The Domain of Grammatical Case
in Lexical-Functional Grammar

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1 Introduction

This paper presents an analysis of adverbial case marking in Korean within the framework of Lexical-Functional Grammar (LFG) (Bresnan (ed.) 1982, Bresnan and Kaplan 1982, Dalrymple et al. (eds.) 1995, Bresnan forthcoming). It has long been observed in a variety of languages that the domain of case assignment extends beyond the arguments of a predicate to include also a range of adverbials (e.g., see, inter alia, Li 1990 for Chinese; Maling 1993 for Finnish; Maling 1989, Wechsler and Lee 1996 for Korean; Przepiórkowski 1998a,b for Polish; Babby 1980, Fowler 1987 for Russian). Temporal and measure adverbials in languages such as Finnish, Korean, Polish and Russian have also been claimed to get their accusative case assigned syntactically by the same processes which are responsible for case assignment to arguments. Moreover, there is a growing discussion of the common semantic properties of arguments