and contextual means, using expressions such asadjectival possessor- and nominal possessor modifiers (Apresjan 1995, Slabakova and Cho 2013). These distinctions may well predict the order and direction ofdifficulty in acquiring semantic expressions across many domains.

So, what about the variability facts in the context of comparativeconstructions and past tense in English-like vs. Japanese-like languages as discussed in chapter 2? Do we need to maintain theDegree Abstraction Parameterin the face of the demise of theoretical interest in

parameters? Or shall we make resort to features as basic units of theoretical equivalence and comparison? Let us explore each possibility in turn.

First, the Degree Abstraction Parameter,asdefined inchapter 2 and repeated in (93), strictly divides languages into two classes with two settings: (i) languages such as English, which have degree binding in the syntax, permit subcomparatives of degrees, exhibit scope interaction effects in comparatives with modals in the matrix clause and show sensitivity to negative islands, and (ii) languages like Japanese, which disallow subcomparatives of degrees, lack scope interaction effects in modalized comparatives and show indifference to negative islands.

(93) Degree abstraction parameter (DAP) (Beck et al. 2004:325)
A language does/does not have binding of degree variables in the syntax

Unfortunately, this distinction is not always clear-cut. Some languageshave thepositive setting of the DAP but lack subcomparatives of degrees. An example of this type language is Russian. In this language, a normal comparative, as exemplified in (94a), is fine, but thesubcomparative in (94b) is impossible:

(94) a. Obuv' Halo dlinneye moyego
shoes Halo longer than mine
'Halo's shoes are longer than mine are.' (Russian counterpart is OK)
b. *Obuv' Halo dlinneye chem shkaf glubokiy.
Halo's shoes longer than the cupboard deep.
'Halo's shoes are longer than the cupboard deep.
(Russian counterpart is ungrammatical)

Beck et al. (2009) get around the problem by offering another parameter in which the degree argument of the gradable adjective may or may not be filled in the syntax (the Degree Phrase Parameter). Subcomparatives, unlike normal comparatives, require the degree argument slot of the *than*-clause to be overtly filled in the syntax.

(95) [than [how 1 [the cupboard is [AP t_1[A deep]]]]]

(96) [[Deg-P -er [than [how 1 [mine are [~~AP t_1 long~~]]]]] [1 [AP t_1 [A' long]]]
(Beck et al. 2009:34)

As we can see in (95), the degree argument slot of the SpecAP in the *than* clause is overtly filled in the syntax by the trace (t_1). The fact that English allows the overt filling of the degree argument makes subcomparatives grammatical. Russian does not allow the SpecAP of the gradable adjective to be filled in the syntax, meaning that thestructures which involve overt filling of degree arguments such as subcomparatives, measure constructions and degree questions are not permissible in this language. Normal comparatives are fine in both types of language, since the problem of overt filling disappears in Russian under ellipsisand the fact that the-*er*quantifier must not stay in SpecAP of the matrix clause in the overt syntax, but at LF. Therefore, Russian is fine with a degree operator moving and leaving a trace in SpecAP at LF (see chapter 2).

The postulation of a different parameter raisessome empirical issues. Why should a language like English employ both instances of filling up SpecAP in the same subcomparative structure: one in the overt syntax within the *than* clause and the other at LF by means of themoving -*er*operator? Why should languages like Spanish and Romanian which have the negative setting of the Degree Phrase Parameter resort to other syntactic means to overtly fill their SpecAP in subcomparatives (e.g., Romanian uses the particle *de* in subcomparatives), other than leaving a trace which arisesfrom the overt movement of the operator? These questions are not meant to instantiate a counterargument against the Degree Phrase Parameter. They trigger a side-effect debate that may arise from the highly stipulative nature of the analysis presented here in terms of parameters.

Secondly, we have good reason to abandon the feature-based approach along the lines of Lardiere-Slabakova as an untenable theory which falls short of predicting variability and L2 learnability in the domain of comparative structures and past tense across English-like and Japanese-like languages. The mismatches investigated in Slabakova (2008), for example, have little to say about the L2 acquisition and knowledge of truth-conditional, sentential semantics of meaning. Slabakova conceptualizes the syntactic-semantic mismatch as a representation of the same meaning that is made up from different morpho-lexical elements.[104] On the Bottleneck Hypothesis (Slabakova 2008), functional morphology is argued to be the most difficult linguistic information to acquire, with its syntactic and semantic reflexes being easiest to attain at the end of the journey. When it comes to meaning, morpho-lexical structures are not the direct expression of truth-conditional meaning. They are ambiguous and imprecise. These structures are subject to rules of construal that produce unambiguous, precise and compositional structures as expressions of truth-conditional meaning. Testing mismatches as conceptualized under Slabakova's Bottleneck Hypothesis amounts to testing the acquisition of morphosyntactic structure and the affiliated grammatical meaning articulated in terms of features. The question of what L2 learners know about the morphosyntactic structure is independent of knowledge of meaning per se. The question of whether L2 learners would eventually arrive at the grammatical meaning as encoded in terms of features can be answered with big "yes", provided that these features are universally supplied elements. Therefore, it isnot always the case that the way in which a feature is expressed (i.e., directly orindirectly, overtly or covertly) may tell us how hard or easy acquisition of some meaning is. Consider for example the case of comparatives in English and Japanese again. While both languages express comparison in a direct and overt way, it isexpected under Slabakova's (2009) argument that L2 learners in both directions, ceteris

[104] Or being supplied by context (Ramchand&Svenonius 2004).

paribus,should not face any noticeable difficulty in acquiring the universal meaning of comparison along with its related interpretive properties. Assume that the universal meaning of comparison is expressed grammatically viathe semantic feature [+comparative]. As we can see in subsection (3.2.1), thisfeature is not expressed differently in the two types of languages.The expression of this feature is both direct and overt in the two types of languages, since both languages have an overtly specified morpho-lexical structure that denotes comparison as its primary meaning.[105]

Considernow (97)(cf.chapter 2).

(97) a. Mary-wa [John-yori] (motto) takusan-no ronbun-o kaita
Mary-Top John-YORI (more) many-Gen paper-Acc wrote
'Mary wrote more papers than John'

b. Mary wrote more papers than John

Clearly, we have a sort of syntax-semantics mismatch in which a universal meaning (say comparative or past tense) is expressed differently:not through different morpho-lexical or morphosyntactic expression of features in the native and primary languages, but throughdistinct typed logical forms encoding different truth conditions (contra Slabakova 2009, Slabakova and Cho2013). The mismatch is captured by having a distinct and unambiguous typed structure withdifferent truth conditions for the same meaning of each category of languages. Differential comparatives in both English and Japanese are expressed using equivalent morphosyntactic structures: both types of language have overt and direct syntacticstructures for comparatives.

[105]With a trivial difference: in English, the positive form of gradable adjectives is morphosyntactically basic, and the comparative form is derived from it either via *-er* affixation or via periphrastic use of *more*. In Japanese, however, the positive and comparative forms are not audibly different (Grano 2012:515). This morphosyntactic difference is not based on overt vs. covert or direct vs. indirect expression of meaning as conceptualized by Slabakova & Cho (2013).

However,each language has a different logicalform thatexpresses the universal meaning of comparison.[106]While the English comparative is a quantified structurethat involves a higher-order degree quantifier relating sets of degrees, the Japanese comparative is a lower-level structure involving an inherently comparative adjective of type <e,t> thatcombines intersectively with the *yori*-clause by predicate modification with no degree quantification.

We claim that the process of acquiringcompositionalmeaning with an L2 typed structure that is different from that of L1, along with its associatedinterpretation, is predicted not to proceed easily simply because the morphosyntactic structure thatexpresses that meaning is expressed overtly and directly. A Japanese or Chinese L2 learner of the English comparative should notonly know that *-er than* expressions encode comparison in English. She shouldalso know that this morpheme encodes a feature that belongs to a higher-type meaningwhich acts as a higher-order functor (a quantifier). She should know that thishigher-typed object is a logical constant with an invariant meaning that isdetermined by the application of a semantic rule by virtue ofform, but not contentor reference. Such an element relates sets of degrees, so that an instance of degreeabstraction should be established to create a standard of type <d,t> and another tocreate the restriction of type <d,t>. The learner will know that degree-basedsubcomparatives are grammatical and thosestructures that involve degree abstraction across a negative island boundary are not. Similarly, an English learner of Japanese shouldknow that the comparative in Japanese or Chinese does not involve a higher-order functor, butan element of the lower type<e,t> (a predicate of individuals). It is just a low-typepredicate which inherently encodes the comparative meaning with a contextually determinedstandard (Beck et al.2004,Krasikova 2008).

[106] By logical form, we mean the representation of the form of type-denoting objects, which naturally divide into logical terms such as *every*, *necessarily* or *and* and non-logical terms such as *elephant*, *Socrates*, or *large* (May 1991, MacFarlane 2000).

As a result, QR and degree abstraction should not be introduced as structural prerequisites for interpreting the comparative.This leads to a scenario in which negative islandscan grammatically be violated, no scope interactions with other scope-bearing expressions arises, and degree-based subcomparatives are not accepted.

Mismatchesof this sort cannot be predicted simply by assuming that features may be expressed in different ways,i.e. overtly and directly by morpho-lexical means or covertly and indirectlyvia other contextual or indirect syntactic or morphological means.This argument leaves us with an inevitable conclusion: in some cases, neitherthe morpho-lexical structure nor context may determine the potential semanticvariation among languages via morphosyntactic encoding of a specific meaningor recovering it from context (contra Ramchand&Svenonius 2004 and Slabakova 2009). Assume that the computational system of the syntax and the Conceptual-Intentional systemare universal, with certain features, such as comparative, that are universally available in syntactic-semantic representations (Ramchand&Svenonius 2004,Slabakova 2009).[107] As we have just shown, themeaning of comparison is associated with different clustersof interpretations in Japanese/Chinese and English,and these cannot be accommodatedinto the feature-based theory along the lines of Lardiere-Slabakovaby justassuming that they follow from the encyclopedic content of features and howmuch information about the content can be expressed by the morpho-lexical carrieror the context. Such (re-)assembly of features falls short ofaccounting for the interpretive variability that results from having distinct truth-conditional structures for articulating the same meaning in the native andtarget language.Variability of this sort cannot be predicted by the distinction betweenmorphologicaland contextualassignment of meaning. It invites a different theory that may explain thedifferent expressions of comparatives

[107] All languages express comparison in a way or another (Beck el at. 2009, Bochnak 2015).

in languages. This theory shouldaccount for the case at hand and the other cases whose meaningvaries depending on overt morpho-lexical and contextual extralinguisticfactors.

Our alternative is built on the assumption that the exact specification of meaningnot only depends on the system of grammatical features (contraLardiere 2008) or encyclopedic content (contra Lardiere 2008 and Slabakova 2009), but also on a system of logical types that determine their combinatorialproperties.[108] We approach the concept of features by adopting the following definition (Bierwisch 2012:327),which determines the combinatorial conditions under which type-denoting constituents compose in hierarchical, functor-argument relations.[109]

(98) Semantic features are elements that belong to a system of logical types

By postulating the type-based primitive level of semantic features, we are not rejecting the standard assumption that features are basic elements of linguistic structures thatmay encode grammatical distinctions (e.g., past ordefinite) or conceptual conditions (Bierwisch 2011,Alexiadou et al.2007).[110]We are just saying that languages may differ in the typed specification of the morpho-lexemes that express a particular meaning. Such differences may lead to mismatches with variability effects that are not captured by the featural specification of the morpho-lexemes or the way a language expresses the feature (i.e. whether directly or indirectly).[111]Rather, the variability arises as the result of having different typed specifications for the same structure expressing the same meaning.

[108] See Starke (2014) for a similar proposal that captures syntactic variation in terms of lexical elementsthat represent syntactic constituents of different sizes as built by the computational system.
[109] See also Ajdukiewicz (1935) and the more recent developments of the idea such as Lewis (1972), Cresswell (1973) and Montague (1974).
[110] With "semantic feature" taken as a synonym for grammatical meaning.
[111] For a grammatical meaning to be encoded by some relevant morphosyntactic structure, there should always be one way for morphology to express the grammatical meaning. The morphology that encodes a certain meaning should be viewed as either unambiguous, with this meaning, or having additional features that encode other additional meanings.If English and Arabic encode definiteness using dedicated morphology (definite articles or

Byway of illustration, consider the comparative construction in English-like and Japanese-like languages. While the English comparative of superiority is a quantified structure that involvesa higher-typed quantifier of type <dt,<dt,t>, the comparative in Japanese is non-quantificational, since it involves an inherently comparative, context-dependent adjective of type <e,t>. This difference in the typed structure of comparatives in the English-like and Japanese-like languages lead to striking interpretive differences.Because English has a quantified comparative structure, English permits subcomparatives of degrees. It also shows sensitivity to negative islandsand exhibits scope interactions between the degree head and a modal operator in the main clause. As for Japanese-like languages, since the comparative structure in this language is non-quantificational, Japanese does not permit subcomparatives of degrees,is indifferent to negative islands, and does not show scope interactions in modalized comparative structures.

Let us take past tense as another illustration. Japanese and English express the past tense using equivalent morphology in a direct and overt manner. The past tense behaves differently in the two languages: while the past tense is quantificational in Japanese, it ispronominal in English. When it comes to complex structures with an embedded *before* clause, the different semantic behavior of the past tense results in interpretive differences between the two languages. The quantificational past tense of Japanese cannot be embedded in a *before* clause under a past-tense matrix clause. Since the denotation of [[before]] presupposes that there is a definite leftmost moment for the set of times denoted by the embedded clause, and that definite leftmost time follows the leftmost time of the set of times denoted by the context (by time density), there will be no first time meeting the requisite description, since for any time t where the *before*-complement holds true, there would be a time t' preceding t such that the *before*-complement

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prefix *l* in Standard Arabic), such morphology should reflect an unambiguous meaning of the grammatical feature [+definiteness], with additional meanings that may be added, depending on cross-linguistic variation.

precedes t. Because of this presupposition failure, Japanese always has an underspecified present tense in subordinate clauses embedded under a past-tense matrix clause in *before*constructions. This gives rise to a p-shiftability property, in which the embedded clause is felicitous at times that may precede, coincide with, or follow the speech time(see chapter 2 andSharvit 2014). English, on the other hand, has a pronominal past tense that can be embedded in *before*-clauses without giving rise to this presupposition failure. English, therefore, does not exhibit the p-shiftability property. The embedded clause is only interpretable in the past tense; its time must precede the speech time.

It is far from clear howlearning these properties could proceed by simply (re-)assembly of features in the sense ofLardiere-Slabakova. As argued in the last subsection, we have good theoretical reasons to abandon parameters. This step, however, is undesirable, since the case in question cannot be captured by simply postulating a parameter (namely, the Degree Abstraction Parameter or a Quantificational vs. Pronominal Parameter) whose (re-)setting results in the emergence of differentclusters of interpretive properties. Equating parameters with features as an alternative does not help either.It follows that an alternative analysis is needed. We suggest that the difference between the two species of language is in how they selectfrom theuniversal inventory of typed elements in the same semantic space in such a way that different languages express different sentential meanings by constructing different logical forms out of different type-denoting elements. It happens that English chooses to encode the comparative using a higher-order quantifier and Japanese using a low-typed meaning of predicate of individuals. It also happens that Japanese chooses to encode the past tense using an existential quantifier and English using a pronominal past that has a lower-typed denotation (i.e., type i). The difference in

selection of type-denoting structures results in different clusterings of interpretive properties associated with relevant logical forms in the two species of language.

4.2. Semantic Variation Reduces to the Size of Typed Trees

Recall that our understanding of semantic features is based on the definition repeated in (99).

(99) Semantic features are elements that belong to a system of logical types which determines the combinatorial conditions under which type-denoting constituents compose in hierarchical, functor-argument relation.
(Bierwisch 2012:327)

Based on this understanding of semantic features, we maintain with slightmodification the standard view adopted by most generative L2 acquisitionists,namely that linguistic variation among languages reflects variation in the featuralcontent underlying inflectional morphology in the lexicon. We view semantic variation as differences in the featural affiliation ofdifferent type-specifications that makeup functional meaning categories, or what von Fintel& Matthewson (2008) call "semantic glue".[112]

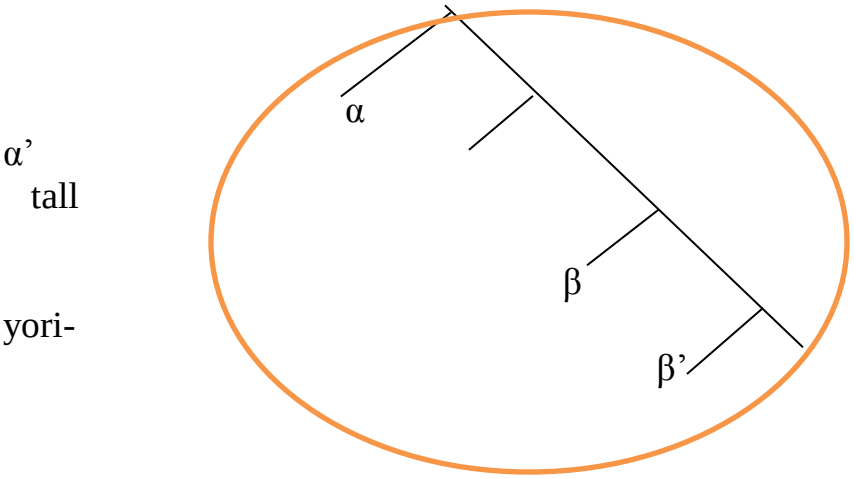
We saw in the previous section that neither parameters norfeaturescan provide a robustaccount for the variability of the cross-linguistic semantics of comparatives and past tense in English-like vs. Japanese-like languages. We encounter a traditional problem of variation: if both types of language have a syntactic means for expressing comparison/past tense, what explains the striking interpretive differences between the two types of language?

[112] In von Fintel & Mathewson's (2008) terms, semantic glue is a cover term that refers to a higher-type meaning which combines low-level typed expressions in the formation of normal sentence meaning. Semantic glue in the typed structure may correspond to overt functional morphemes (say past tense or higher-order quantifiers). They may also operate covertly as truth-conditional operators (e.g., the universal modal that the *if*-clause restricts in indicative conditionals; Kratzer 1991).

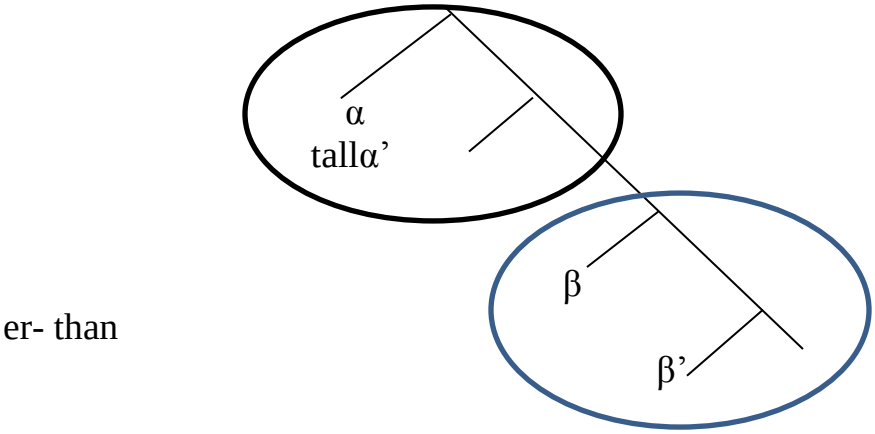
To answer this question, we need first to delineate the invariant part of grammar (i.e., principles). A central concern in Chomskyan/Minimalist linguistics is the drive to make as much of the grammar as possible invariant across languages. Progress continues within that tradition asshown by cross-linguistically well-attested linguistic representations such as the order and featural content of the underlying (categoric) functional representations, locality conditions and binding principles. If almost everything is invariant in the grammar (from principles to features to full-fledged representations), the question is how to account for the variation in the domain of universal meaning (e.g., comparison, past tense), which is expressed using different typed structures with different truthconditions in English-like vs. Japanese-like languages. This type of variationreduces to the difference in the content and size of the typed tree that corresponds to the semantic object of the relevant lexical item: a bigger typed constituent associated with a higher-type meaning (i.e., quantifiers) vs. smaller typed constituent associated with a low-type meaning. This technology is similar to the one that is developed within the nanosyntax framework, in which different lexical items can spellout phrasal constituents ofdifferent sizes (Starke 2002, 2012). As we saw in the previous section, the comparative and past tense structures in English,on the one hand, and those of Japanese and Chinese,on the other hand,vary along one crucial dimension: while the comparative is a quantifier that involves QR in English, it is an element of lower type in Japanese with no QR. Similarly, while the Japanese past tense is an existential quantifier that undergoes QR, in English it is an element of lower type that does not undergo QR. On our nanosyntactic view, the variation lies in the size difference of the typed structure (i.e., higher-typed vs. lower-typed meanings) and the (un)availability of spell-out-driven movement (i.e., the availability of QR in higher-typed meaning vs. its absence in lower-typed meanings).

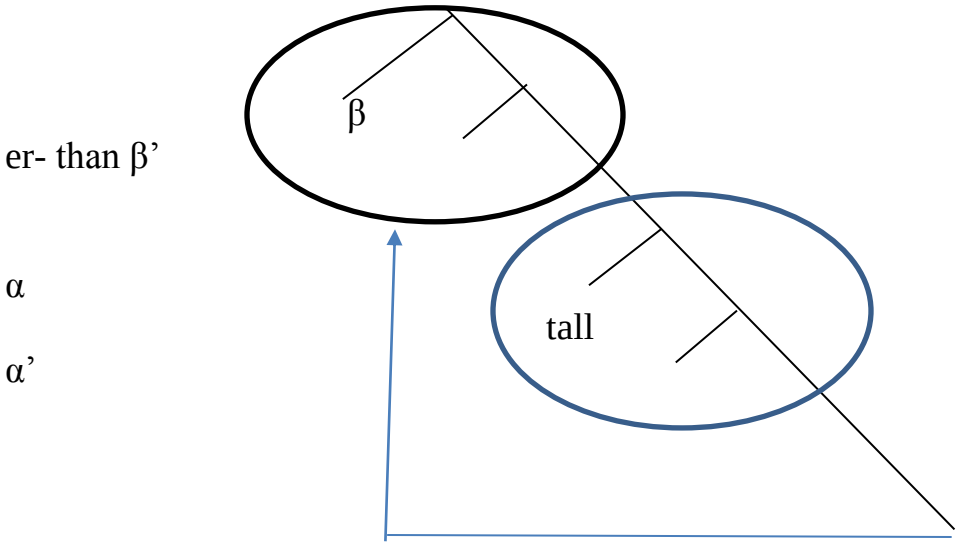
Consider the trees in (100) and (101),which illustrate the variation in terms of size difference and spell-out movement.

(100) a. Jim is taller than Bill (comparative in Japanese)

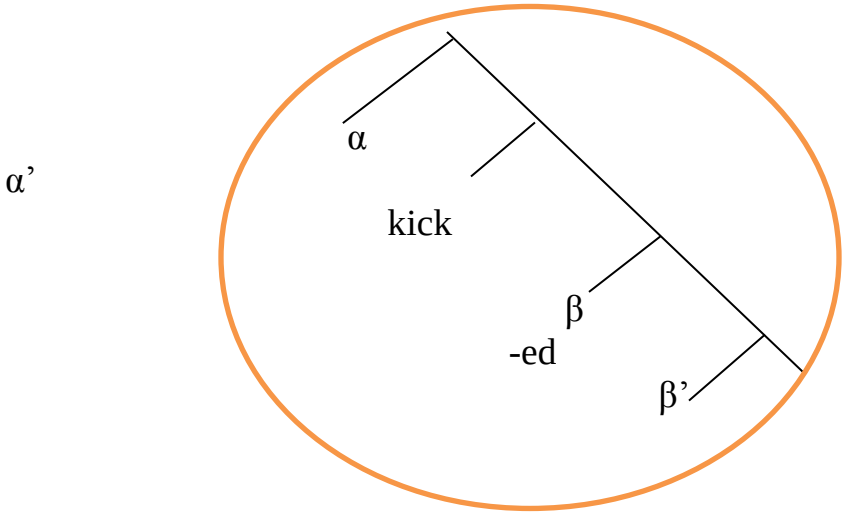


b. Jim is taller than Kim. (comparative in English)





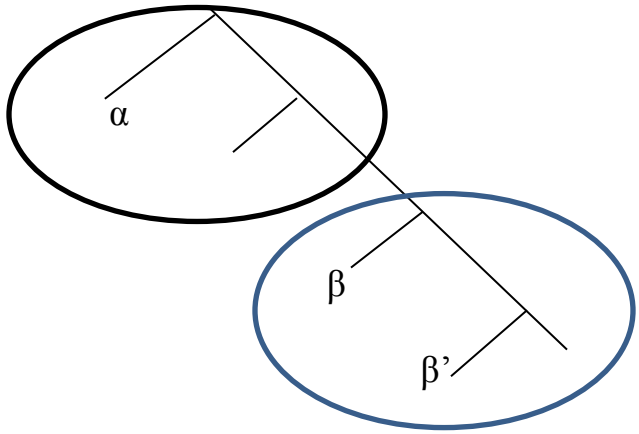
(101) a. before he kicked the ball (past tense under *before* clause in English)



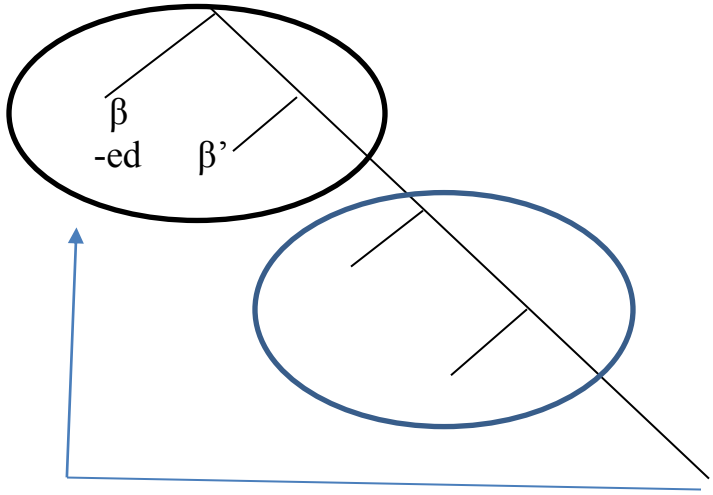
b. before he kicked the ball (past tense under *before* in Japanese)

kickα’

ed



α
ed
α’



As we can see, the English comparative spells out two lexical items (i.e.,α and β represent syntactic units).

(102) a. tall[α [α’]]

b.-er [β [β’]]

And the Japanese comparative spells out one lexical item:

(103) tall [α [α’ [β [β’]]

Similarly, the Japanese past spells out two lexical items:

(104) a. kick ⟷ [α [α']]

b. –ed ⟷ [β [β']]

And the English past tense spells out one lexical item:

(105)

kicked ⟷ [α [α' [β [β']]

To see how the variation reduces to the spelling out of different sizes of lexical items and movement, I will first explain some terminology and workingassumptions that make the picture clearer.[113]

We introduce the notion of "semantic unit", which is either atomic or compositional. An atomic unit is a functor or an argument. A compositional unit is an object that results fromhaving a functor applied to its argument. Semantic derivation proceeds in such a way that it spells out atomic and compositional units. We can see that the comparative in Japanese consists of one semantic unit with an inherently comparative adjective being saturated by its contextually set standard(100a). Also, the past-tense verb in English is spelled out as one unit, since the past is a pronominal element of type ithat directly saturates the verb, which is a functor that denotes a predicate of times. Once the derivation reaches a point of type mismatch, the derivation cannot spellout one semantic unit: there will be no single lexical item the covers the whole structure up to the point of computation. If this structure is to be spelled out, a last-resort procedure musttake place to save the structure. Such alast-resort procedure is QR: a type of spell-out-driven movement, in the terms of Starke (2009). As the item moves, it leaves a trace with the appropriate type to compose with the higher functor. The object that resultsfrom functional application is spelled out as one unit. The moving item, on the other hand, applies directly to this

[113] Our theory of semantic variation follows previous work in nanosyntax(Starke 2002,2009, 2013).

item via function application. In this way, the derivation resorts to two lexical items. This is what explains the variation in comparatives and past tense in English-like vs. Japanese-like languages. A question arises at this point: what is the nature of such a higher-typed meaning that QRs to spell out two lexical items?I will discuss this question in the next section.

4.3. Functional Morphemes as Semantic Glue

For an utterance to have a fully formed sentence meaning, it needs a functional category with a high-type meaning that combines low-type content morphemestogether. For example, the following sentence cannot have a normal sentence meaning without having a functional meaning holding together the two low-type content morphemes *cat* and *purr*; such functional elements include determiners and temporal or modal operators.

(106) cat purr

(von Fintel& Matthewson 2008:156)

Functional morphology consists of five kinds of information: (a) the morpho-phonological structure that encodes the overt affixation of morphemes, (b) grammatical meaning such as tense, aspect, and modality, (c) syntactic reflexes that are the consequence of syntactic transformation driven by feature checking and deletion (e.g., DP movement, topicalization, etc.), (d) interpretable features that regulate meaning, and finally (e) a specification of logical types that regulate combinatorial conditions under which type-denotingconstituents compose in hierarchical, functor-argument relations. Let's look at them in turn.

First, languages may differ in whether or not they represent a certain functional meaning overtly. English and Japanese, for example, overtly represent tense. Other languages, such as

Okanagan (Dunham 2011), have bare predicates that can be interpreted temporally as past, present or future.[114]

Second, grammatical features represent another domain of language variation. Previous research has shown that cross-linguistic variation is attributable to differences in grammatical features that make up functional and lexical categories (Borer1984, Chomsky 1995, Baker 2008).This amounts to saying that language variation follows from the lexicon and learners should learn the functional and lexical categories to be able to (re-)assemble the featural structure of the target lexical or functional item in the target language.[115]On the assumption that the syntax (e.g., the computational system) is universal, no two languages may differ in the recursive syntactic mechanism of structure building. However, languages may differ in the syntactic reflexes that come as structural consequences of regulating movement of phrases,which in turn depends on the specification of certain grammatical features;[116] variation in grammatical features in thelexicon may thus trigger different syntactic processes to operate in the syntax in different languages.[117] Third, semantic features do not represent a point of variation. All languages are expressive enough to encode the same meanings, such as tense and comparison, using different grammatical or extra-grammatical means (Jackendoff 2002).

Finally, there isvariation in the logical types of functional categories.[118]This variation has to do with the level of type order of structures. Assume that we have two levels of type order: a low type level for expressions that refer to individuals, situations or predicates of individuals and a high type level for expressions that denote predicates of predicates of individuals (e.g.

[114] For more case studies, see Bittner (2005), Matthewson (2006), and Tonhauser (2011).
[115] See for example Slabakova (2008) and subsequent work.
[116] Acquisition of syntactic parameters along with its structural consequences (White 2003 and related work).
[117] See Papadopoulou et al. (2011) for acquisition of word order, White (1990) for verb movement, and Martohardjono (1993) for*wh*-movement.
[118]To the best of my knowledge, this type of variation has not been studied in the SLA literature. We focus on this type of variation in this work.

quantifiers) (Chierchia 1984, Partee 1987, von Fintel& Matthewson 2008). The difference in logical types denoted by a particular functional morpheme in different languages triggers the employment of different compositional mechanisms at LF. Byway of illustration, consider the denotation of comparatives in English and Japanese. While the comparative in English is ahigh-type quantifier that relates predicates of degrees, in Japanese it is alow-type predicate that relates entities. Byselecting different typed specifications for this functional meaning from the functional lexicon, each language employs different sets of rules from the universal compositional mechanism for encoding the comparative, with the result that there are two different logical forms with different truth conditions and different clusters of interpretations(see the previous section).

4.4. Conclusion

In this chapter, we introduced a level of linguistic variation at which functional meanings may be lexically categorized with logical type denotations, in such a way that a particular functional meaning may be expressed using different logical forms with different truth conditions in different languages. We illustrated this point of variation by discussing the functional meanings of comparison and past tense in both English-like and Japanese-like languages. We showed that in one set of languages, the functional meaning is expressed using a quantified logical form, and in another set using a non-quantified logical form. Such a difference in the logical type categorization and selection of universal compositional rules stands behind a number of striking surface interpretive differences in the two sets of languages.

We showed that variability of this sort cannot be explained in terms of parameter (re-)setting or feature (re-)assembly. We suggested a nanosyntacticapproach in which the variation is

reduced to the size of the spelled-out constituents of the functional meaning in the two sets of languages.

Chapter 5

Compositional Meaning inSecond Language Acquisition

5.1. What is at stake in L2 acquisition of meaning?

To better understand what L2 acquirers know about meaning in the second language, the previous literature on L2 semantics usesdifferent learning tasks to investigate interpretive properties that follow fromthe syntax-semantics interface.[119] These tasks require learners to grasp two types of knowledge: the morphosyntax and its interpretive underlying properties. L2 acquisition of meaning is viewed as a mapping procedure between the syntactic structure,which comprises syntactic phrases, constituents and their structural relations, and its associated semantic structure,which comprises logical types (e.g., events, entities, times, degrees) and their recursivehierarchical relations. The challenge for L2 learners is to acquire those mismatches that may arise in different languages by performing appropriate syntax-semantics mappings.

While the content of the semantics module and the compositional mechanism of meaning are assumed to be universal (Ramchand &Svenonius 2008, Cho &Slabakova 2013), languages differ in howdifferent linguistic forms map different meanings. The representative literature on L2 semantics remains sloppy about what we mean by“linguistic forms”and what we mean by “meanings”. A predominant line of research assumes “linguistic forms” to be the morphosyntactic structure or inflectional morphology and takes “meanings” to be those primitives that are part of the universal semantic module of language, such as ongoing, habitual meanings of tenses, existential readings,etc.

A learning task of this sort involves the acquisition of mismatches in which knowledge of the morphosyntax is a prerequisite for learning meaning (i.e., the morphology-before-semantics

[119] See Slabakova (2008:ch. 6-7) and references therein.

view) or knowledge of meaning may be independently acquired, given the universality of the conceptual meaning primitives and the semantic mechanisms of computation (semantics-before-morphology view) (White 2003:ch. 6, Slabakova 2006:316-317).

Let us consider some case studies that exemplify the two types of learning tasks involving the acquisition of such syntax-semantics mismatches.The first learning task involves one-to-one mapping ofa piece of morphology that is simple and frequent onto its associated interpretations. This learning task may represent a mismatch: different languages may have different inflectional morphology mapping onto different interpretations. The second task involves novel complex morphosyntactic structures with relevant interpretations that are easy to acquire by virtue of the universality of composition, apart from the complexity of the morphosyntactic structure.[120]The main finding of those studies that investigated the first learning task situation was that L2 acquisition of meaning proceeds incrementally towards the development of native-like knowledge of semantics (e.g.,Montrul&Slabakova 2002, Slabakova 2003, Gabriele 2005, among many others). The main finding of the second type is that the sentential meanings associated with complex syntactic structures are easily acquired, since there is no L1-L2 mismatch in articulating the sentential meaning, whichis supposed to be obtained using the universal mechanism of compositionality. In either case, knowledge of meaning was shown to present no difficulty for L2 acquirers, and the difficulty lies in the acquisition of the morphosyntactic structure (Dekydtspotter, Sprouse& Anderson 1997; Dekydtspotter& Sprouse 2001; Dekydtspotter, Sprouse &Thyre 1999, 2000; Unsworth 2005; among many others). In what follows, I will review an example of each learning situation.

[120] Since the establishment of the complex morphosyntactic structure necessarily entails the acquisition of the truth conditions associated with that syntactic structure.

An example of the first type of learning task is the L2 acquisition of aspectual interpretive properties amongEnglish L2 learners of Spanish, as investigated in Montrul and Slabakova (2002). The authors investigated a learning task in which English L2 learners of Spanish acquire the fact that the imperfect morpheme in Spanish expresses habituality. They should also acquire the fact that the imperfective morpheme expresses both habitual and ongoing eventualities and thepreterite morpheme expresses only a one-time completed event in this language. Notice that these facts are not native-like: In English, while the imperfective expresses the ongoing event, the past tense is ambiguous between two readings: the one-time completed reading and the habitual reading.

To examine the knowledge of this mismatch, Montrul and Slabakova (2002) tested 71English L2 learners of Spanish using an inflectional morphology test and a sentence conjunction judgment task which specifically tests the semantic interpretations of the preterite and imperfect tenses. The morphology test divides the sample of participants into three groups: the advanced, intermediate and no-morphology groups.The judgment task exposes participants toa set of compound sentences each of which consists of two conjoined sentences. Some conjunctions are felicitous, and others are not, as exemplified in (107) and (108).

(107) Joaquín corría (imperf) la carrera de fórmula 1 pero no participó.
'Joaquín was going to participate in the Formula One race but didn't participatein it.'

-2 -1 0 1 ②

(108) Pedro corrió (pret) la maratón de Barcelona pero no participó.
'Pedro ran the Barcelona marathon but he didn't take part in it.'

② -1 0 1 2

(Montrul and Slabakova 2002:122)

The participants were asked to evaluate each sentence on a scale ranging between -2 and2. Correct judgment is based on knowledge of which aspectual morpheme (preterite orimperfect) expresses which meaning (habitual event, one-time completed event, or ongoing event). The main goal of this study was to see whether there is a correlation between knowledge of aspectual morphology and its relevant meanings (accomplishments, achievements and states). The authors arrived at two main conclusions. First; knowledge of aspectual morphology necessarily precedes knowledge of relevant semantic interpretations. This is evidenced by the statistically significant correlation between learners' level of proficiency (i.e., advanced, intermediate) and the sensitivity to the preterite-imperfect distinction. Second, knowledge of the aspectual meaning may be obtained gradually, with a native-like competence in the advanced group, who successfully establish the correct aspectual morphology in their interlanguage. The findings of this study contribute more evidence supporting the Bottleneck Hypothesis (Slabakova 2008),according to which functional morphology is the most difficult part ofthe grammar for L2 learners to acquire, with its syntactic and semantic reflexes easily attained in L2 acquisition, given the universality of itsmeaning primitives and the application of the composition mechanism.[121]

[121] Two other case studies that investigate temporal-aspectual knowledge in the second language are Slabakova (2003) and Gabriele (2005). Slabakova (2003) investigated the acquisition of English grammatical aspect by L2 Bulgarian learners. Those learners must acquire the fact that bare eventive verbs inEnglish entail the completion of the event. For example, the sentence in (i) entails that the event of crossing the street is complete:

(i) I saw Mary cross the street

Slabakova (2003), following Giorgi &Pianesi (1997), assumes that the completion entailment in (i) stems from the fact that English bare verbs bear the default [+perfective] feature in the lexicon. Bulgarian bare verbs, on the other hand, do not bear [+perfective] and hence the Bulgarian equivalent structure to (i) lacks the completion entailment. A mismatch of this sort is responsible for the emergence of interpretive differences in the two languages. In English, the present tense denotes habituality so that the progressive morpheme is needed for denoting ongoing interpretation and progressive state predicates denote temporary states. Bulgarian, on the other hand, lacks progressive tense and the present tense may denote either habitual or ongoing readings. Slabakova (2003) conducted an experimental study using a morphology production test and truth-value judgment task to investigate knowledge of English bare

An example of the other learning task situation[122]is the L2 acquisition of quantification at a distance in Dekydtspotter, Sprouse &Thyre(2000).[123]This study investigated the interpretation of quantification-at-a-distance (QAD) constructions by L2 English learners of French.French, unlike English, allows quantifiersmeaning 'much', 'many' or 'too'to be located outside the NP phrase, binding a null determiner trace of type e, as exemplified in (109) and (110).

(109) [$_{IP}$Ila[$_{VP}$ [$_{V}$trouvé[$_{NP}$ [$_{QP}$beaucoup] de pièces d'or]]]] (non-QAD)
He has found many of coins of-gold
'He found many gold coins.'

(110) [$_{IP}$Il a [$_{VP}$[$_{QP}$beaucoup] [$_{V}$trouvé[$_{NP}$[$_{QP}$ e] de pièces d'or]]]] (QAD)
He has many found of coins of-gold
'He found many gold coins.'
(Dekydtspotter, Sprouse &Thyre 2000:268)

The quantified constructions (109) and (110) are interpreted differently in French. The quantifier in the QAD construction in (110) denotes a large number of iterated events of finding gold coins (event-related reading). It cannot mean that many gold coins were found in an individual event (object-related reading). The non-QAD construction in (109), on the other hand,

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verbal predicates and its interpretative consequences by Bulgarian L2 learners. Slabakova showed that the advanced group successfully acquired the fact that bare verbal predicates entail the completion of event. She also showed that learners are accurate in the acquisition of the interpretive properties associated with the [+perfective] of bare verbal predicates: habitual interpretation of the present, the ongoing interpretation of the progressive and the temporary reading of the progressive state predicates. Intermediate learners showed less accuracy in the acquisition the ongoing progressive. Again, the main finding of this study documented a correlation between knowledge of morphology and the grammatical meaning associated with it.

Gabriele (2005) also investigated knowledge of present progressive accomplishments and achievement predicates in the English-Japanese and Japanese-English interlanguages using a grammaticality judgment test. Gabriele showed that Japanese learners of English correctly reject those ungrammatical sentences with missing morphology. Intermediate and beginning learners did not show a high level of accuracy in evaluating grammatical sentences. On the other hand, English learners of Japanese of all levels correctly judged the *te-iru*morphology that is associated with the progressive in Japanese. Again, the study showed that the acquisition of interpretive properties of temporal morphology is possible.

[122]Where the morphosyntactic structure presents more difficulty for L2 learners and the acquisition of the interpretive properties proceed easily at the syntax-semantics interface with no mapping mismatches.

[123]See also the acquisition of double genitives in Dekydtspotter, Sprouse & Anderson (1997), discontinuous constituents in Dekydtspotter& Sprouse (2001), scrambling in Unsworth (2005), and object and subject interpretations of questions in Gruter (2006), among many others.

is ambiguous between the two readings. English lacks QAD constructions, and its non-QADcounterpart is ambiguous between the event-related and object-related readings.

According to Dekydtspotter et al. (2000), the two readings have distinct syntactic structures: while the event reading involves positioning the quantifier in SpecVP to quantify over the ordered pair <event, object>, the object-oriented reading involves quantification over individual objects. An English acquirer of French needs to acquire the fact that the quantifier in (110) is merged in SpecVP and bindsthe empty individual-event variables in the determiner position of the NP. This fact gives rise to the unambiguous event-related reading in the QAD construction in (110). If all the learners need to acquire is a formal feature in the lexicon that derives the direct merger of the quantifier into SpecVP, it follows that the acquisition of such a syntactic feature leads to the establishment of asyntactic structure that triggers the application of the universal mechanism of semantic computation,which in turn results in the acquisition of the unambiguous event-related reading of (110).

Dekydtspotter et al. (1999, 2000) tested this knowledge using a Truth Value Judgment Test (TVJT) where a sample of participants are exposed to a set of stories in their L1 followed by test sentences in French. The authors tested the sensitivity of learners to the distinction between the object-related and event-related readings by testing how learners interpret QAD constructions that are felicitous in both event-related and object-relatedcontexts and constructions with frequency adverbials such as *beaucoup de fois*,which are only compatible with the event-related reading. The authors' findings showed that French native speakers and English L2 learners of French are sensitive to the distinction between the event-related and object-related quantification in QAD constructions, on the one hand, and the event-related of the construction with quantification over events, on the other hand. This amounts to saying that the learners were

capable of establishing asyntactic structure in which the merger of the quantifier into SpecVP is possible, giving rise to the event-related structure in QAD constructions in their interlanguage.

We can see that the main findings of most studies investigating these two types of learning tasks share the conclusions outlined in (111):

(111)

a. The aspect of meaning that L2 learners learn comprisesuniversal primitives (e.g., habituality, one-time completed event, quantification-over-individuals or events etc.)that follow from the universal semantics module. Languages vary in their syntactic ways of expressing theses conceptual primitives.[124]

b. The establishment of the target-like morphosyntactic structure along with its featural specifications is essential to the acquisition of meaning. In one scenario, different morphosyntactic units may map onto different meaning primitives. The L2 acquisition of some meaning primitive should not represent any difficulty as long as the morphosyntactic units encoding that meaning primitive areestablished in the L2 interlanguage. In another scenario, the learning of complex syntactic structures leads to the automatic employment of the universal composition mechanism of meaning.

We think this line of reasoning makes a strong case for the idea that the difficulty of L2 acquisition lies in acquiring functional morphology.[125] It also makes a strong case for the inevitability of acquiring meaning primitives at the end of the process of L2

[124]Replicating an assumption that was put forth in Jackendoff (2002) in which the concept of meaning is universal, and languages differ in the syntactic means to express it.

[125] See Slabakova 2008 and the references therein.

acquisition.[126]However, theseinvestigations arefar from representative or conclusive when it comes to making genuinereflections aboutL2 semantics per se. Such a research agenda suffers from two confusions.First, the expression of a meaning primitive is not necessarily expressed via different morphosyntactic means in different languages. The expression of meaning may be expressed using different truth conditions as expressed by distinct unambiguous, precise logical forms in different languages. On this view, we look at how the same unit of meaning, which is supposed to be universal as part of the semantics module, is expressed using different truth conditions, rather than how different linguistic forms map onto different grammatical interpretations (e.g., Montrul and Slabakova 2002). In the first type of investigation, there is a danger of circularity: we begin with the assumption that a relevant meaning is universal as part of the universal conceptual structure and we end up with the assumption that learners seem to arrive at the same meaning using the target-like morphosyntactic mode of expression. The challenge, on this view, reduces to knowledge of morphosyntax, which is not the genuine carrier of meaning, given its ambiguity and imprecision in meaning expression.[127]

Second, the linkage between the acquisition of the (complex) morphosyntactic structure and the successful employment of the universal mechanism of semantic computation is pointless for acquisition purposes. It is not always the case that knowledge of the morphosyntax leads to the correct acquisition of the truth conditions related to the meaning of that structure. The morphosyntactic structure may be unambiguous and imprecise. What we need to test is thelinkage between a logical form and the successful articulation of the truth conditions related to that form. When it comes to language acquisition, languages vary with respect to the logical form that encodes the truth conditions of a given meaning primitive. The challenge for language

[126] Though the process proceeds gradually or incrementally.
[127]See, for example, Heim &Kratzer (1998).

learners is to acquire the lexical item with the target-like logical type. Once this is achieved, learners' grammar would employ a different set of universal compositional rules to construct the target-like logical form with its target-like truth conditions. Byway of illustration, consider the comparative structure in English and Japanese. What is crucial is not how learners can acquire the morphosyntax related to comparatives in one language or another to arrive at the fact that learners can establish the knowledge of comparative of superiority (e.g., Bill is taller than Jim). The crucial pointis how learners come to acquire the fact that the comparative in English is a quantifier with a higher-order meaning of type <dt,<dt,t> and that of Japanese has a lower-order meaning of type <e,t>. These facts lead to the employment of different composition mechanisms chosen from the overall universal space of compositional rules in constructing the language-specific logical form. A mismatch of this sort can be directly tested by testing the acquisition of the interpretive consequences that each language-specific logical form has.In English, the fact that we have aquantified logical form makes subcomparatives of degrees grammatical. It also makes intensionalized comparatives ambiguous between the two readings of surface and inverted scope and it makes comparatives sensitive to negative islands. On the other hand, the fact that we have a non-quantificational logical form in Japanese makes subcomparatives of degrees ungrammatical. It makes intensionalized comparatives unambiguous, with only the surface reading, and it makes comparatives insensitive to negative islands (see chapter 2 for a detailed overview). In testing these interpretive properties, we really test learners' acquisition of the target-like logical typed specification of the functional meaning and their target-like choice of compositional mechanism in constructing that form.

On this view, the same universal meaning unit is assumed to be present in learners' interlanguage in any case and the universal mechanism of compositionality is also assumed to be

in effect in the L2 grammar.[128] However, such a universal meaning is expressed through different truth conditions as the consequence of constructing different logical forms using different mechanisms of semantic computation. Notice that, on this view, the parametric point is that the same unit of meaning is expressed using different logical forms with different truth conditions. The source of variation is the difference in the logical typed denotations of functional items across languages. This difference leads to differences in how the universal mechanisms of semantic computation are employed (i.e. choosing from the space the compositional rules needed for combining the type-denoting constituents) and hence to differences in the expression of truth conditions for the same meaning primitive.Therefore, what L2 learners know about meaning cannot be investigated by simply examining situations in which different morphosyntactic structures are mapped onto different meaning primitives or situations in which the truth conditions of some functional meaning are automatically captured once the morphosyntactic structure is acquired. After all, on the assumption that these primitives are universal, their acquisition is a matter of fact and the connection between assembling or re-assembling these features of the target language relative to the morphosyntax is independent of knowledge of meaning per se. On our viewpoint, the question of what L2 learners know about meaning is best addressed by investigating situations in which the same functional meaning or primitive is approached using different truth conditions in the native and target languages. Therefore, the challenge in L2 acquisition of meaning does not lie in the success of L2acquisition of meaning primitives relative to the morphosyntax, but in the success of L2 learners'capturing the L2 truth conditions of the target-like functional meaning regardless of learners' knowledge of the morphosyntax.

[128]Given their universality (Ramchand&Svenonius 2008, Cho &Slabakova 2013).

Theserious step we take is to investigate a type of mismatch in which a functional meaning may involve different truth conditions regardless of the simplicity and complexity of the morphosyntactic structure. In this learning task, the learner should acquire the fact that for this meaning primitive of this syntactic structure, there is a different logical form with different truth conditions that expresses the functional meaning in question. The learner mustalso figure out the lexical items with theirlogical typed specifications, and based on this knowledge, the learner must choose the rules that are needed to combine these lexical items from the space of the universal mechanism of semantic composition in view of their logical typed specifications. These learning strategies lead to the successfulconstruction of the logical form of the functional meaning in the target language. In the next section, we will say more about this type of mismatch that best reflects theL2 knowledge of meaning.

5.2. Another learning Task: the Acquisition of a Different Case of Syntax-Semantics Mismatch

In order to mediate between the morphosyntax and the semantic component, at least two instances of mapping are needed: a lexical form-meaning mapping and sentential form-meaning mapping.[129]The acquisition of sentential meaning depends on the acquisition of relevant lexical meanings that make up the full sentence. A language user should understand the meanings ofindividual morphemes[130] to be able to combine these meanings together toform full sentential meanings using the universal mechanism of compositionality (Heim &Kratzer 1998). On this view, successful L2 acquisition of lexical meaning leads to successful L2 acquisition of

[129] Where the rules of compositionality apply to denotations underlying functional and lexical items to compose meanings of complex units. This involves learners' access to the innate mechanism of computation as learners analyze input.
[130] Whether they are functional or lexical.

sentential meaning. L2 acquisition of lexical meaning may involvemismatches that L2 learners mustlearn as an initial step of acquisition. Once this is achieved, L2 learners should have no difficulty composing target-like sentential meanings, given that all they need to know is how to compose the already acquired lexical and functional items using the innate mechanism of composition,following the typespecification of each lexical item.

According to Sprouse (2006), lexical acquisitionof vocabularyinvolves phonological relabeling, lexical entries adjusted so as to bear target-like denotations.Acquiring the word *car*, for example, proceeds by associating the concept CAR with the relevant set of phonological, syntactic and semantic grammatical features, along with its logical type.[131] In chapter 3 we argued, following standard practice, that cross-linguistic variation among languages reflects differences in the inventory and properties of functional morphology (Borer 1983,Chomsky 1991,Fukui 1986,von Fintel& Matthewson 2010). We argued that functional morphemes may have different logical type specifications across languages. Consider for example the different behavior of bare NPs in languages like Chinese and English. In accounting for this cross-linguistic difference, Chierchia (1998) proposed the Nominal Mapping Parameter,according to which a language like Chinese only allows kind-denoting, non-predicative nominals oftype e, meaning that they can freely occupy an argumental position. English-like languages, on the other hand, allow NPs to be predicative, since their NPsdenote predicates of individuals of type <e,t>,whichserve as an argument saturating a higher-type quantificational determiner. This variation in logical type specification has an effect on how bare nominals are distributed in languages of the two types.Another example of variation is found in the domain of comparatives and past tense. We saw in chapter 2 that the striking interpretive differences between Japanese-

[131]Which determines the combinatorial conditions under which semantic constituents compose in hierarchical, functor-argument relations. See Bierwisch (2012) for a detailed exposition of semantic primes.

like and English-like languages in comparatives and past tense can be explained by proposingdifferent typed structures,[132] using different sets of universal rules of composition,resulting in different truth conditions expressing the functional meanings of comparison and past tense in these two species of languages.

Although an L2 learner, regardless of proficiency level, is expected to be able to express a certain meaning (e.g., comparison) in oneway or another, the challenge is how to express the meaning (e.g., comparison, past tense, argumental bare NP) in the target-like manner, which may require adjusting the logical type of the functional morphology. A Japanese learner of L2 English needs to figure out that the comparative morpheme in English denotes a degree quantifier of type <dt,<dt,t>. This fact leads to language-specific employment of the universal mechanism of composition, whose application gives rise to a cluster of interpretations such as the expression of subcomparatives of degrees, sensitivity to negative islands and the emergence of scope ambiguity in intensionalized comparatives. This is a severe poverty of stimulus situation since knowledge of the quantificational expression of comparatives does not follow from the native language, Japanese,whose comparative is of a lower type (namely<e,t>) and consequently disallows subcomparatives of degrees and does not exhibit negative island effects orscopal interactions in intensionalized comparatives. Clearly, these interpretations are not taught at any level of instruction and they are not easily extracted from L2 input by induction or analogical observation.

Given mismatches of this sort, we face a different learning task in which knowledge of morphosyntax is not crucial.[133]What is important is knowledge of the target-like logical typed specification of the lexical items. This knowledge leads to target-like employment of

[132]The higher-type quantificational meaning vs. lower-type meaning.
[133]Except insofar as it may be related to the way in which the syntactic logical form is derived in that language.

compositional mechanisms that is different from that of the nativelanguage. In acquiring the English comparative, the learner should acquire the fact that the comparative is a quantified expression whose logical form is constructed by using a different set of universal compositional rules from that set which is used in the native language. In this way, a Japanese learner of English, for example, has no way to acquire the type-specification of the comparative by positive or negative evidence. She also cannot transfer this knowledge from her L1 grammar, since Japanese lacks a quantificational comparative. A learner should extract this knowledge indirectly from the input by performing inductive strategies or attending to the systematic pattern of interpretive properties of the quantificational comparative in English (e.g., scope interaction, subcomparative of degrees, sensitivity to negative islands). Once this is successfully achieved, the learner automatically resorts to a different set of rules to compose the logical form encoding the meaning. These rules incorporate degree QR and degree abstraction/binding and the second-order function application that involves arguments which denote predicates of degrees (see chapter 2). Notice that in the native language, learners use a different set of compositional rules in which there is no QR or abstraction,and the composition proceeds through first-order function application.

Let us consider two representative lines of inquiry that may account for the acquisition of this sort of mismatch. The first is based on impairment approaches and the second is UG-access based. On the Global Impairment View,[134] the acquisition of the interpretive properties[135]whose clustering points to the acquisition of the typed specification of the functional meaning along with the language-specific mode of semantic compositionproceeds construction by construction (Clahsen& Hong 1995,Neeleman&Weerman 1997). Accordingly, the acquisition process is not

[134] See White (2003).
[135]Whose clustering indicates the acquisition of the typed specification of the functional meaning along with the language-specific mode of semantic composition.

UG-governed. This amounts to saying that L2 acquirers rely on adefault process in internalizing the construction-by-instruction grammar with simpler, less detailed and shallower mental representations (Clahsen&Felser 2006).[136] An example of these representations is the canonical thematic pattern (AGENT-ACTION-THEME), which is highly frequent (Townsend &Bever 2001). One piece of evidence supporting this position comes fromMarinis et al. (2005). In this study,the authors investigated the online processing of constructions with long-distance *wh*-dependencies, which incorporate complex processes such as successive-cyclic movement and locality effects. The authors showed that L2 learners of English (i.e., Chinese, Japanese, German and Greek) and native speakers of English process *wh*-dependencies differently.The native speakers showed evidence of making use of intermediate gaps,while L2 learners seem to associate the displaced *wh*-phrase with its lexical subcategorized copy in the base-generated position, meaning that L2 learners do not observe the adjacency constraint on long-distance movement in English. The findings of this study have been taken to support the Shallow Structure Hypothesis,according towhich L2 learners rely on structures with lexical semantic and direct predicate-argument relations that do not incorporate complex notions such as successive-cyclic movement.[137]

On the Shallow Structure Hypothesis'assumption that L2 learners have no UG access and rely instead on shallower, less detailed meaning-based representations, we expect that L2 learners of comparatives or past tense will rely on shallower representations that are good enough to process the meaning of comparatives. Recall that we discussed two logical form representations that encode comparisonof superiority and past tense cross-linguistically: the

[136] As predicted by the Shallow Structure Hypothesis (Clahsen & Felser 2006).
[137]For more case studies investigating this hypothesis, see Omaki and Schultz (2011), Aldwayan, Fiorentino & Gabriele (2010), Dekydtspotter & Miller (2013), Reichle & Birdsong (2014), Hawkins & Hattori (2006), and Tsimpli & Dimitrakopoulou (2007).

quantificational logical form of the English comparative/Japanese past tense with a higher-order quantifier that should raise and induce degree/time abstraction, and the simpler and less detailed non-quantification logical form of the Japanese comparative/English past tense,which is derived in one-to-one correspondence with the syntactic structure by function application and predicate modification, combining lower-level meanings without postulating complex grammatical processes such as QR and abstraction (see chapter 2). On this analysis, the non-quantificational logical forms represent shallower representations than the quantificational logical form.[138] If the Shallow Structure Hypothesis is correct, we expect that L2 learners shouldrely on the non-quantificational logical form as a default representation in processing the meaning of comparison/past in the second language. This amounts to saying that learners'interlanguage should exhibit a knowledge of comparatives in which subcomparatives of degrees are ungrammatical, intensional comparatives are unambiguous, and comparatives are insensitive to negative islands. Similarly, learners' interlanguage should exhibit a knowledge of past tense in such a way that they accept the past tense to be embedded under a past tense matrix clause in *before* constructions with a no-p-shiftability property (see chapter 2).

This view of L2 acquisition is in partial agreement with another hypothesis,[139]according to which L2 learners fail to acquire the mismatch because they fail to acquire the formal features that derive the grammatical processes or because they simply transfer such features from their L1 (Hawkins & Hattori 2006, Tsimpli&Dimitrakopoulou 2007). If this view of local impairment is correct, it is possible that L2 learners fail to acquire the typed specification of the functional meaning of comparatives or past tense becauseit is either impaired or transferred from L1. If impaired, this means that learners would not be able to express a differently derived comparative

[138] Since the two modes of compositionality express the universal meaning (e.g., comparison and past tense).
[139] Dubbed the Local Impairment View.

on a systematic UG-based basis. If transferred from L1, we expect that L2 learners of Japanese would transfer both the typed-structure labelling of the functional meaning and its associatedcompositional mechanism. In this way, learners would exhibit the native-like interpretive properties in expressing comparison or past tense in their interlanguage. For example, an English learner of Japanese comparatives would wrongly judge subcomparatives of degrees as correct in Japanese. They would assume that intensionalized comparatives would have the inverted scope reading in addition to the surface reading. They would wrongly judge comparatives with abstraction across a negative island boundary as ungrammatical. On the other hand, an English learner of German comparatives would correctly judge subcomparatives of degrees as correct in German. They would acquire the scope ambiguity in intensionalized comparatives and they would judge as ungrammatical those comparatives which are sensitive to negative islands.

The UG-based hypotheses, on the other hand, argue that L2 learners can acquire the formal features of the functional categories, as evidenced by their native-like performance in exhibiting the syntactic and semantic consequences of acquiring those features even if learners fail to acquire the functional morphology associated with them(Schwartz & Sprouse 1996; Epstein, Flynn &Martohardjono1996; Lardiere 1998; Prévost& White 2000). The difficulty and predicted variability of L2 acquisition has been approached from different perspectives. One representative view is the missing surface inflection hypothesis (Prevost & White 2000). On this hypothesis, learners' deficiency lies in a mapping problembetween abstract features and surface morphological forms, such thatincorrect production of morphologysurfaces despite the fact that learners successfully acquire the underlying syntactic and semantic reflexes associated with the missing or underrepresented morphology.

Another hypothesis that seeks to account for L2 variability within the UG-based approach is the prosodic transfer hypothesis (Goad, White, and Steele 2003;Goadand White 2004, 2006). This hypothesis attributes the difficulty and high variability in producing functional morphology in L2 acquisition to the difference in the prosodic structure between the native and target languages,notwithstanding the fact that the syntactic representation is already acquired by L2 learners. That L2 learners may not build the target-like prosodic structure stands behind the failure to produce inflectional morphology. It has been argued that different languages attribute different prosodic structures to different functional morphemes (Goad and White2004, 2006, 2008). Even if L2 learners are able to acquire the syntactic representation of those morphemes, the failure in assigning to them their target-like prosodic structure results in a deficiency in production.[140]

One more influential hypothesis that falls within the UG-based approach is the Feature Reassembly Hypothesis. On this hypothesis, L2 acquisition involves the acquisition of formal features that bundle together to form lexical items. The difficulty arises when learners are required to assemble lexical items in the second language by reconfiguring features from the way they represent lexical items in the first language into the way they represent lexical items in the second language(Lardiere 2009:173). On this view, the task of L2 acquisition reduces to learning lexical items with theirbundles of features as configured in the target language. Consider, for example, how the pronominal system in French and English involves different featural specifications in the lexicon.While French lexically encodes grammatical gender in the case of [+human] and [-human] referents as well as determiners, pronominal clitics and strong pronouns, English lexically encodes gender for [+human] objectsonly. Another difference is how the two

[140] See Goad and White(2004) for a case study from the acquisition of English by Mandarin Chinese L2 speakers in the domain of past tense and past participial morphemes.

languages encode the [+/-human] feature in pronouns.While English lexically encodes the [+/-human] distinction, the French pronominal clitic may refer to [+human] and [-human] objects. Shimanskaya and Slabakova (2014) investigated the L2 acquisition of the English pronominal system by French L2 learners, using a Truth Judgment Task with a forced-choice picture selection task. They found that beginning and intermediate learners committed more errors with grammatical gender when referring to inanimate nouns than they did with animate nouns. This feature is finally acquired by advanced learners. This suggests that learners exploit a reassembly of features in an incremental and developmental manner in the course of L2 acquisition.

For the case at hand (i.e., acquisition of comparatives and past tense in English and Japanese), the learning task does not involve assembly or reassembly of features by adding, deleting or progressively altering the featural specification of lexical items that encode lexically underlying interpretations. The task is that for a givenfunctional meaning (e.g., comparison or past tense), the learner mustacquire the lexical or functional item of the native language along with its type-specification. In view of what types of denotations these items have, L2 learners must employ the target-like mechanism of compositionality byselecting from a universal space of compositional rules. Once this is successfully achieved, the learner is able to construct the target-like logical form of the functional meaning, and hence the interlanguage should exhibit the cluster of structural interpretive properties associated with that logical form.

Byway of illustration, consider our two case studies. As shown in chapter 2, the expression of the functional meaning of comparison in English is different from that in Japanese. English has a quantified logical form for the comparative of superiority, which is associated with a cluster of interpretive properties: English permits subcomparatives of degrees,English comparatives are sensitive to negative islands, and English comparatives with

intensionalizedmain clauses are ambiguous between the surface and inverted readings. For a Japanese L2 learner to acquire the functional meaning of comparison in English, she should acquire these properties byinternalizing them systematically in her interlanguage. This can only be achieved if she acquires the fact that English comparison has a quantified logical form with a degree quantifier that relates predicates of degrees. It is very difficult to conceptualize how the mechanism of feature (re-)assembly could account for this learning task. What is crucial is to acquire the lexical item with its appropriate type realization,which leads to the construction of the target-like logical form expressing the truth conditions of the functional meaning in question. As the example shows, the Japanese learner should acquire the fact that the comparative [[-er]] in English denotes a quantifier of degrees of type <dt,<dt,t>. Such a type-denoting element needs two predicates of degrees as its arguments so that a certain selection of the universal set of compositional rules can be made to determine the quantified logical form in question. Those involve direct function application with the predicate of degrees represented by the standard of comparison (e.g., *than*-clause), QR of the degree generalized quantifier, degree abstraction and binding a trace of type d, and finally another instance of function application in which the predicate of degrees created by QR saturates the generalized degree quantifier.

Similarly, the acquisition of Japanese past tense involves the construction of a quantified logical form. This results in the emergence of the interpretative property of p-shiftability in the past-under-past in *before* clauses: the fact that the existential quantifier of the past tense in Japanese cannot be embedded in *before*-clauses under past-tense main clauses means that the tense of the *before*-clause under the past is an underspecified present (i.e., it can be interpreted prior to the speech time, simultaneous to the speech time or posterior to the speech time). For an English L2 learner to acquire the functional meaning of past tense in Japanese, she should

acquire the p-shiftability property in *before*-constructions,and this property should be reflected in her interlanguage. This can only be achieved if she acquires the fact that Japanese past tense has a quantified logical form with an existential quantifier that relates predicates of times. Again, it is far from clear how the mechanism of feature (re-)assembly can account for this learning task. The English learner should acquire the fact that the past tense in Japanese denotes an existential quantifier overtimes of type <it,it>. Such a type-denoting element needs to compose directly with a predicate of times. A certain selection from the universal set of compositional rules must be made to construct the logical form in question. Those include QR of the time quantifier, time abstraction and binding of a trace of type i, and finally another instance of predicate modification in which the generalized time quantifier of type <i,t> composes directly with another operator of type <i,t> (e.g., [[before]]). The fact that a *before* clause embedded under matrix past tense does not allow this quantificational composition of the past makes the *before* embedded tense under the matrix past tense a default underspecified present, which in turn gives rise to the p-shiftability property. The learner's rejection of the past tense in the embedded *before* clause and the availability of p-shiftability in her interlanguage indicates the successful acquisition of quantificational past. In the next chapter, we will make explicit some research questions along with their hypotheses to address the L2 acquisition of non-nominal quantification as represented by comparative and past tense L2 acquisition. We will introduce two bi-directional experiments to test these hypotheses. We will also draw some clear conclusions about the L2 acquisition of these phenomena in the context of form-meaning connections, apart from the already reviewed hypothesis under the UGapproach.

Chapter 6

Experimental Study of L2 Acquisition of Non-Nominal Quantification

6.1. Research Questions

The first research question is how L2 learners interpret non-nominal quantification in the second language. More specifically, can an L2 learner comprehend the invariant logical meaning that is associated with non-nominal quantifiers? By invariant meaning, we mean the fixed meaning of logical constants whose interpretation arises from the application of general semantic rules.[141] These rules require the satisfaction of structural and semantic properties that insure their proper application. Consider, for example, the non-nominal quantificational meaning of the differential comparative operator in English as represented in (116).[142]

(112) $[\![\text{-er}_{\textbf{clausal}}]\!]=\lambda Q_{<d,t>}\lambda P_{<d,t>}.\max(P) > \max(Q)$

The meaning of this operator is determined by thecombinatorial semantic rule which relates two sets of degrees (represented by the variables Q and P of type <d,t>) by saying that the maximum value of one set of degrees exceeds the maximum value of the other set of degrees. The application of this rule depends on the satisfaction of certain structural properties, such as having constituents to represent the restriction and nuclear scope arguments of the quantificational operator, which in turn requires the application of QR and degree abstraction (see section 2.2).

We saw in chapter 2 that not all languages have the English-like quantificational comparative. Japanese, for example, has inherently comparative adjectives with lower-typed

[141] The application of semantic rules defines the recursive truth-functional structure of language. The terminology used in this section is due to May (1991) and MacFarlane (2000).

[142] There are different semantic instantiations for the [[-er]] in the literature, including the A/¬A analysis (Seuren 1973) as defined in (i.a) and the subset-based semantics (Bhatt and Takahashi 2011) as in (i.b):
(i) a. $[\![\text{-er}]\!]= \lambda G_{<d,et>}\lambda C_{<d,t>}\lambda x_e.\exists d\ [G(x,d) \wedge \neg C(d)]$
b. $[\![\text{-er}]\!] = \lambda Q_{<d,t>}\lambda P_{<d,t>}.\ [P \subset Q]$

denotations (i.e., type <e,t>) that encodes differential comparison.[143] AJapanese L2 acquirer of English comparatives encounters a learning situation in which she mustacquire the fact that the English comparative is quantificational. This fact is neither transferable from her L1 grammar nor explicitly and directly learnable from a classroom-based environment.[144] The learner mustlearn how to interpret a mode of comparison which involves a quantifier with a higher-order 2-place function that takes as its restriction the predicate of degrees represented by the standard of comparison. A generalized quantifier is formed, comprising the quantifier along with its restriction; it undergoes QR, a process which forms another predicate of degrees via abstraction, which serves as the nuclear scope argument of the quantifier. Once the quantificational meaning of comparison along with its structural and semantic properties is successfully acquired, we expect a Japanese learner of English to accept subcomparatives of degrees, recognize scopal ambiguities in intensionalized comparatives, and be sensitive to negative islands.

Similarly, an English learner of Japanese encounters a learning situation in which she must learn the quantificational meaning of the past tense in Japanese, represented as in (113).

(113) For any K, t $\in D_i$, $[\![\text{past}]\!]^{K,g}(p)(t)$ is defined only if K < t and there is a t' $\in D_i$ such that t' $\subseteq$K and p(t') is defined. When defined,$[[\text{past}]]^{K,g}(p)(t)$= 1 iff there is a t' $\in$ {t'' $\subseteq$K: p(t'') is defined} such that p(t') =1.

(Sharvit 2014:241)

The knowledge of quantificational past tense can be tested indirectly by examining L2 learners' knowledge of sequence of tense in *before*clauses.[145] If the English learner of Japanese acquires the quantificational meaning of past tense, she would necessarily reject the past-under-past

[143] See section 2.2 or alternatively consult Beck et al. (2004, 2009).
[144] Of course, the comparative structure is taught in every grammar class, but the meaning of comparative as a higher-order quantifier that relates two sets of degrees in such a way that it allows subcomparatives of degrees, exhibits scope-taking ambiguities with other intensional operators, and respects negative islands is not taught in classroom settings.
[145] See Sharvit (2014) and references within.

sequence in *before* clauses in Japanese.[146]She would know that the embedded tense in the *before*clause under the past-tense matrix clause is underspecified, with a p-shiftability property in which the embedded tense can be interpreted prior to the speech time, concurrent to the speech time or after the speech time, meaning that there is no past tense interpretable under the past matrix clause in the *before*clause in Japanese.

Acquiring the quantificational meaning of past and comparison involves a learning task in which the interpretive properties to be learned follow directly from the truth-conditional aspect of meaning. That is, the mapping between the morphosyntactic structure and relevant meaning primitives (i.e., lexical features such as tense or comparison) is not at issue. In this sort of syntactic-semantic mismatch, the universal meaning (comparison or past tense) finds oneunambiguous truth-conditional structure in the native language and a distinct unambiguous truth-conditional structure in the targetlanguage.[147] Our twocase studies represent this sort of mismatch. In both cases, we have a universal meaning that is expressed by a quantified logical form in one language and by a non-quantified logical form in another language: the universal meaning of comparison that is expressed by a quantified logical form in English and by a non-quantified logical in Japanese, and the universal meaning of the past tense that is expressed by a quantified logical form in Japanese and by a non-quantified logical form in English.

Acquisition of this kind of syntax-semantics mismatch can be detected in an interlanguage that shows parametric clustering of subtle interpretations (e.g., p-shiftability, scope ambiguities, subcomparatives of degrees, sensitivity to negative islands). Learners, therefore,

[146] On the assumption that *before* denotes a definite description (i.e., given context C, *q before p* is true iff some q-time in C precedes the first p time in C). The definite description *before*should not be able to accept a quantifier as its complement. Given time density, existential quantification under the definite description *before* gives rise to a fatal presupposition failure: *before* presupposes a unique time that is the first p-time preceded by some q time. In the context of existential quantification, there will be no such a first time since there will be always a time t that precedes the first time of q which is preceded by the time at which p occurs. In other words, there will be no unique p-time that is needed to satisfy the uniqueness presupposition of the definite description *before* (Sharvit 2014).
[147] See chapter 4.

mustfigure out the L2 truth-conditional structure that expresses the universal meaning in the target language (i.e., the comparative or past tense).This can be achieved by learners' (re-)connecting the target-like typed structure with the surface syntactic structure. To acquire the quantificational meaning of comparatives, a Japanese learner of English will need to map a logical form that has a higher-order operator (i.e., the degree head) which relates two sets of degrees into the syntactic structure of the comparative. Such a process of mapping is neither available in the L1 grammarnor detectable from the positive evidence.[148] It also represents a case of structural mismatch in which the logical form involves further structural processes and enrichments (e.g. QR and degree abstraction and binding) that cannot be predicted from the surface syntactic structure: there is no one-to-one correspondence between the logical form structure and the categorial syntactic structure.

The L1 grammar of Japanese, on the other hand, has a different instance of mapping, in which no degree quantifier is involved and the lower-type structure of the comparative proceeds in one-to-one correspondence with the syntactic structure without incorporating the fixed meaning of quantification as in the higher-typed structure.Once mapping is achieved, the L2 learner will correctly judge subcomparatives of degrees as grammatical, recognize the scope ambiguity in intensionalized comparatives and show sensitivity to negative islands. In other words, the two modes of expressing the same meaning primitive involve logical forms that impose further requirements on the truth conditions (i.e., quantified logical forms) and logical forms which contribute indirectly to truth through the syntactic composition (i.e., non-quantified logical forms).[149]

[148] Which represents comparison using a lower-order typed structure that involves a predicate of individuals of type <e,t>, as composed with an individual and a contextuallyset standard of comparison.
[149] May (1991) refers to this distinction as "syncategorematic vs. categorematic" dichotomy.

The second research question mainly concerns the acquisition of the mismatch from the perspective of the directionality and relative ease or difficultyof acquiring the universal meaning, given the different truth-conditional structures that express the same meaning. Amismatch of this sort involves one morphosyntactic structure expression for the universal meaning (i,e., comparison or past tense). The same universal meaning in the two languages is expresseddirectly and overtly by the same syntactic structure. The difference is that themeaning takes two different logical forms, each of which has a distinct typed structure (i.e., distinct truth conditions).The first is the quantificational logical form in which the semantic structure incorporates logical constants such as quantifiers. Their meaning arises from signifying the combinatorial relation between distinct meaningful elements (i.e., propositions or predicates). It imposes further requirements on truth. Acquiring this logical form is not fully dependent on the syntactic structure for articulating the target-like truth conditions of the universal meaning structure, but also on the use of the invariant meaning of logical constants (e.g., quantifiers) whose meaning is innate and formally determined by UG. Elements in this set bear fixed meanings which are universal (Kretzmann 1982:211–214, Partee 1992:124–125,May 1991:353, von Fintel & Matthewson 2008). For example, the quantificational differential comparative in English denotes the arithmetic relation which relates two sets of degrees in the greater-thanrelation. Similarly, the existential quantificational meaning of the past tense in Japanese denotes a non-empty intersection between two sets of times. Those meanings are formally determined by UG. UG, then, defines a set of logical constants Γ that is innately determined. Every grammar selects a subset of Γ based on the individual experience of the language user: while English grammar selects a quantificational meaning for encoding differential comparatives, Japanese happens to encode comparison by inherently specifying its meaning in lower-type predicates of individuals (i.e.

adjectives).[150]Similarly, Japanese selects a quantifier to encode past tense, but English chooses to encode the past tense as a pronoun, which is assigned a value by context.

The second form is the non-quantificational logical form. The universal meaning can be expressed using structures with non-logical terms,each of which supplies "matter" and isassigned meaning by virtue of its reference. Contribution to truth depends on the way the structure's terms compose relative to the categorial syntactic structure. To illustrate using our example, the comparative structure in Japanese is non-quantificational. It is a lower-typed expression that comprises an adjectival predicate and its arguments. Similarly, the English past tense is represented as a pronoun whose meaning is assigned by context and whose contribution to truth is determined by how it combines with other elements relative to the syntactic structure (i.e., direct saturation).

Given these two options for expressing the same meaning primitive, the question under consideration is which direction represents more difficulty. Since the non-quantificational option is more prototypical and more syntacticized, with its truthconditions being derived directly from the syntactic structure,[151] it may be the case that this option represents less difficulty than its quantificational counterpart, which places more requirements on truth with more structural properties to be satisfied in addition to those requirements that are met in the syntactic composition. Assume that deriving the truthconditions requires constructing the relevant logical form and connecting it with the syntactic categorial structure (von Stechow 2012). Is it the case that a logical form constructed by establishing a one-to-one mapping between the semantic typed

[150] We should acknowledge that this approach entails a particular mechanism of L1 acquisition: how does it come to pass that L1 learners acquire the quantificational vs. non-quantificational meaning of the same meaning primitive?
[151]The notion "prototype" is applied in language acquisition studies (Kellerman 1979, Andersen & Shirai 1994, Shirai 2002). If categorematic structures are to be considered prototypical, given that they do not contribute to the truth-structure beyond the syntactic composition, then it may be the case that they are learned earlier and more easily than syncategorematic/quantificational structures.

structure andthe overt syntactic structure (i.e., the categorematic, non-quantificational direction) is the clearest and easiest to learn?Is the logical form constructed from a higher-order quantifier relating other lower-typed expressions with extra information added, which doesn't stand in a one-to-one mapping with the syntax, harder and slower to learn?

As a case of enriched composition, quantificational forms integrate more structural properties than non-quantificational forms:they specify a higher-order functor, createabstracts and establish binding relations with scope domains. Such structural requirements are not needed in non-quantificational forms,which express the truth conditions of the universal meaning through one-to-one mapping with the syntactic composition.

This leads us to the third research question. Given greater difficulty in taking one option or another, what makes that option harder to learn?[152] Will the quantificational logical form be easier to acquire or will it be more difficult, since the processing of its structure is complex for the reasons outlined above? Does L1knowledge play a role in this process? For example, will we expect a situation in which an English learner of Japanese comparatives will transfer the L1parsing mechanism to the L2 structure, or vice versa, in such a way that we will have a systematic error pattern in the relevant interlanguage? Which transfer from which direction affects the course of acquisition more? What effects of transfer are most devastating to the course of acquisition? What about factors like input, frequency, structural complexity and structural saliency of the L2 form?[153]

[152] This is a broad question investigated from different perspectives (see for example Andersen 1983; Gass&Selinker 1992; Jarvis 2000a, 2000b; Jarvis &Odlin 2000; Jiang 2002;Kellerman 1995; Odlin 1989, 2002; Pavlenko& Jarvis 2002; Ringbom 1987; vanPatten 2004).

[153] These factors have been investigated intensively in the literature from different perspectives with different research agendas (see Gass 1997 for an overview).

In the next subsection, we will present a set of hypotheses that addresses these research questions. We will also introduce some relevant concepts and learnability conditions throughout the discussion.

6.2. Specific Hypotheses

Recall that our understanding of semantic features is based on the followingworking assumption (Bierwisch 2012:327).

(114) Semantic features are elements that belong to a system of logical typeswhich determines the combinatorial conditions under which type-denotingconstituents compose in hierarchical, functor-argument relation.

Based on this understanding of semantic features, we maintain with slightmodification the standard view that variation among languages reflects variation in the featural content underlying inflectional morphology in the lexicon. We view semantic variation as differences in the featural affiliation ofdifferent type-specifications that makeup functional meaning categories, or what von Fintel & Matthewson (2008) call "semantic glue".

Since we take meaning as a complex, multifaceted cognitive organization thatis not solely explainable in terms of features (Jackendoff 2002), some aspectsof meaning should integrate other notions and processes that go beyond mappingsemantic features onto relevant morpho-lexical items. Depending on which theory of meaning is in order, we have at least two research agendas on which thegenerative approach of meaning acquisition is based: second language acquisitionof lexical meaning and second language acquisition of phrasal meaning. Theformer agenda investigates L2 acquisition of the semantic primitives that makeup lexical items as well as argument structure and its relation to thematic roles (see,for example, White

1987, Bley-Vroman & Yoshinaga 1992,Juffs 1996,and Inagaki 2001, among many others). The latter goes beyond the acquisition of features. It focuses on the combinatorial processes that interact to build up the overall meaning of a structure out of the meanings of its component parts at higher levels (see,for example, Dekydtspotter et al.1997, Gabriele 2005, and Slabakova 2005).[154]

The two research agendas look at the acquisition of meaning against learners' knowledge of the morphosyntax from two perspectives: while the semantic properties to be learned under the lexical meaning approach depend on knowledge of morphology as the locus of formal features, the phrasal meaning approach cares for morphology only insofar as the properties to be learned involve the mapping of the overall typed semantic structure with its target-like semantic glue onto the syntactic categorical structure. As evidenced by a vast influx of psycholinguistic and behavioral studies in the acquisition of syntax-semantics mismatches, functional morphology has been shown to be at the heart of L2 acquisition of syntax-semantics.[155] The successful acquisition of functional morphology necessarily leads to the acquisition of the semantic properties of structure. The acquisition of semantic properties may proceed easily and independently of the acquisition of functional morphology, which represents the greatest difficulty in the L2 acquisition process (Slabakova 2008).

This argument relies on two working assumptions.First, meaning is grammatical as part of universal conceptual structure and it is grammaticalized in the shape of formal semantic features. The acquisition of sentential meaning proceeds by either the successful mapping of morphosyntactic forms onto different meaning primitives (i.e. features) or it follows automatically once the syntactic structure is acquired by means of the universal mechanism of

[154] Truth-conditional semantics is one representative approach.
[155] See for example Dekydtspotter and Sprouse (2001), Dekydtspotter et al. (1997), Gabriele (2005), Hawkins and Hattori (2006), Marsden (2009), Montrul and Slabakova (2003), and Slabakova(2003).

semantic computation. Second, morphology (i.e.,the morpho-lexical structure) is made of features (e.g., semantic or syntactic ones), and differences between languages areexplainable in terms of differences in the featural make-up of inflectional morphology (Chomsky 1995). With these two standard assumptions in mind, Slabakova (2008) and Lardiere (2009) attribute the acquisition of syntactic and semantic properties of the second language to one learning task: the acquisition of features or how featural matrices of functional items are developed and (re-)assembled in the L2 grammar (Lardiere 2009). Different languages may express the relevant feature differently: either overtly, using dedicated morphology (e.g., definiteness in English), or covertly, using the morphological form of the possessor, whether feature (re-)assembly is required or not (Slabakova& Cho 2013).[156]

If we are to maintain the view that L2 learners grasp the meaning of the targetsentence just in case they judge the sentence true in conditions in which the target-language speakers would also judge the sentence true, and that they judge it falseotherwise, the Lardiere-Slabakova approach would have little to tell us about the acquisition of those semantic properties that are directly associated with the successful grasping of the target-like truth conditions of the meaning in the second language. Notice that for the case at hand, learners are not simply required to map a certain morphosyntactic form onto certain interpretations by simply (re-)assembling features. They are not also required to acquire the syntactic structure as a prerequisite for the successful employment of compositionality that leads to the successful acquisition of sentential meaning. The challenge is to acquire the relevant item with its language-specific type specification that represents the meaning primitive. Let us see how the Feature Reassembly Hypothesis in the sense of Lardiere-Slabakova falls short of the syntax-semantics mismatches at hand.

[156] Or more precisely, the L2 acquisition of these features may involve the development of featural matrices of the items of the functional lexicon and distribution of these features in the L2 grammar using subsequent and ongoing feature (re-)assembly.

Consider the scenario in which L2 Japanese learners come to the task of acquiring English comparatives. We expect that once the Japanese learner masters the morphosyntactic structure of English comparatives, the feature [+comparative] follows straightforwardly (i.e., the universal meaning that differentially compares two entities or (sets) of degrees).[157][158]In interpreting differential comparatives in the context of a truth-conditional theory of meaning, Lardiere-Slabakova's line of reasoning may proceed as follows.

Assume with Slabakova (2009) and Cho and Slabakova (2013) that the computational system and its featural repertoire are universal. Assume further with them that cross-linguistic variation is attributable to the encyclopedic content of particular features and how much information about the reference of their variables is provided by the overt morphology or context.[159] Since we take logical types as a special type of features, the learner is expected to systematically delete the type-specification of the relevant functional meaning of the native language and replace it with the target-like type-specification of the same functional meaning. The learner is not expected to assemble or reassemble types, since these features are not affiliated with conceptual interpretations and are not part of bigger matrices of grammatical features. Those only determine the combinatorial conditions under which semantic constituents compose in hierarchical, functor-argument relation(Bierwisch 2012). In other words, those

[157] We may also expect that the feature [+comparative] may come to Japanese learners for free, even if the Japanese learner does not actually acquire the morphosyntactic comparative structure of English. White (2003) and Lardiere (2000) proposed two views of the morphology-syntax connection: the acquisition of inflectional morphology triggers the acquisition of syntactic properties, and the acquisition of syntactic and semantic properties proceeds easily and distinctly from the acquisition of morphology. Slabakova adopted this line of reasoning and applied it to the acquisition of meaning. She entertained the notion that inflectional morphology with its featural content represents the greatest difficulty in the course of SLA, with its semantic and syntactic reflexes being the easiest linguistic properties to acquire by L2 learners (Slabakova 2008).
[158]Assume that universal meanings are expressed in terms of features (see Lardiere 2009 andreferences therein).
[159]Building on Ramchand &Svenonius (2008).

features are to be used or unused, but not subject to be added or re-inserted to a matrixof other features.

To illustrate this point, a Japanese leaner of English should acquire the fact that the functional meaning of comparatives of superiority in English lies in the functional morpheme that denotes a higher-order quantificational meaning of type <dt,<dt,t>>. She should acquire this fact after deleting the type specification of the comparative adjective, which is inherently comparative with the type <e,t>. If we take the acquisition of meaning as the successful construction of the logical form with the appropriate target-like element, along with the intuitive employment of the relevant compositional mechanism that combines the elements in view of their type-specifications, reassemblyof logical types reduces to the systematic procedure of updating the semantic content of those items'lexical entries (i.e., the content of the functionstheyexpress) to shift an adjective from an <e,t> meaning to an <e,d> or <d,et>meaning.

This does not precisely predict variability and ease or difficulty of learning beyond the matterof acquiring the lexical item that bears the target-like logical type itself. Here lies the circularity of this argument: we need an explanation for the relative easeor difficulty of grammatical meaning in terms of features. Theexplanation is captured by either the processes of (re-)assembly of features andmapping features onto their morphological realizations or by assigning them valuesrelative to indirect morphosyntactic means or contextual clues. When it comes to acquiring logical types, the procedure is one: update lexical entries. For example, in our case study, Japanese learners of L2 English are required to update the logical representation of comparative from an expression of the lower-order type <e,t> into an expression of the higher-order type <dt,<dt,t> in which comparison is expressed quantificationally. This again brings the

question of variability in L2 acquisition to the table: how does this systematic procedure account for ease and difficulty and the variable performance of L2 acquirers?

The featural (re-)assembly account overlooks non-trivial semantic knowledge that should be acquired by L2 learners if their course of acquisition is to be rigorously and genuinely assessed relative to native-like competence. For example, the striking interpretive differences in the comparative structure between Japanese/Chinese, on one hand, and English/German, on the other hand, cannot be predicted using feature-based proposals along the lines of the White-Lardiere-Slabakova approach. The difference is only explainable by mapping the universal meaning to be acquired onto truth-conditionally distinct structures that unambiguously and differently express that meaning in each type of language. These distinct structures are neither morphosyntactic nor contextually determined meanings in the strict sense of the word. They are just semantic-content structures that arise from the construction of the target-like typed structure and mapping it onto the syntactic categorial structure that carries the universal meaning in question. This is one area of parametric difference that has never been explored before (as far as I am aware). All representative accounts that build on (re-)assembly of features never predict the acquisition of this type of syntax-semantics mismatch since they appear to systematically relate the acquisition of meaning to the acquisition of the morphosyntax, with features being subject to assembly and reassembly relative to the native-like configuration of featural matrices.

In this way, we can speak of L2 acquisition of meaning as involving a learning task in which L2 learners acquire syntax-semantic mismatches where the universal meaning is expressed in the native language using one unambiguous typed structure and in the target language using another unambiguous typed structure. In other words, the success of L2 acquisition hinges on internalizing the native-like structure with its associated parser. We saw in

chapter 2 that Japanese and Chinese express comparison using a context-dependent non-quantificational logical form and English-like languages express comparison using a quantified logical form. It's crystal clear that the challenge for the Japanese learner of English comparatives is neither acquiring the morphosyntactic structure of English that directly conveys the universal meaning of comparison nor getting it from other indirect or covert means such some indirect morphosyntactic structure or context.[160] The challenge is how to express the universal meaning using the truthconditions of English-like comparative semantics by constructing the target-like quantified logical form. This brings to the table anon-trivial learning task in which the Japanese learner of English comparatives must acquire the invariant meaning of the logical constant expressed by the quantifier [[-er]]. This again depends on learners' ability to grasp the relevant syntactic and semantic conditions that facilitate the application of the semantic rule on which the interpretation of the quantifier depends. Once it is successfully obtained, the learner will show knowledge of the cluster of interpretations that are related to quantified comparison such as accepting degree-based subcomparatives, scope ambiguities that arise from the interaction between the comparative and other intensional operators in the matrix clause, and rejecting those comparatives that violate the negative island condition.

Notice that if we look at this mismatch in terms of updating logical types, along the lines of the Lardiere-Slabakova approach, two questions arise.For UG-based theories,[161] what explains the relative ease and difficulty across the domain of empirical variability in L2 acquisition given the default systemic procedure of updating types and the default overt syntactic means of expressing the functional meaning in question?

[160] See for example Cho &Slabakova (2013) for how Russian on the one hand and Korean and English on the other handhave different ways of expressing definiteness, varying along the lines of overtness and directness of expressing the features related to definiteness.
[161] See Schwartz & Sprouse (1996); Epstein, Flynn &Martohardjono(1996); Lardiere(1998); Prévost& White (2000).

On the Lardiere-Slabakova feature (re-)assembly approach, this means that one of the instances of updating types is more or less difficult, and hence success and failure in L2 acquisition can be measured by the success and failure in showing the cluster of interpretations that are associated with the targetlogical form. In other words, one set of interpretations would be more or less difficult than the other set of interpretations, given that some instance of mapping of types would be more or less difficult than another instance of mapping of types. It is far from clear how to address the question of relative ease and difficulty of logical-type mapping, given that such a mapping is a default update-as-a-whole procedure.

For non-UG access theories,[162] the question is whether or not the L2 learner would eventually show accuracy in acquiring the interpretive properties that are associated with the logical form in question. To make a strong case for this view is to show that the acquisition of the associated interpretation proceeds construction by construction or by other means. This may indicate that learners would not be able to realize the target-like type specification of the functional meaning in question and would lack access to the space of universal mechanisms of semantic computation to choose from.

To address our research questions and given these considerations, we will make explicit a set of hypotheses that builds on a processing model along with some well-established

[162] A processing model as established in vanPatten (2004 and related work) along with assumptions from the Shallow Structure Hypothesis (Clahsen& Felser 2006) and "quick-and-dirty parse" (Townsend & Bever 2001). See also Clahsen & Hong (1995), Neeleman & Weerman (1997). This claim is based on other well-established and empirically attested processing hypothesesthat are based on the idea of shallow processing in L2 acquisition. Accordingly, L2 learners rely onlexical-semantic, pragmatic and unmarked structures in interpreting sentences without making use ofenriched syntactic and functional information for sentence interpretation. This claim has been investigatedagainst different linguistic domains, including the Shallow Structure Hypothesis(Clahsen & Felser2006),which investigates the processing of filler-gap dependencies in long-distance movement, the Depth of Processing Hypothesis(Fodor 1995),Good-Enough Representation for Comprehension(Firrieira,Baily and Ferraro 2002), the Last Assignment of the Syntax Theory(Townsend & Bever 2001),the Underspecification Hypothesis(Sanford &Sturt 2002), and theForm-Meaning Connection theory(vanPatten 1996,2003). We depart from this line of inquiry by assuming that learners' reliance on simple shallower mental representations takes place in the initial stages of acquisition as a default starting point, but not as the only representations that persist throughout the acquisition process, which is assumed, on this view, to be a non-UG-based and globally impaired process.

assumptions about linguistic processing. Such a processing procedure is developmental, in the sense that it proceeds through multiple stages, and directional, in the sense that it involves two processing directions: perception,which proceeds from phonology to semantics, and production,which proceeds from semantics to phonology (see chapter 3). The hypotheses are outlined in (115).

(115)

i. In initial processing, the L2 learner begins by assuming the non-quantificational logical form of the universal meaning (e.g., comparison orpast tense). This is achieved by the learner's (re-)labeling the logical typed specifications of lower-typed lexical items. Depending on these re-labelings, the learner makes a specific choice of universal mechanism of compositionality in constructing the non-quantificational logical form with its truth-conditional representation in order to encode the meaning in question. At this stage, only semantic elements with non-logical, lower-typed, reference-based meanings are mapped onto their corresponding syntactic structures. In this way, deriving the relevant truth conditions is minimal, as it is achieved solely relative to the syntactic composition. Since at this initial stage of processing, the grammar doesn't incorporate logical constants in the structure, the limited attentional procedures of the learner's working memory will be focused on the minimal truth-conditional structure that is derived via the one-to-one mapping between the semantic and syntactic structures. If the universal meaning (e.g., comparison) can be expressed either by using a non-quantificational logical form as in Japanese/Chinese-like languages or by using quantificational logical form as in English/German-like languages, then L2 learners, in the early stages of

acquisition, may opt for the non-quantificational derivationfirst, which involves shallower and more straightforward, more basic processing than the non-quantificational structure, which contains logical constants whose full interpretation imposes further requirements on the truth-definition of the sentence, as represented by the interpretation of higher-order semantic glue.[163] L2 learners are practical in that if this shallower derivation of logical form is sufficient for comprehension (i.e., good enough to comprehend or produce the universal meaning), early learners go for it and ignore the more complex option of assuming a quantificational structure, which incorporates a more complex logical form. We expect that a beginning learner, regardless of the native-like wayof expressing the relevant meaning, will begin byprocessing the comparative meaning using a categorematic parsing mechanism: the set of compositional rules that are used to combine the low-type semantic elements. If this hypothesis is proven correct, the early learner will show no evidence for constructing a quantificational logical form in expressing the relevant meaning, and this will beobservable in the difficulty they experience with the interpretive properties of quantificational comparatives, such as interpreting degree-based subcomparatives, scope ambiguity in intensional-comparative structures and

[163] If we accept the view that the non-quantificational (categorematic) structure is a more basic and more prototypical representation than the quantificational structure by virtue of its having a simpler and less enriched specification of truth, then (115.i) can be viewed a consequence to the prototypical hypothesis, which has its roots in SLA in the work of Bowerman (1978) and Kellerman (1978), and which has been successfully applied by Shirai & Andersen (1995) in the domain of tense-aspect L2 acquisition. The gist of this hypothesis is that L1 and L2 acquisition proceeds sequentially from what is prototypical to what is peripheral (for more information, see Shirai 2000).

comparatives with negative island effects.And we will expect to see the same behavior, mutatis mutandis, in the acquisition of past tense.[164]

It's worth mentioning that the distinction between the class of non-logicallexical expressions and the class of logical constants is captured by whatBierwisch (1995) called boundedness of primes. Unlike logical constants,lexical elements are based on a system of primes that is necessarilyunbounded. The unbounded system is the one that is subject to a sort ofconstructive operation such as quantification, anaphora and question words(Partee 1992,Bierwisch 1995). In the contrary, the class of logical constantsshould be viewed as bounded, since it is based on a system of primes that isnot sensitive to constructive operations such as quantification, anaphora andquestion words (Partee 1992). Given this distinction, UG should provideconditions that enable the unbounded lexical elements of non-quantificational structure to compose: the character of their typed structure along with its combinatorial specifications. At the syntax-semantics interface, the already constructed syntactic composition serves as a reference skeleton for the typed structure, which proceeds to the semantics for further processing.[165] In this way, the elements of the skeleton are assigned their lexical meanings (i.e., content) as determined by basic domains such as experience, perception, common sense etc. (May 1991:353,Jackendoff 1996, Bierwisch 2000).[166]This

[164]Notice that this hypothesis holds of early learners in general, regardless of the parsing mechanism used in the native language. Under this hypothesis, we also expect that an early German learner of L2 English, whose native language, German, has a quantificational comparative, would begin with the non-quantificational mode of expression in the early stages of her L2 acquisition.

[165] vanPatten (2004) calls this procedure accommodation or reconstruction.

[166]Our model departs from proposals that are based on competition of alternative representations (models such as Autonomous Inductive Theory (Caroll2001) and Acquisition by Processing Theory (Truscott & Smith 2004)).

hypothesis has two main assumptions.First, the grammar involves an instance of initial processing that aims at registering a form-meaning connection that mediates the external world and the internal structure of the grammar (vanPatten 2011). Second, the non-quantificational expression of comparatives and past tense involves a one-to-one correspondence between the typed logical form and the categorial syntactic structure. Given these two assumptions, the initial processing that aims at creating form-meaning connections suffices to articulate the truth conditions of the universal meaning using categorematic non-quantificational logical forms by virtue of the one-to-one mapping between the typed and categorial structure.

On the assumption that logical information is innately bounded (May 1991;Partee 1992; Fodor1981, 1988), the processing of syncategorematic representations (e.g., quantified logical forms) should involve an instance of selection in which learners' linguistic experience triggers the selection of logical constants such as quantifiers from an innate inventory of UG (Bierwisch 1995). This process of selection requires retrieving the invariant meaning of the logical constant from long-term memory and copying it into working memory at the syntax-semantics interface during the transient processing of the structure. At this point, the parser working on the grammatical representation realizes that the quantified structure must satisfy additional syntactic properties, such as QR, abstraction over variables and binding. The structure then is submitted to the semantics for another processing stage, in which the quantifier resolves the

Ourmodel is based on a kind of crash-proof grammar (Putnam 2010) in which only winner representations compete for convergence (see below).

problem of its restriction and the flavor of quantification. The associated lexical elements are also assigned meaning by reference. The processing of quantificational logical form represents an instance of subsequent processing. It cannot be achieved relative to the syntactic composition in initial processing. Such processing involves further requirements (e.g., accommodation or reconstruction) in which a logical constant is selected, and a set of additional structural requirements is satisfied.[167] This process requires extra work atthe semantics-syntax interface because it is not a one-to-one mapping between the syntactic and semantic structures: the logical form represents a richer structure than its associated syntactic structure, with more truth-conditional information and structural requirements. This comes as a direct consequence of selecting a logical constant with a higher-type meaning. This creates a logical form with additional structural operations that does not match the syntactic one. If this assumption holds true, we expect Japanese learners of comparatives in advanced stages of acquisition to show accuracy in acquiring degree-based subcomparatives, scopal ambiguities in intensional-comparative structures and sensitivity to negative islands. We also expect advanced English L2 Learners of Japanese past tense to acquire *before*-clause structures that trigger p-shiftability (see chapter 2). This process is developmental:[168] for a Japanese learner to acquire the quantificational meaning of the English comparative, she should

[167] The point here is that the interpretation of quantified expressions involves an additional stage of processing. Such a stage takes place in the semantics. Under the parallel model of Jackendoff (2002), this instance of processing indicates the presence of a generative semantics that helps process the non-nominal quantified expressions, along with a generative syntax and the interface between them.

[168] For more information on developmental learning, see Pienemann (1998), Bardovi-Harlig (1995, 2000), Kasper & Schmidt (1996), and Towell, Hawkins & Bazergui (1996).

acquire the relevant syntactic and semantic properties that are necessary for the application of the semantic rule of degree quantification, such as QR, abstraction and binding. Knowledge of degree quantification depends on achieving some fundamental prerequisites such as knowledge of how to create degree abstracts in the syntax. Therefore, knowledge of quantificational comparatives depends on achieving another learning milestone, which is the learning of how to create degree abstraction and degree binding.[169] If this argument is on the right track, we would expect a positive correlation between the successful acquisition of quantificational comparatives and the successful attainment of other structures that involve degree abstraction over degree variables, such as direct measureconstructions[170] (e.g., *Bill is 6cm tall*), amount relatives, degree questions, equatives,superlatives, and constructions with *too*, *enough* and *so…that* (see von Stechow 1984).

Given these two routes of processing the universal meaning, a syntax-semantics mismatch situation arises: an L2 learner takes one processing route in his native language and has to take another processing route in the target language for expressing the universal meaning in question. There are four logical possibilities:

a.The native language and target language use non-quantificational structures in articulating the universal meaning.

b. Both languages use quantificational structurestoexpress the universal meaning.

[169] Similarly, knowledge of quantificational past depends on achieving another learning milestone, which is knowledge of creating time abstraction and time binding.

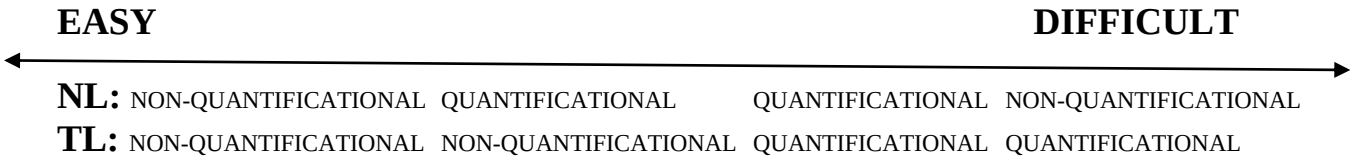
[170] On the assumption that measure phrases denote predicates of intervals that undergo QR and degree abstraction (Schwarzschild & Wilkinson 2002).

c. The native language uses the quantificational option and the target language uses the non-quantificational one.

d. The native language uses the non-quantificational option and the target language uses the quantificational one.

In all of these cases, we expect that L2 learners begin with the non-quantificational structure. If the target language expresses the same meaning quantificationally, the learner is expected to experience greater difficulty in acquiring the truth conditions of the universal meaning of the target language. However, if the target language expresses the same meaning non-quantificationally, the learner would experience less difficulty in acquiring the universal meaning, as schematized in the cline of difficulty below.

Fig. 6.1: **The cline of difficulty**



Generally speaking, advanced learners would be more accurate in expressing atarget-like quantificational meaning than early learners, since this mode of expression requires further processing for reconstructing and accommodating the target-like meaning beyond what is required in non-quantificational expression of the same meaning. On the assumption that L2 learners, at early stages of acquisition, begin with non-quantificational expression of meaning, the scenario in which the target-like meaning is expressed non-quantificationally would be easier

than that in which it is expressed quantificationally. We also expect that L2 learners whose native language has non-quantificational expression of meaning would be more accurate in expressing non-quantificational meaning than those L2 learners whose native language has quantificational expression for the same meaning.[171] Analogously, beginning L2 acquirers would experience more difficulty in acquiring the quantificational expression of the target-like meaning than advanced learners.L2learners whose native language has quantificational expression of the meaning in question would experience less difficulty in expressing quantificational meaning than those L2 learners whose native language has non-quantificational expression of the same meaning.[172]

ii. The general learning mechanism we assume is this: acquiring the relevant L2 meaning involves a competition between a grammar that involves the categorematicparsing procedure (e.g., non-quantificational expression of meaning) and agrammar(s) that involves other parsing procedures (e.g.,syncategorematic parsing procedure forquantificational meaning). For a learning mechanism of this kind tosucceed, learners' interaction with comprehensible unambiguous input is needed in oneway or another (vanPatten2004 andreferences therein). On the assumption thatlearning is failure-driven, a learner who encounters an input S that the currentgrammar with its parsing mechanism fails to process will increase the probabilityof the

[171] We will delve into this point very shortly.

[172] Carroll (2001) assumes that language processing mechanisms proceed unconsciously, beyond the control of learners. If this assumption is true, we expect L2 learners whose native grammar involves quantificational expression of the universal meaning to transfer an L1 syncategorematic processing mechanism in acquiring the target-like meaning. In this way for example, a German L2 learner of the English comparative will transfer the syncategorematic processing mechanism associated with the quantificational comparative and they will show better performance in acquiring the English comparative meaning, which is quantificational, than the Japanese comparative meaning, which is non-quantificational.

selection of another grammar that may be able to process the input inquestion.[173] To illustrate this point using our case study, if Japanese L2learners begin with the categorematic processing mechanism (e.g., non-quantificational expression of meaning) in grasping the truthconditions of the universal meaning of English-like comparatives, acquiringquantificational comparatives requires the selection of a grammar with a parsingmechanism that makes use of the quantificational, high-type meaning of the degree head along with the associated syntactic and semantic properties that facilitate the application of the semantic rule of quantification. Failure to interact with input like degree-based subcomparatives orinverse scope readings of comparatives that contain intensional operators may inhibit the selection of such a grammar. Learners' selection of a grammar with syncategorematic compositional procedures underlying English-like comparatives draws on highly specialized input.

iii. For the type of input that is needed for the selection of the target-like grammar, we offer two more hypotheses.First, the frequency and saliency of input may affect the ultimate attainment of the target-like structure in cases of syntax-semantics mismatch.[174]Acquisition of quantificational expression of the meaning of comparatives and past tense involves learning a cluster of interpretations that are not prominent or regular in natural discourse settings. To illustrate this point, the property of p-shiftability is not frequent or salient in discourse. In Japanese,

[173] This probabilisticapproach to learning is inspired by the variational model (Legate & Yang 2005, 2007).
[174] For the role of frequency in L2 acquisition, see Ellis (1996, 2002); Horst, Cobb & Meara (1998); Hulstijn, Holander &Greidanus (1996); Rott (1999); Vidal (2003); and Myles et al. (1998). For the effect of increased frequency see Lee (2002); Leeman, Artegoitia, Friedman & Doughty (1995); Trahey & White (1993); White (1998); and Williams & Evans (1998).

for example, a past-tense reading of the underspecified present in a *before* clause embedded under a past-tense matrix clause is more prominent than the present and future readings of the embedded tense. It is far from clear how exposure to the underspecified present tense with p-shiftability will trigger the selection of a quantificational meaning for the past tense, since the prominent past reading can be expressed using the native-like pronominal past.[175] Similarly, the low-scope reading of English comparatives containing intensional operators is more prominent and more frequent than the inverted-scope reading. The former reading is the only availablereading in Japanese. Given the prominence of the former reading, it is far from clear how a Japanese L2 learner will acquire the scope ambiguity, given the non-saliency and non-frequency of the inverse-scope reading in English.

Second, as predicted by the subset hypothesis (Berwick 1985, Manzini &Wexler 1987, Wexler & Manzini 1987, Slabakova 2006), learners begin with the most restrictive grammar. As predicted by this learnability principle, it will be easier for learners to proceed from a grammar with non-quantificational past orcomparative to a grammar with quantificational past or comparative, since this direction involves positive evidence in the input to expand the grammar by adding more interpretations. For example, the principle predicts that it will be easier for Japanese learners of English to acquire the quantificational comparative than for English learners of Japanese to acquire the non-quantificational comparative, since they may rely on positive evidence based on

[175] This point raises a question about L1 acquisition of meaning and whether L1 acquisition has theoretical implications for the theory in question. It is beyond the scope of this dissertation to deal with it.

input that engages additional interpretations, such as the inverted-scope reading of intensionalized comparatives ordegree subcomparatives.

On the other hand, the principle predicts that it would be more difficult for learners to proceed from a grammar with quantificational past or comparative to a grammar with non-quantificational past orcomparative, since this direction does not involve positive evidence in the input but negative input that is based on correction. It therefore requires the learner to acquire the unavailability of some interpretations by contracting the grammar through eliminating unavailable interpretations. For example, the principle predicts that it will be more difficult for English learners of Japanese to acquire the non-quantificational comparative, since they mustrely on negative evidence to acquire the fact that inverted scope in intensionalized comparatives and subcomparatives of degrees are unavailable in Japanese.Similarly, the principle predicts that it will be easier for English learners of Japanese to acquire quantificational past tense, since they may rely on positive evidence that is based on input that engages additional interpretations, such as *before*-clauses with p-shiftability. On the other hand, the principle predicts that it would be more difficult for learners to proceed from a grammar with quantificational past to a grammar with non-quantificational past,for the reasons outlined immediately above. For example, the principle predicts that it will be more difficult for Japanese learners of English to acquire the non-quantificational past in English, since they must rely on negative evidence to acquire the fact that the embedded present and future tenses in *before* clauses with a matrix past tense in English are unavailable.

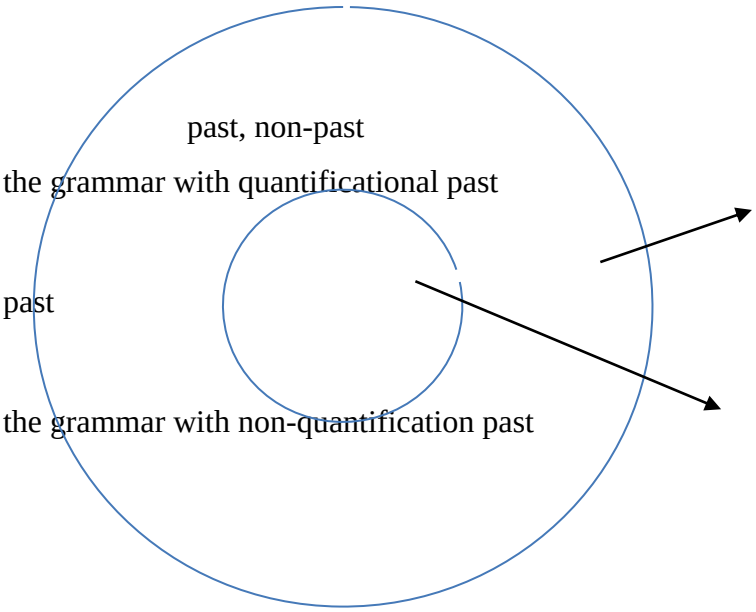
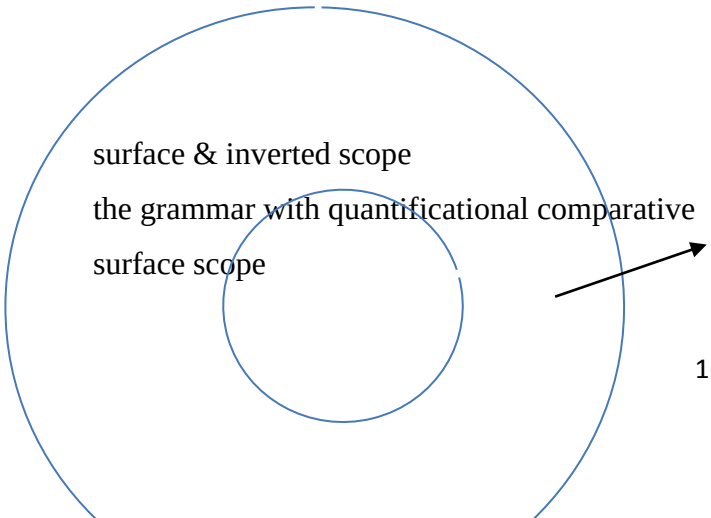
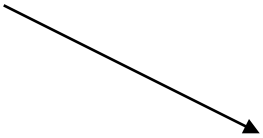


Fig 6.2: Subset-superset relationship between the grammars of Japanese and English for the (un)availability of the p-shiftability property,a consequence of the quantificational-pronominal distinction in the past tense.





the grammar with non-quantificational comparative

Fig6.3: Subset-superset relationship between the grammars of English and Japanese for the (un)availability of scope inversion in comparatives,a consequence of the quantificational/non-quantificational distinction.

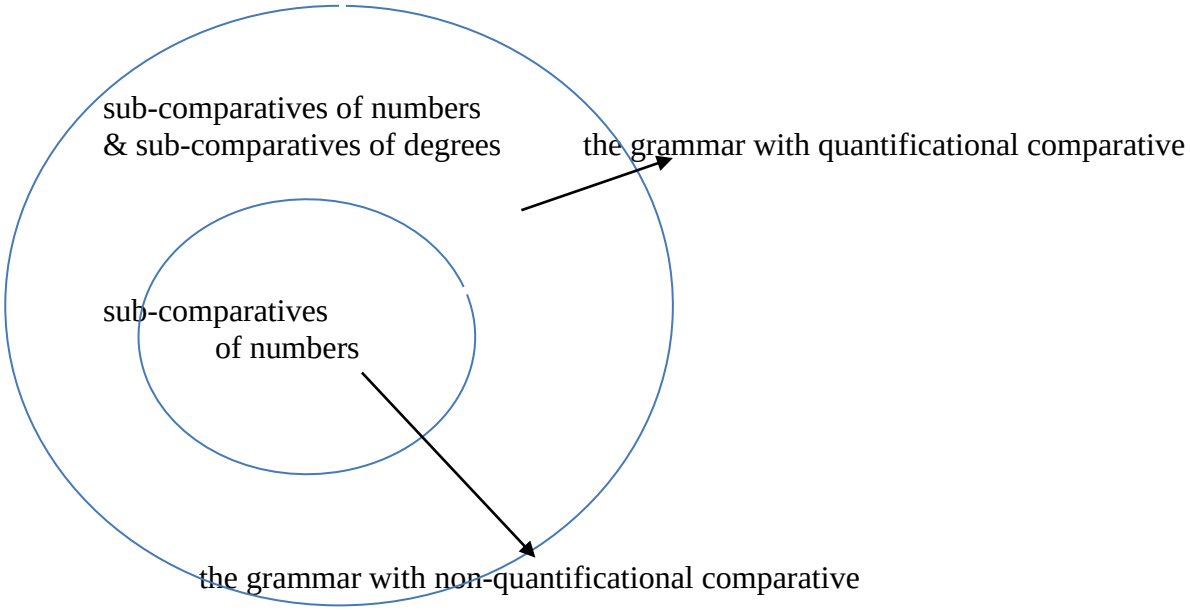


Fig 6.4: Subset-superset relationship between the grammars of English and Japanese for the (un)availability of degree subcomparatives,a consequence of the quantificational/non-quantificational distinction.

Notice that the subset principle as applied to the data in question is in conflict with the predictions of the first hypothesis, which predicts that the quantificational expression of meaning is more difficult to acquire than the non-quantificational expression of meaning. The saliency/frequency hypothesis is in line with the first hypothesis given that the non-

quantificational expression involves more salient, more frequent and more prototypical interpretations in the context of use. In the next section, we will run two bi-directional experiments that directly test the predictions of these hypotheses.

6.3. Bi-Directional Study

6.3.1. The Experiment

6.3.1.1. Participants

Four linguistic groups participated in the experiment: (i) a group of Japanese learners of English(*n* = 17), (ii) a group of English learners of Japanese(*n* = 16), (iii) a control group of Japanese natives (*n* = 6),and (iv) a control group of English natives(*n* = 10). Participants were tested atdifferent American campuses including the University of Wisconsin System, Chicago, Purdue, Iowa and Illinois at Urbana-Champaign. All participants were college students or employees, aged between 20 and 45. All Japanese native speakers had started learning English after the age of 14. All English native speakers had started learning Japanese after the age of 18. All of them had learning experience in classroom and naturalistic settings with native speakers.

6.3.1.2. Tasks

6.3.1.2.1. Proficiency Tests

For this study, we conducted two sets of offline tests. The first set includes two proficiency tests.One is an adapted version of Level 2 and 3 from the Japanese Language Proficiency Test.

The test comprises 40 items focusing on the grammar and vocabulary component of the Japanese Language Proficiency test.[176] We used the test to classify the participants into two groups: an advanced learner group that consists of those learners whose performance was at least one standard deviation above the mean, and an intermediate-beginning group comprising the remaining participants. The other proficiency test is an English two-passage cloze testwith 40 missingwords. Participants are required to fill in the blanks with correct answers. If a blank is left empty or a meaningful word that is different from the key answer is supplied, one point is taken off. We isolate as an advanced group those students whose performance fell in the range of scores that were achieved by the native-speaker group. Those who scored below the range of native speakers wereplaced in the intermediate-beginning group (i.e., non-advanced).

6.3.1.2.1. Felicity Judgment Tests

The other set comprises felicity judgment tasks (*n*=61). Participants were exposed to short passages in their native language (Japanese orEnglish) followed by target sentences. The participants were required to evaluate each sentence on a 1-5 scale of felicity in light of the context that is set by each passage. 5 represents the most felicitous and 1 is the least felicitous. Each target sentence was followed by an inference (i.e., an equivalence or an entailment) to double-check learner's understanding of the target sentence. The felicity judgment task tests four properties: p-shiftability (*n*=10), scope interaction (*n*=10), subcomparatives (*n*=10), negative islands (*n*=5). In addition, we included amount and restrictive relatives (*n*=10) as control items[177] as well as filler items (*n*=16). In what follows, we explain each test category along with its predictions.

[176] Which is standardized by Japan Educational Exchanges and Services.
[177] The amount items are constructions with degree abstraction (see chapter 2).

The first property is p-shiftability in *before*clauses, as exemplified in (116). We presented two types of passages (i.e., two contexts).The first type involves p-shiftability of the embedded past (i.e., present or future interpretation of the embedded before clause), as in (116a), and the second involves apast-tense interpretation of the *before* clause (i.e., non-p-shiftable embedded tense), as in (116b)

(116) *a. John and Hilda are supposed to meet each other in Beijing in the next two days. Hilda is scheduled to arrive tomorrow; but, unfortunately, John had an emergency, so he left for Shanghai an hour ago.*[+p-shiftability]

i.ジョンはヒルダが着く前に去りました。

1 2 3 4 ⑤

ii. ヒルダはまだ到着していなかったので、ジョンは彼女に会っていない。

TRUE FALSE

b. ジョンとヒルダは北京で二日後に会う予定です。ヒルダは明日到着する予定です。しかし、不幸なことに、ジョンは急用があったため、上海に一時間前に向かいました。[+p-shiftability]

i. John left before Hilda arrived.

① 2 3 4 5

ii. Hilda's arrival took place after John's departure.

はいいいえ

(117)

a. *Last week, Ai arrived at home, finding Ken asleep. Ai felt bored being alone. She decided to mow the lawn. Ai mowed the lawn very quickly before Ken woke up.* [–p-shiftability]

i. ケンはアイが芝生を刈る前に眠った。

1 2 3 4 ⑤

ii. ケンは目覚めると、芝生が完全にかられていたこと
に気がついた。

TRUE FALSE

b. *先週、アイが帰宅したとき、ケンは眠っていた。アイは一人で退屈だった。アイは芝生を刈ることにした。アイはケンが目を覚ます前に、とてもすばやく芝生を刈った。*[–p-shiftability]

i. Ai mowed the lawn before Ken woke up.

1 2 3 4 ⑤

ii. Ken woke up finding the lawn completely mowed.

はいいいえ

The successful English L2 learner of Japanese is expected to judge (116a) as felicitous (choice 5). She is also expected to evaluate (117a) as felicitous (choice 5). Recall that the embedded tense in Japanese is underspecified, so that it would be compatible with both non-past and past contexts. In giving these judgments, the learner is shown to be insensitive to the past/non-past distinction in the embedded *before* clause in the target sentence. This indicates that the learner no longer uses native-like pronominal embedded past, whose use is infelicitous in (116a), given the context. In doing so, the learner appears to avoid using the quantificational

past, whose use in *before* clauses under a matrix past is prohibited in the target language (i.e., Japanese). This can be taken as an indirect indicator of learners' use of quantificational past.

In the other direction, the successful Japanese L2 learner of English is expected to judge (116b) as infelicitous, since the context indicates that Hilda arrived in the past. She is also expected to accept (117b) as felicitous, since the context indicates that the embedded clause (i.e., Ai's mowing the lawn) took place in the past. These judgments show that the learner is sensitive to the past/non-past distinction. This indicates that the learner never interprets the embedded tense as underspecified or quantificational in English, meaning that the learner resorts to pronominal past in English since the use of quantificational past in (117b) results in an ungrammatical sentence with presupposition failure (see chapter 2).

The second property is scopal interaction in comparatives with modalized matrix clauses (i.e., intensionalized comparatives). Recall that English intensionalized comparatives are ambiguous between the two readings of inverted and surface scope, as exemplified in (118a) and (119a), respectively. Japanese intensionalized comparatives, on the other hand, have only the surface scope reading, as represented in (119b). The intensionalized comparative target sentence in (119b) is infelicitous inthe inverted-scope context. The successful Japanese learner of English is expected to rate both (118a) and (119a) significantly high. The successful English learner of Japanese, on the other hand, is expected to rate (119b) significantly higher than (118b), meaning that the learner shows sensitivity to the two readings in question.

(118) a.ローラとピートは大学によって運営される山岳探検隊に資格を持った山岳メンバーとして参加したい。そのチームへの参加を認められるには、合計登山距離が少なくとも*22000*フィート以上でなければならない。誰もがすきな山を選ぶことができる。ローラがすでに上った距離を考慮すると、彼女は*70000*

フィートの山を登らなければならない。ピートは、チームに参加するために、*90000*フィートの山を登らなければならない。指定された山を登らなければならないわけでも、ローラがピートと競いあわなければならないわけでもない。

[inverted scope]

i. Laura needs to climb a less high mountain than Pete.

1　　2　　3　　4　　⑤

ii. The height of a mountain that Pete needs to climb exceeds the height of a mountain that Laura needs to climb.

はいいいいえ

b. Laura and Pete want to qualify for the mountain climbing expedition that is organized by the university. In order to be permitted to join the team, one has to have climbed a set of mountains whose altitude adds up to at least 22,000 ft. Everyone can choose his or her own mountains. Given what Laura has already done, she still needs to climb a 7,000-ft. mountain. Pete, in order to qualify, still needs to climb a 9,000-ft. mountain. Neither needs to climb a specific mountain, nor is Laura under any obligation to compete with Pete.

i.ローラはピートよりも低い山を登る必要がある。

①　　2　　3　　4　　5

ii. ピートが登らなければら習い山の高さはローラが登らなければならない山の高さを超えている。

TRUE　　FALSE

(119)　a.*大学院生と学部生は今学期に行われる発展生物学を履修することができるが、そのクラスは大学院生、学部生それぞれに異なった必要条件を課している。大学院生はプレゼンテーションをしなければならず、それはちょうど３０分であるべきであり、学部生のプレゼンテーショはちょうど15分であるべきである。*

i. As a requirement in the advanced biology class, a graduate student must do a longer presentation than an undergraduate student.

1 2 3 4 ⑤

ii. One of the class requirements is that a graduate student do a 30-minute presentation and an undergraduate student do a 15-minute presentation.

はいいいいえ

b. *Although graduate and undergraduate students may enroll in the advanced biology class, which is offered this semester, the course has different requirements for graduate and undergraduate students: agraduate student must do a presentation that should take exactly 30 minutes and undergraduate presentations should take exactly 15 minutes.*

i. 発展的生物学クラスの必要条件として、大学院生は学部生よりも長いプレゼンテーションをしなければならない。

1 2 3 4 ⑤

ii. 大学院生は30分のプレゼンテーションを、学部生は15分間のプレゼンテーションをすることがクラスの要求の一つだ。

TRUE FALSE

The third property under examination is knowledge of subcomparatives of degrees. We expect that the successful Japanese learner of English will rate both subcomparatives of degrees and numbers equally significantly high. As for the English learner of Japanese, we only test subcomparatives of numbers, as exemplified in (120) and (121), respectively.

(120) a. *ジアは最近新しいアパートに引っ越した。彼女は新しいアパートが好きだが、彼女は寝室の本棚が好きではない。その本棚は６インチの高さでだ。その上、２インチの幅でとても小さいため、彼女の本は何一つその棚に入らない。*

i. The bookshelf is higher than it is wide.

1　2　　3　　4　　⑤

ii. The degree to which the bookshelf is high exceeds the degree to which it is wide.

はい**いいえ**

b. *アレックスは物理学と数学の両方を大学で勉強している。アレックスは両方の科目でMAを取得しているが、彼女は物理学よりも数学を熱心に勉強している。アレックスは数学で１０科目を履修したが、物理学は４科目しか履修していない。*

i. Alex did more math courses than she did physics courses.

1　　2　　3　　4　　⑤

ii. The number of math courses that Alex did exceeds the number of physics courses that she did.

はいいいいえ

(121) *Alex studied both physics and mathematics at her college. Although Alex has an MA in both subjects, she is more active in the study of mathematics than physics. Alex did ten courses in mathematics, but four courses in physics.*

i.

アレックスは物理学科目を履修したよりもたくさん数学科目を履修した。

1　　2　　3　　4　　⑤

ii.アレックスが履修した数学のコースの数は彼女が履修した物理のコースの数を超えている。

TRUE FALSE

The last property is negative island sensitivity. Recall that English quantificational comparatives are sensitive to negative islands. Japanese comparatives, on the other hand, being non-quantificational,areinsensitive to negative islands. We expect that the successful Japanese learner ofEnglish will reject English comparatives with negative islands and the English learner of Japanese will accept such structures in Japanese. Byway of illustration, consider (122) and (123).

(122) *先週、ヨンは車を買おうと決めました。ヨンは安い車を見つけましたが、それはとても悪い状態でした。セールスマンはヨンに、その悪い状態のため誰もその車を買わなかったと言いました。ヨンは、他のより良い状態で高い車を買いました。*

i. Yong bought a more expensive car than no one did.

① 2 3 4 5

ii. The car that no one bought was bad so that Yong didn't buy it.

はいいいえ

(123) *Last week Yong decided to buy a car. Yong found a cheap car, but it was in very bad condition. The seller told Yong that no one bought this car because of its bad condition. Yong bought another car, in better condition, that cost him more money.*

i.ヨンは誰も買わなかったのより高い本を買った。

1 2 3 ④or⑤

ii. 誰も買わなかった車は悪かったので、ヨンは買わなかった。

TRUE FALSE

6.3.1.3. Results

6.3.1.3.1. P-shiftability

6.3.1.3.1.1. L1 Japanese L2 English

A paired-samples t-test was conducted to compare the participants' judgments onthe [+p-shiftability] property and their judgments on the [−p-shiftability] property. For the native English speaker control group, there was a significant difference in the scores for [+p-shiftability] (M= 3.533, SD= 1.8902) and [−p-shiftability] (M= 4.933, SD= 0.2523) conditions; t(44) = −5.040, p = 0.000.[178]For the non-advanced L1 Japanese L2 English group, there was no significant difference in the scores for [+p-shiftability] (M= 2.967, SD= 1.8659) and [−p-shiftability] (M= 3.467, SD= 1.8705) conditions; t(29) = −0.926, p = 0.362. For the advanced L1 Japanese L2 English group, the difference is not also significant between the scores of [+p-shiftability] (M= 3.164, SD= 1.7823) and [−p-shiftability] (M= 3.764, SD= 1.6097) conditions; t(54) = −1.675, p = 0.100.

Second, a one-way repeated-measures ANOVA was conducted to compare the performance of L1 Japanese L2 English participants with three levels of proficiency: non-advanced, advanced

[178] On the p-value 0.01.

and native groups. We found that there was a statistically significant difference between the three proficiency groups; $F_{1,2} = 6.812$, $p = 0.002$. We further conducted a post hoc comparison test using the Bonferroni test. The test showed that the mean score of the non-advanced group (M= 3.2166, SD=1.8693) is not significantly different from the mean score of the advanced group (M=3.4862,SD=1.7084) at $p = 1.000$. It also showed that the advanced group (M=3.4862, SD=1.7084) is significantly different from the mean score of the native group(M= 4.2333, SD=1.5143) at $p = 0.028$. The non-advanced group (M= 3.2166,SD=1.8693) also differs significantly from the native group (M= 4.2333,SD=1.5143) at p=0.004. The following figure represents the mean ratings of the three proficiency groups:

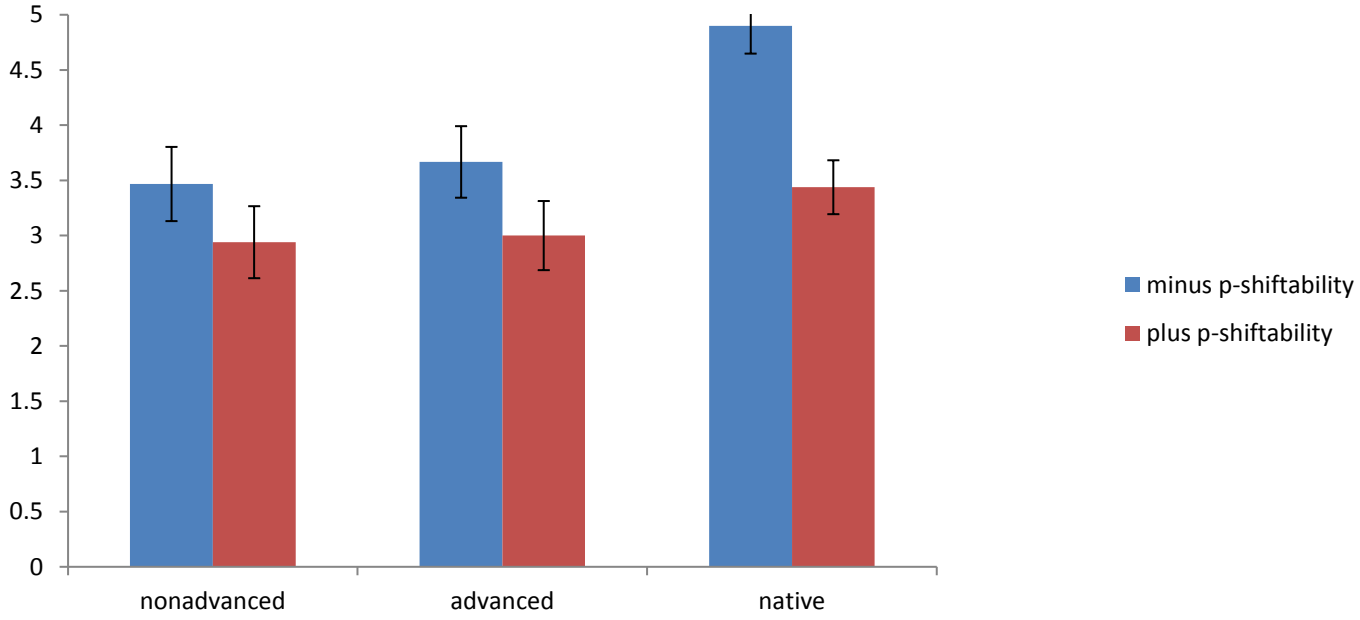


Figure 6.5. Mean ratings of the three proficiency groups in minus vs. plus p-shiftability (L1 Japanese L2 English)

6.3.1.3.1.2.L1 English L2 Japanese

Similarly, another paired-samples t-test was run to compare participants' judgments on the [+p-shiftability] property and their judgments on the [−p-shiftability] property in the L1 English L2 Japanese group. For the Japanese native speaker control group, there was no statistically significant difference in the scores for the[+p-shiftability] (M= 3.9,SD= 1.7878) and [−p-shiftability] (M= 4.8666, SD= 0.7302) conditions; t(29) = −2.636, p = 0.013. For the non-advanced L1 English L2 Japanese group, there was no significant difference in the scores for the[+p-shiftability] (M= 3.400, SD= 1.9794) and [−p-shiftability] (M= 3.720, SD= 1.8848) conditions; t(49) = −0.850, p = 0.399. The same holds true with the advanced L1 English L2 Japanese group. There was no significant difference in the scores for the [+p-shiftability] (M= 3.133, SD= 2.0297) and [−p-shiftability] (M= 3.933, SD= 1.7991) conditions; t(29) = −1.439, p = 0.161.

The repeated-measures ANOVA showed that there is a statistically significant difference between the three proficiency groups; $F_{1, 2}$ =7.759, p = 0.001. The Bonferroni post hoc test indicated that the mean score of the non-advanced group (M= 3.200, SD= 0.258) is not significantly different from the mean score of the advanced group (M=3.533, SD= 0.248) at p = 1.000. It also showed that the mean score of the advanced group (M=3.533, SD= 0.248) is significantly different from the mean score of the native group (M= 4.383, SD= 4.030) at p = 0.008. The non-advanced group (M= 3.200, SD= 0.258) also differs significantly from the native group (M= 4.383, SD= 4.030) at p=0.000.

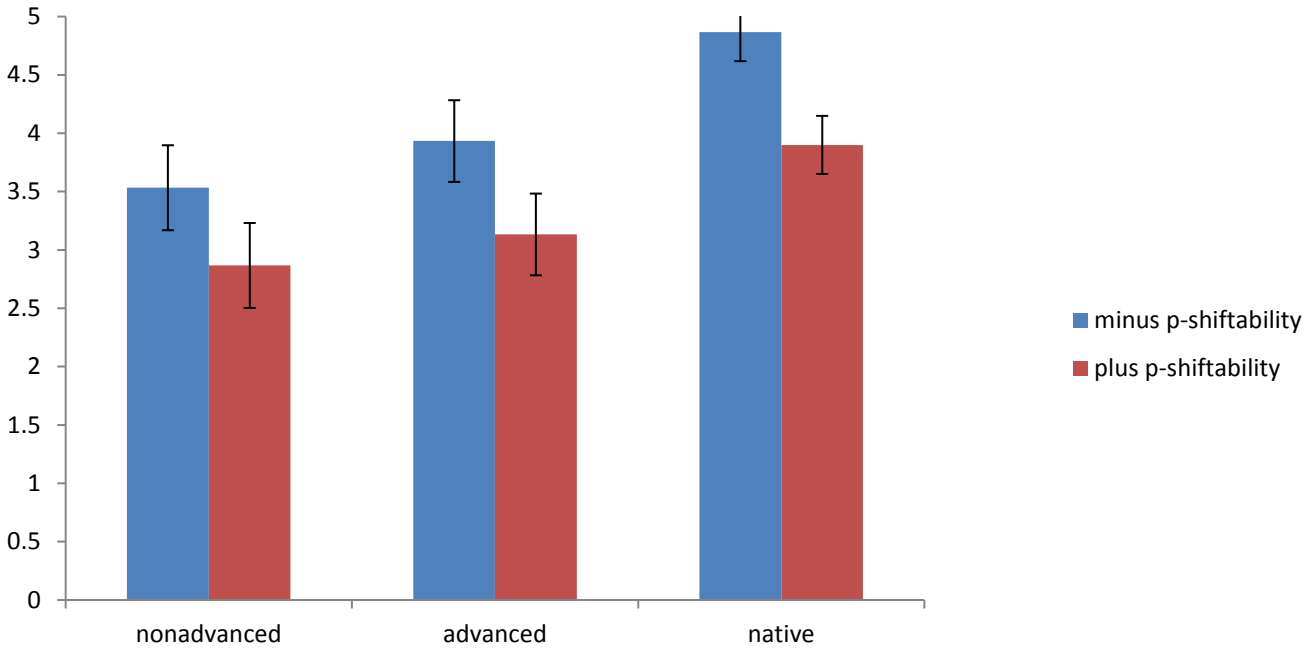


Figure 6.6. Mean ratings of the three proficiency groups in minus vs. plus p-shiftability (L1 English L2 Japanese)

6.3.1.3.2. Scope

We used two statistical measures to test participants' knowledge of scopal interactions between degree quantifiers and other intensional operators in the two directions.

6.3.1.3.2.1. L1 Japanese L2 English

We found that there was no statistically significant difference between the scores of the inverted scope (M= 4.756, SD= 0.8300) and surface scope (M= 4.933, SD= 0.3303) conditions; t(44) = −1.308, p = 0.198 in the native English speaker control group. For the non-advanced L1 Japanese L2 English group, the difference is not significant between the inverted scope (M= 3.500, SD= 1.8708) and surface scope (M= 3.567, SD= 1.8880) conditions; t(29) = −0.120, p = 0.906. For the advanced L1 Japanese L2 English group, there was also no significant difference in the

scores for the inverted scope (M= 3.694, SD= 1.8837) and surface scope (M= 3.882, SD= 1.6862) conditions; t(84) = −3.876, p = 0.362.

The repeated-measures ANOVA showed that there is a statistically significant difference between the three proficiency groups; $F_{1,2}$= 15.606, p = 0.000. The Bonferroni test indicated that the mean score of the non-advanced group (M=1.7422, SD=1.8637) is not significantly different from the mean score of the advanced group (M=1.8024, SD=1.8740) at p = 1.000. It also showed that the advanced group (M= 1.8024, SD=1.8740) is significantly different from the mean score of the native group (M= 0.2903, SD= 0.6344) at p = 0.000. The non-advanced group (M=1.7422, SD=1.8637) also differs significantly from the native group (M= 0.2903, SD= 0.6344) at p=0.000. The following figure represents the mean ratings of the three proficiency groups:

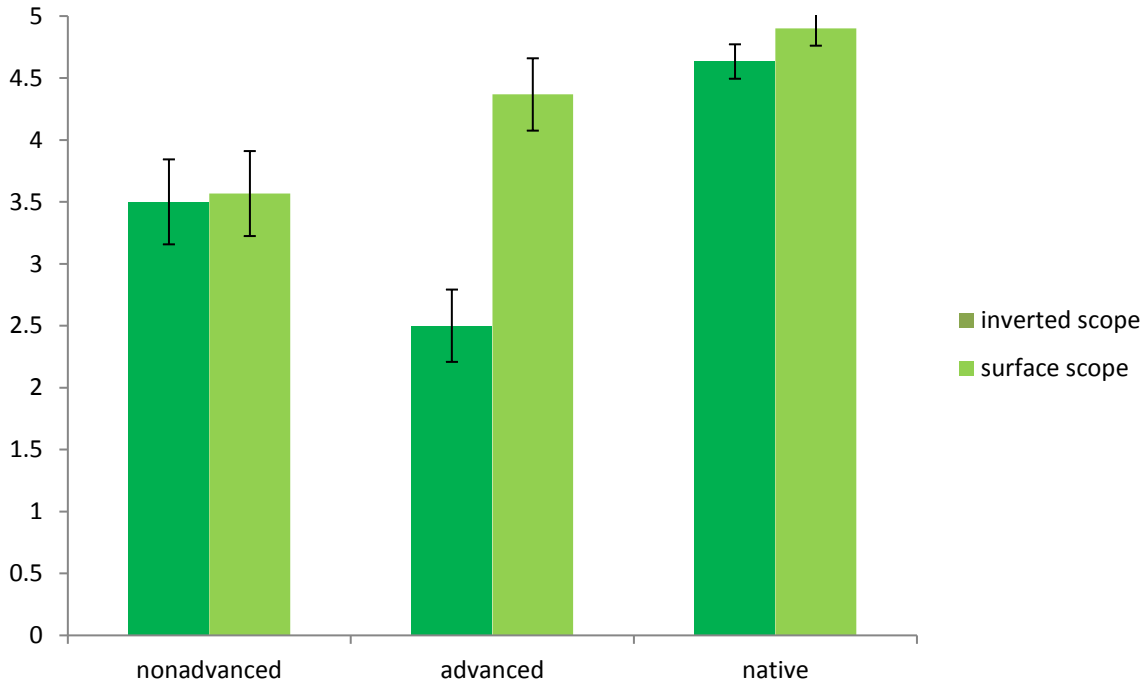


Figure 6.7. Mean ratings of the three proficiency groups in inverted vs. surface scope (L1 Japanese L2 English)

6.3.1.3.2.2. L1 English L2 Japanese

In the L1 English L2 direction, we found that for the Japanese native speaker control group, there was a statistically significant difference in the scores for the inverted scope (M= 2.733, SD= 1.9989) and surface scope (M= 4.733, SD= 1.0062) conditions; t(59) = −6.325, p = 0.000. The native speakers of Japanese favored the surface scope reading, as expected. As for the non-advanced L1 English L2 Japanese group, thedifference in the scores for the inverted scope (M= 3.00, SD= 2.0205) and surface scope (M= 4.120, SD= 1.6738) conditions is also significant; t(49) = −2.714, p = 0.009. For the advanced L1 English L2 Japanese group, there was a significant difference in the scores for the inverted scope (M= 2.333, SD= 1.9149) and surface scope (M= 4.3941, SD= 1.4564) conditions; t(32) = −4.436, p = 0.000.

We also found that there is no statistically significant difference amongthe three proficiency groups; $F_{1, 2}$= 0.724, p = 0.487. We further conducted a post hoc comparison test using the Bonferroni test. The test indicated that the mean score of the non-advanced group (M= 3.56, SD=1.9296) is not significantly different from the mean score of the advanced group (M=1.92,SD=1.9761) at p = 1.000. It also showed that the mean score of the advanced group (M=1.92, SD=1.9761) is not significantly different from the mean score of the native group (M= 3.7333, SD= 1.8764) at p = 0.849. The non-advanced group (M= 3.56, SD=1.9296) also does not differ significantly from the native group (M= 3.7333, SD= 1.8764) at p=0.911. The following figure represents the mean ratings of the three proficiency groups:

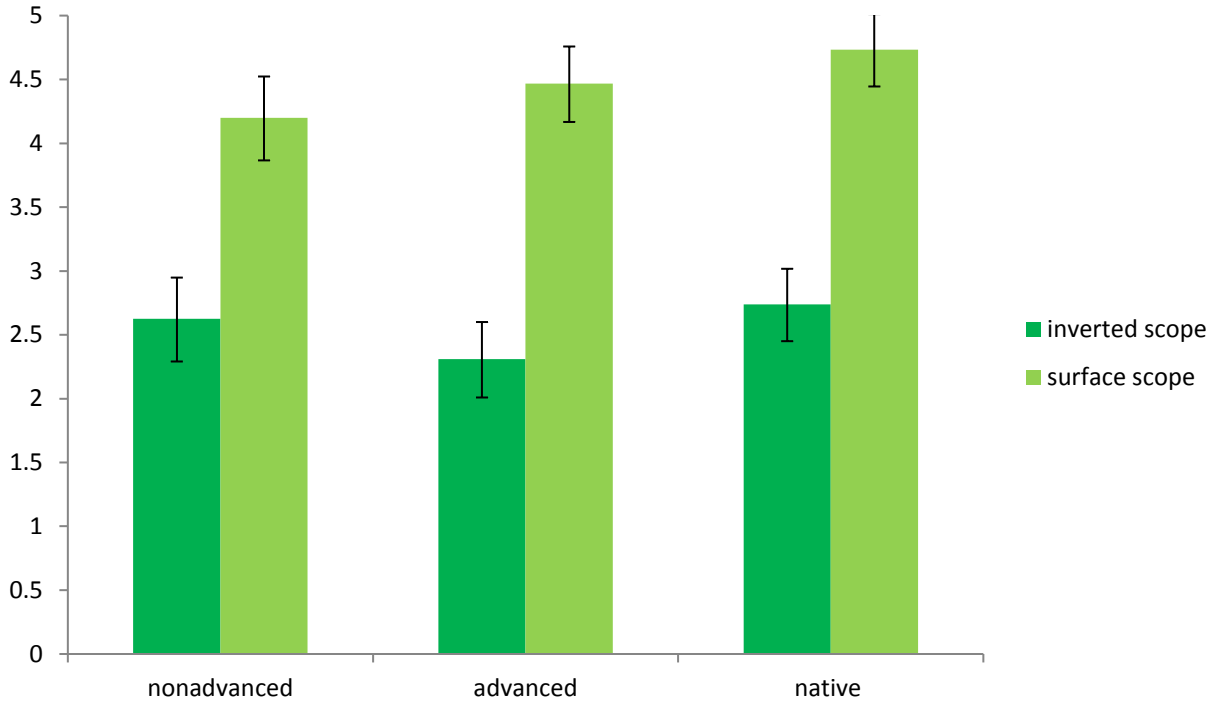


Figure 6.8. Mean ratings of the three proficiency groups in inverted vs. surface scope (L1 English L2 Japanese)

6.3.1.3.3. Negative Island Condition

6.3.1.3.3.1. L1 Japanese L2 English

As for interpreting negative islandhood in L1 Japanese L2 English, we found that there is a statistically significant difference between the three proficiency groups; $F_{1,2} = 8.931$, $p = 0.000$. Our post hoc test indicated that the mean score of the non-advanced group (M= 1.4777, SD=1.6626) is not significantly different from the mean score of the advanced group (M=1.92,SD=1.6632) at $p = 1.000$. It also showed that the advanced group (M=1.92,SD=1.6632) is significantly different from the mean score of the native group (M= 3.933,SD= 1.6706) at p =

0.005. The non-advanced group (M= 1.4777, SD=1.6626) also differs significantly from the native group (M= 3.933,SD= 1.6706) at p=0.002. The following figure represents the mean ratings of the three proficiency groups:

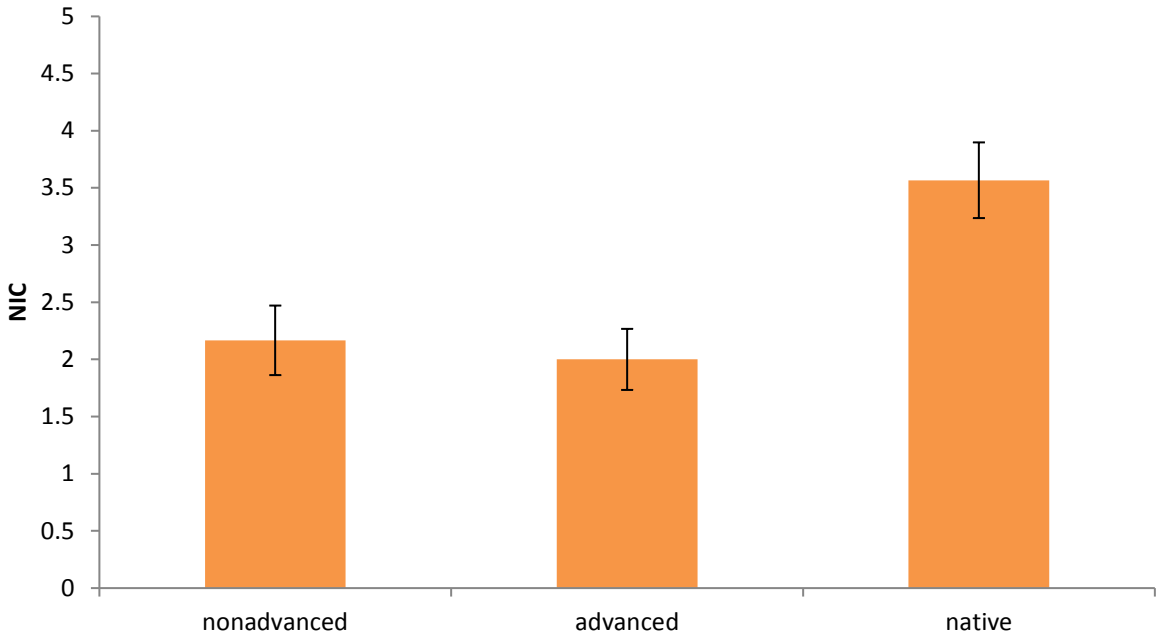


Figure 6.9. Mean ratings of the three proficiency groups in the negative island condition (L1 Japanese L2 English)

6.3.1.3.3.2. L1 English L2 Japanese

In the L1 English L2 Japanese direction, we found that there was a statistically significant difference between the three proficiency groups; $F_{1,2}$= 10.604, p = 0.000. The post hoc test indicated that the mean score of the non-advanced group (M= 2.8, SD=1.948) is significantly different from the mean score of the advanced group (M=4.2, SD=1.627) at p = 0.004. It also showed that the advanced group (M=4.2, SD=1.627) is not significantly different from the mean score of the native group (M= 4.6,SD= 1.500) at p = 1.000. The non-advanced group (M=

2.8,SD=1.948) also differs significantly from the native group (M= 4.6,SD= 1.500) at p=0.004. The following figure represents the mean ratings of the three proficiency groups:[179]

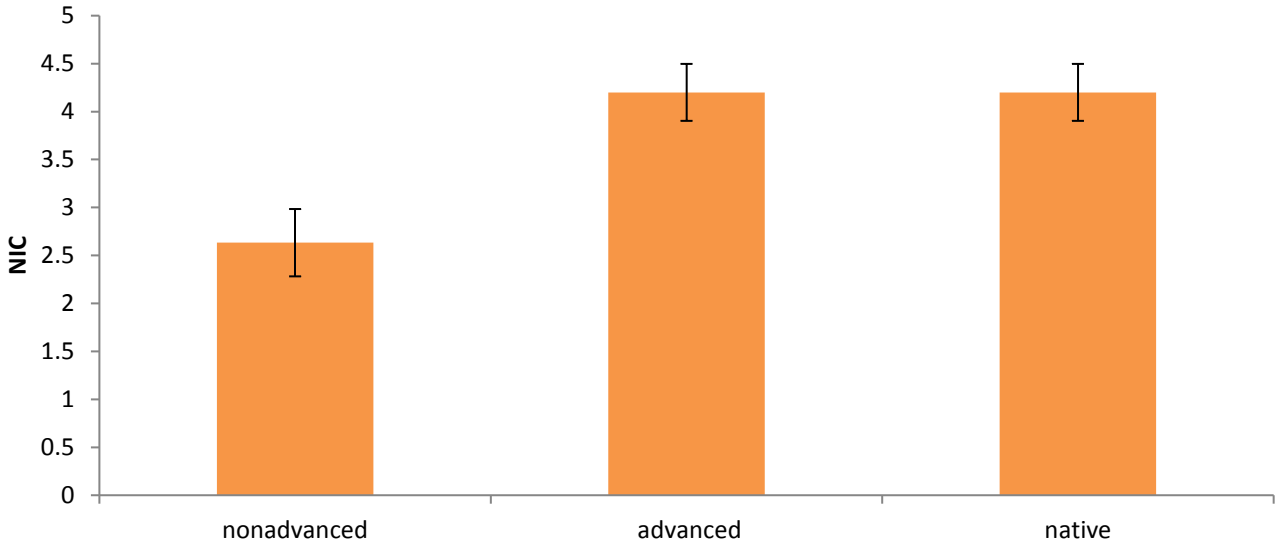


Fig 6.9. Mean ratings of the three proficiency groups in the negative island condition (L1 English L2 Japanese)

6.3.1.3.4. Sub-Comparatives[180]

6.3.1.3.4.1. L1 Japanese L2 English

Finally, our results showed that in the native English group, there was no significant difference in the scores for the degree subcomparative (M=4.911, SD= 0.4168) and number subcomparative (M= 4.933, SD= 0.2523) conditions; t(44) = −0.298, p = 0.767. For the non-advanced L1 Japanese L2 English group, the difference is not significant for the degree subcomparative (M= 4.433, SD= 1.3309) and number subcomparative (M= 3.967, SD= 1.7117) conditions; t(54) =

[179]The scores for the negative island condition in the English control and L1 Japanese L2 English are converted as follows. A raw rating of 1 is converted into 5, 2 into 4, 3 remains as 3, 4 into 2, and 5 into 1.
[180]In this experiment, I did not test the L1 English L2 Japanese case. The reason is that Japanese does not have syntactically well-formed subcomparatives.

1.3309, p = 0.109. For the advanced L1 Japanese L2 English group, the difference is also not significant for the degree subcomparative (M= 4.491, SD= 1.2747) and number subcomparative (M= 4.218, SD= 1.4490) conditions; t(54) =1.252, p = 0.216.

The results also showed that there was a statistically significant difference between the three proficiency groups; $F_{1, 2} = 8.872$, p = 0.000. The post hoc test revealed that the mean score of the non-advanced group (M= 4.2, SD=1.5382) is not significantly different from the mean score of the advanced group (M=4.3545,SD=1.3652) at p = 1.000. It also showed that the advanced group (M=4.3545,SD=1.3652) is significantly different from the mean score of the native group (M= 4.9222,SD=0.3427) at p = 0.003. The non-advanced group (M= 4.2,SD=1.5382) also differs significantly from the native group (M= 4.9222,SD=0.3427) at p=0.003. The following figure represents the mean ratings of the three proficiency groups:

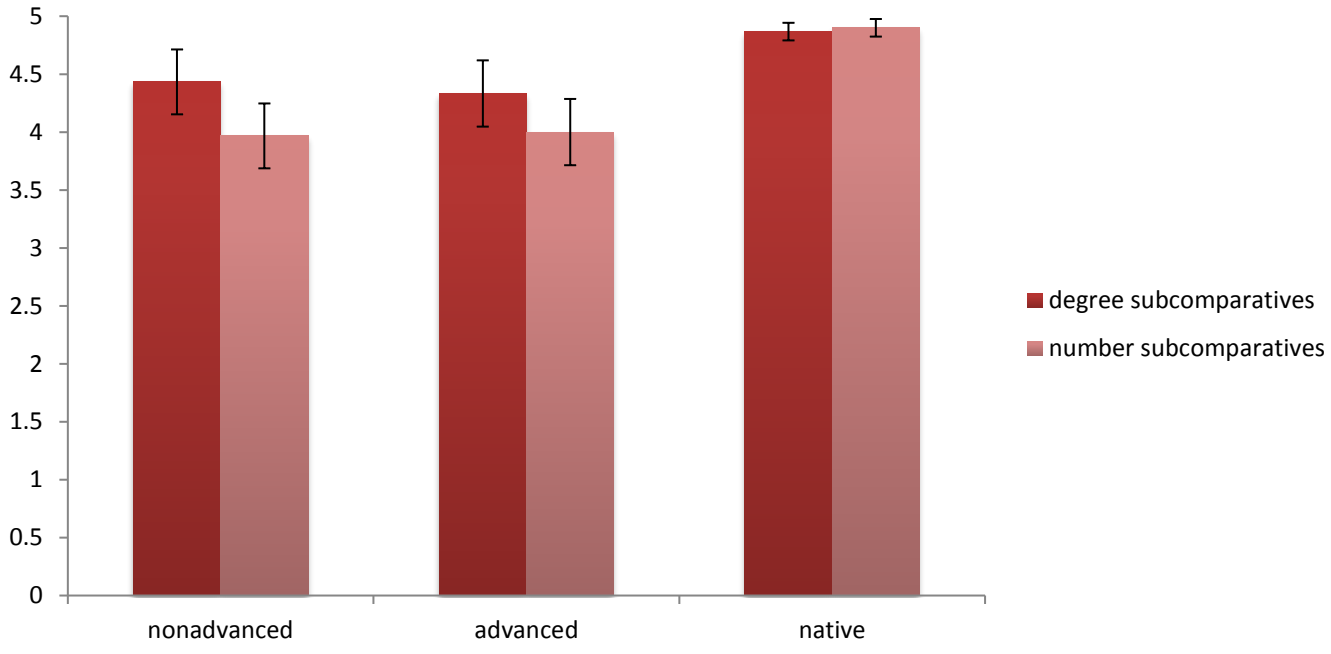


Fig 6.10. Mean ratings of the three proficiency groups in degree and number subcomparatives (L1 Japanese L2 English)

Chapter 7

Overall Discussion, Implications and Conclusion

Our hypotheses center around three main questions about the acquisition of truth-conditional, quantificational meaning of the past tense and comparative: whether or not the non-quantificational logical representation of these meanings is easier to acquire than the quantificational representation, the effect of L1 transfer and the role of saliency and dominance in interpreting the intended meaning. In what follows, I will discuss these issues in the context of our experiment.

7.1. Quantificational vs. Pronominal Past Tense

For the L1 Japanese L2 English learners, our results show that unlike native speakers of English, the advanced and non-advanced L2 learners do not seem to acquire the pronominal past tense in embedded *before* clauses. They are not sensitive to the [+/−p-shiftability] distinction in interpreting embedded tense in L2 English. Despite the fact that the embedded verb is inflected for overt past-tense morphology, learners chose to p-shift the tense of the embedded clause in such a way that they interpreted the embedded past as an underspecified value with an embedded eventuality that may be interpreted not only as past tense, but also as non-past.

The Japanese natives showed no sensitivity to the distinction. The results showed that the Japanese native group rated the past and non-past readings of the embedded clause in *before* clauses equally high. Similarly, L1 English L2 Japanese learners(both advanced and non-advanced learners) are indifferent to the past and non-past readings of embedded past. This is a clear indication for an early acquisition of quantificational past.[181] It appears to be the case that it is easier for learners to expand the grammar so as toadd the quantificational past (i.e. to

[181] Note that the learners' means were a bit lower than the native Japanese speakers' means.

includethe non-past reading) than it is for them to contract the grammar so as to have only the pronominal past,which involvesde-learning the non-past reading. In the past-tense case, the acquisition of quantificational past represents the most restrictive grammar undergoing expansion. It draws on positive evidence in such a way that learners acquire the past and non-past readings. On the other hand, the acquisition of the non-quantificational past represents the least restrictive grammar undergoing contraction, which requires the de-learning of the non-past interpretation. Our results showed that the L1 English L2 Japanese learners neither transferred the composition of non-quantificational past nor began the acquisition process with the non-quantificational representation as a shallower representation.

7.2. Quantificational vs. Non-Quantificational Comparative

7.2.1. Scope

As indicated, the English native speakers showed no sensitivity to the inverted vs. surface scope readings of intensionalized comparatives. They rated each scope reading equally high. Also, neither the L1 Japanese L2 English advanced group nor the non-advanced group were sensitive to the inverted- and surface-scope distinction. They ratedthe tworeadings similarly high. The results also showed that there is a significant difference between the native group on the one hand and the advanced and non-advanced groups on the other hand. The advanced and non-advanced groups perform quite equally, with no significant difference in rating the distinction. We take this finding as a further indication that learners may interpret the meaning of comparatives quantificationally at an early stage of L2 acquisition.[182]

[182] Given the results of the p-shiftability test, it is possible that learners displaced biased performance due to their uncertainty about the past and non-past readings, and so they gave ratings in the middle of the scale. To prevent such an effect, a larger sample should be tested to give more genuine results.

As for the L1 English L2 Japanese group, the two proficiency groups showed a significant difference in interpreting the inverted- vs. surface-scope constructions. The three proficiency groups (natives, non-advanced and advanced) accepted the surface-scope reading and rejected the inverted-scope reading. This is again a clear indication that the comparative is not interpreted as quantificational in the L1 English L2 Japanese. Such a result casts doubt on the role of L1 transfer. It also lends support to the Shallow Processing Hypothesis. Equally important, it shows that the learners successfully de-learn the inverted scope reading despite this severe povertyofstimulus situation.

7.2.2. Negative Island Condition

Unlike with the native speakers of English, our results showed that both the non-advanced and advanced L1 Japanese L2 English groups accepted comparatives with negative island violations as grammatical in their L2 English. There was no significant difference between the two groups, but there was a significant difference between the non-advanced and advanced group on the one hand and the native-speaker group (M= 4.289,SD= 1.391) on the other hand. Clearly, the L1 Japanese L2 English learners are not sensitive to the negative island condition, meaning that they do not seem to employ degree quantification in interpreting comparatives with negative island effects.

As for the L1 English L2 Japanese, the non-advanced group seemed to reject the grammatical comparatives whose English counterparts induce negative island violations. Both advanced and native speakers rated such constructions in Japanese as felicitous. We take this finding as an indication that learners seem to use the non-quantificational meaning of comparatives in such a way that they are insensitive to the negative island condition.

7.2.3. Subcomparatives

Among L1 Japanese L2 English learners, all proficiency groups rated subcomparatives with their degree and number interpretations equally high. There was no significant difference between the two interpretations. There wasno significant difference in rating the distinction between the non-advanced and the advanced groups. Nevertheless, both groups were significantly different from the native group. What this finding shows is that L1 Japanese L2 English learners seem to interpret subcomparatives quantificationally.

The results from L2 acquisition of scope ambiguity and degree subcomparatives seem to support the L2 acquisition of the quantificational meaning of comparatives in English. The results also do not exclude the possibility of an early acquisition of non-quantificational meaning of comparatives in L2 Japanese.

When it comes to the negative islandcondition, we saw that our L2 learners seem to interpret the comparative non-quantificationally.

7.3. Overall Discussion and Conclusions

7.3.1. The Subset Principle vs. Shallow Processing

In our case study, the subset principle predicts that quantificational meaning is easier to acquire than non-quantificational meaning. The Shallow Processing Hypothesis claims the opposite:non-quantificational meaning is easier to process, given that the associated logical form is more basic, more syntacticized and shallower than its quantificational counterpart. The results from the L2 acquisition of quantificational vs. pronominal embedded tense support the subset principle, and hence weaken the shallow processing hypothesis in the domain of L2 acquisition of embedded tense in *before*constructions. We found that the performance of L1 Japanese L2 English learners in acquiring quantificational past tense was better than the performance of L1 English L2

Japanese learners in acquiring pronominal past tense. Perthe subset principle, the L2 acquisition of pronominal past is predicted to be more difficult than that of quantificational past,since it involves de-learning of interpretations in a way that does not follow from the positive evidence.[183]Thegrammar with the pronominal past tense is a subset of the grammar with quantificational past. The shallow processing hypothesis, meanwhile, predicts that the pronominal past is acquired earlier than the quantificational past. Our results showed that L1 Japanese L2 English learners failed to de-learn the non-past reading of embedded *before*clauses.

As for scope, the L1 Japanese L2 English learners were indifferent to the distinction between surface-andinverted-scope contexts. They judged both conditions of scope similarly high. This finding indicates that learners might process the comparative quantificationally at an early stage of acquisition. Again, this is a further indication that the quantificational meaning of the comparative is well presented in L2 English. The proficiency groups in L1 English L2 Japanese, on the other hand, showed sensitivity to the distinction between surface- and inverted-scope contexts: the three proficiency groups accepted the surface reading and rejected the inverted reading. This finding also supports the shallow processing hypothesis, since we have evidence supporting learners' knowledge of non-quantificational shallower representation in L2 Japanese. The learners were able to de-learn the inverted scope reading.

The results involving negative islands are quite surprising. There is no evidence for the acquisition of quantificational comparative among either non-advanced or advanced L1 Japanese L2 English learners. Such learners are not sensitive to the negative island condition in English. They seem to accept the comparative construction that violates this condition. The L1 English L2 Japanese learners, on the other hand, wereable to acquire the fact that Japanese comparatives are

[183]Since the grammar with the pronominal past tense is a subset of the grammar with quantificational past, so that the latter involves the de-learning of some interpretations that do not follow from the positive evidence.

insensitive to negative islands. Although the non-advanced learners rated such constructions very low, advanced learners judged these constructions very high, with a performance that is not significantly different from that of the native speakers.The data from the acquisition of the negative island conditionprovides a case for the shallow processing hypothesis, in which the non-quantificational, negative-island-insensitive construction is easier to acquire than its negative-island-sensitivecounterpart.

Finally, the results from subcomparatives show that the three groups of proficiency in L1 Japanese L2 English are indifferent to the distinction between degree and number subcomparatives. Although there is a significant difference in performance between the non-advanced and advanced groups, on the one hand, and the native group, on the other hand, the participants acrossthe three groups rated each property very high. This finding indicates that learners made use of degree quantification in acquiring degree subcomparatives.

The conclusion that can be drawn from the discussion is that we haveevidence for the applicability of the subset principle in the acquisition of quantificational vs. non-quantificational embedded tense and for the inapplicability of the shallow processing hypothesis. Unexpectedly, the data from scope do not support any of these hypotheses, since learners showed equally high performance in acquiring the quantificational vs. non-quantificational comparative, as indicated in knowledge of scope interaction in intensionalized comparatives. The data from subcomparatives support the early L2 acquisition of degree quantification. However, the data from negative islandsoffers supporting evidence for the shallow processing hypothesis. As we can see, our results reveal conflicting findings with respect to the acquisition of quantificational vs. non-quantificational meaning. We are unable to offer anargument that supports one

hypothesis to the exclusion to another. However, we will look more closelyat possible factors that make one direction more or less difficult to acquire than the other.

7.3.2. L1 Transfer vs. Saliency

Let us differentiate between two types of saliency for our case study. First, we have saliency of form, in which the expression of meaning is encoded in the morphosyntax. In English, for example, the embedded *-ed* morpheme expresses past tense. Another type is saliency of interpretation. An expression is interpretively salient when there is a context c that makes certain interpretations unambiguously prominent for that expression. Take, for example, the embedded past tense in English. This morpheme expresses the past tense. Therefore, this form is incompatible with non-past contexts. Such a morpheme in an embedded*before*clause is only compatible the context of past tense.

Assume thatlearning is failure-driven. That is, a learner who encounters an input S that the current grammar's parsing mechanism fails to process will increase the probability of the selection of another grammar that may be able to process the input in question (Legate & Yang 2005,2007). We will suggest that in cases where there is a mismatch between saliency of form and saliency of interpretation, an error case emerges that L2 learners fail to process. Such a situation triggers the selection of a new grammar. For the case athand, we have two different grammars: quantificational past/comparative and non-quantificational past/comparative. I will further suggest that in cases wherethere is no mismatch between saliency of form and saliency of interpretation, no native-like grammar is used and hence L2 learners transfer the L1 grammar.

Let us look at our case study item by item. In acquiring pronominal past in L1 Japanese L2 English learners, there is no mismatch between saliency of form and interpretation. In Japanese, the embedded*before*tense can be interpreted in the past and non-past, since in

Japanese, such an embedded tense is p-shifted (i.e., expressing past and non-past). The fact that the embedded past tense in English is inflected with-*ed* is not incompatible with non-past contexts, since such an embedded tense can be taken to express both past and non-past.[184] Given no mismatch, L1 Japanese L2 learners will not encounter a case that triggers the selection of a new grammar. They automatically transfer the quantificational grammar of the past tense. This explains why L1 Japanese L2 learners fail to de-learn the non-past reading of embedded past tense in English.

As for the L2 acquisition of quantificational tense, L1 English L2 Japanese will encounter a mismatch between the underspecified tense and the past-tense context. The embedded tense represents a case of salient present-tense form and salient past-tense interpretation. This triggers a mismatch in saliency of form and interpretation. For those learners, this position should be occupied by a past tense. Such an error triggers the selection of the quantificational past,which leads to the relative success in the L2 acquisition of the p-shiftability property.

The same logic applies to the acquisition of other properties, including scope and degree subcomparatives. For each property and in both directions, we noticed that L2 learners encounter a saliency mismatch between form and interpretation. In the L2 acquisition of scope ambiguity for L1 Japanese L2 English learners, comparatives with inverted-scope readings are salient inform but non-salient in terms of interpretation.[185] This triggers the selection of a grammar that employs the quantificational meaning of comparatives. Such a grammar permits both the inverted and surface readings of intensionalized comparatives. The same holds true in the L1

[184] Recall that the embedded tense is underspecified. It can be interpreted as past ornon-past depending on context (see chapter 2).
[185]I mean they are salient in form as comparatives and non-salient in interpretation as having an inverted-scope reading.

English L2 Japanese learning direction. As for subcomparatives, a similar mismatch arises that triggers the selection of a different grammar in both directions.

Finally, we have the special case of L2 acquisition of the negative island condition. Assume that comparative constructions in Japanese are insensitive to negative islands. L1 Japanese L2 English learners will observe no mismatch between the ungrammatical English sentences that violate negative islandsand the context. Therefore, they process such constructions non-quantificationally, and hence they will accept such structures as grammatical. As for the L2 acquisition of non-quantificational comparative, L1 English L2 Japanese learners will observe a mismatch between a wrong form and a correct context. Hence, they will select a non-quantificational grammar to accept the correct forms of Japanese comparatives that are insensitive to negative islands.

7.4. Conclusion

As shown in the results, the main finding of this bi-directional experiment gives rise to a mixed set of results: both the subset principle and the shallow processing hypothesis find support in the domain of L2 acquisition of embedded tense and comparatives. We cannot draw any conclusive inferences or conclusions regarding the relative ease ordifficulty of acquiring quantificational vs. non-quantificational meaning. To overcome this problem, we need to test larger samples of informants that best represent what L2 learners know about quantificational vs. non-quantificational meaning,in order to determine which direction is easier to acquire and how the L2 learners come to the task of acquiring the relevant meaning.

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Curriculum Vitae

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- M.A., linguistics, (August 2011), **University of Leeds**, United Kingdom

Dissertation title: *Secondary Predication in Standard Arabic*

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- Full time Instructor, Department of English, (2012-2014), **King Abdul-Aziz University**, Rabigh, Saudi Arabia.
- Part time Instructor, Department of English, (Summer 2012), Isra **University**, Amman, Jordan.
- Part time Arabic Instructor, Language Center, (Fall 2011), **Hashemite University**, Zarqa, Jordan.
- Teacher of English, (2005-2010), **Ministry of Education**, Jahra, Kuwait.
- Teacher of English (2004-2005), **Islamic Educational College**, Amman, Jordan.

Courses Taught

- The Diversity of Human Language, **University of Wisconsin – Milwaukee**,Milwaukee, Wis., USA
  - Teaching assistant leading discussion sections (Fall, Spring 2014)
  - Teaching assistant leading discussion sections (Fall, Spring 2015)
  - Teaching assistant leading online discussion sections (Fall, Spring 2016)
  - Main instructor (Fall, 2017; Spring 2018)

  - Introduction to Syntax, **King Abdul-Aziz University-Rabigh,** Saudi Arabia
    Main instructor (Spring, Fall 2013)

- Advance Reading, **King Abdul-Aziz University-Rabigh,** Saudi Arabia
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- Introduction to Linguistics, **King Abdul-Aziz University-Rabigh,** Saudi Arabia
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- English 101, (2012-2014), **King Abdul-Aziz University-Rabigh,** Saudi Arabia
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  - Main instructor leading online classes

- Theoretical Linguistics, (2011), **Isra University,** Jordan
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- English 101, TOEFL and Arabic, (2011), **Hashemite University,** Jordan
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Field of Specialization

Second Language Acquisition, Syntax, Formal Semantics, Psycholinguistics, (Mathematical) Logic, Pragmatics, Computational Linguistics

Research Interests

Broad

Second language semantics, Acquisition by Processing, Generative Transformational Grammar, Truth Conditional Semantics, Modal and Temporal logic, Natural Language Processing, General Arabic linguistics

Narrow

- Second language semantics
  - L2 acquisition of truth conditions
  - UG-accessibility
  - poverty-of stimulus
  - quantification in the second language.

- Minimalist Syntax
  - the phase theory
  - left periphery constructions
  - information structure
  - (secondary) predication
  - hierarchical building
  - relative clauses

- Formal Semantics
  - gradability
  - evidentiality
  - conditionals & modality
  - temporality
  - attitudinal predicates
  - amount & maximalizing relatives
  - secondary predication.

- Pragmatics:
  - the computation of scalar implicatures
  - alternatives
  - islandhood conditions of degree depictive questions.

- Computational linguistics:
  - parsing
  - processing of Logical Forms

- Logic:
  - temporal and modal logic

Honors and Awards

- Travel Award, $ 2,400 (2017)
- Graduate Student Travel Award, $700 (2017)
- Nominee for the Distinguished Graduate Student Fellowship (2016-2017)
- Chancellor's Award, University of Wisconsin-Milwaukee $1700 (2016-2017)
- Chancellor's Award, University of Wisconsin-Milwaukee $1700 (2014-2015)
- Graduate Teaching Assistantship, Department of Linguistics at University of Wisconsin-Milwaukee (2014-present)

Professional Activities

- Attendee of the Blackboard Essential Training -Distance Education, **King Abdul-Aziz University -Jeddah**, Saudi Arabia (2014)
- Attendee of the workshop of ISO 9001-OHSAS 18001-ISO 14001,**King Abdul-Aziz University -Rabigh**, Saudi Arabia (2013)
- International MA Students representative in the Department of Linguistics and Phonetics, **University of Leeds**, Leeds, UK (2010-2011)

Publications

Monograph under preparation

- *Logical Form in the Second Language: an investigation into non-nominal quantification in interlanguage*.

Peer-reviewed Articles

- Abu Helal, A. (2019). On Dimensional Property Concepts in **Levantine Arabic**: Evidence for Uniformantism. In Caitlin Richter & Ava Creemers (eds.), *Proceedings of the 42th Pennsylvania Linguistics Colloquium*, volume 25.

- Abu Helal, A. (2018).On Discourse Features Inheritance in the vP Information Structure: Evidence from Depictive Secondary Predication in **Standard Arabic**. *Studia Linguistica.* DOI**:**10.1111/stul.12090.

- Abu Helal, A. (accepted with minor revision). A phrasal or clausal comparative head: Assessing the facts in the Context of **Levantine Arabic**. *Studia Linguistica*.

- Abu Helal, A. (accepted with thorough revision) ya(illi) Relatives in **Levantine Arabic**: A Case for Matching. *Linguistic Inquiry*.

- Abu Helal, A. (under review). *The logic behind QAD modality in **Standard Arabic***

- Abu Helal, A, (submitted) *On Secondary Predication in **Standard Arabic**: A Zero Morpheme Analysis.*

- Abu Helal, A. (under preparation). *Strong Islandhood of Degree Depictive Questions*.

- Abu Helal, A. (under preparation). *Conditionals as Topics: The Case of amma in **Standard Arabic***.

- Abu Helal, A. (under preparation). *On the Epistemic Modality Meaning of the Future: Evidence from Futurate Sawfa and Sa- in **Standard Arabic***.

Presentations in Peer-reviewed Conferences and Colloquia

- 2018. *On Dimensional Property Concepts in Levantine Arabic: Evidence for Uniformitarianism.* Talk presented at the 42nd Annual Penn Linguistics Conference- **University of Pennsylvania-USA**, March 24-26.

- 2018. *Density, temporality and University in Assertive Modality*. Talk presented at the Western Interdisciplinary Student Symposium on Language Research – **University of Western Ontario-Canada**. March 9.

- 2017. *Modal qad in Standard Arabic*. Talk presented 50th Societas Linguistica Europaea - **University of Zurich-Switzerland,** September 10-13.

- 2017. *Logical Form in the Second Language*. Poster presented at the Generative Approaches to Language Acquisition International Conference (GALA 13). **Universitat de les Illes Balears (UIB), Palma de Mallorca-Spain**, September 7-9.

- 2017**.** *How it happens that temporality constrain quantification force of rigid modality.* Talk presented at the 33rd Northwest Linguistics Conference. **University of British Columbia-Canada**,May 5.

- 2017. *Notes on Actuality Entailment*. Talk presented at 14th annual Workshop in General Linguistics. **University of Wisconsin at Madison-USA,** April 1st.

- 2017. *On Context-Free Modality*. Talk presented at 9th annual Conference of Illinois Language and Linguistics Society. **University of Illinois at Urbana Champaign**-USA, 31st March.

- 2017. *A Speech-act approach to Context Dependent Modality*. Talk presented at the Purdue Languages and Cultures Conference. **Purdue University at West Lafayette-USA**, March 4th.

- 2017. *Modality vs. Evidentiality*. Talk presented at JilJadid Conference in Middle East Languages and Literatures. **University of Texas at Austin- USA**, February 24.

- 2016. *Evidential qad in Standard Arabic*. Talk presented at Syntax-Semantics Workshop of the American Midwest and Prairies (SSWAMP), **Northwestern University-USA**, October 27.

- 2014. *On Locative Inversion and EPP Condition*. Talk presented at Semantics Workshop of the American Midwest and Prairies (SWAMP), **University of Wisconsin at Milwaukee-**USA, October 27.

- 2012. *Notes on Semitic Control*. Talk presented at King Abdul-Aziz Linguistics Colloquium. **King Abdul-Aziz University**-Saudi Arabia, November 3.

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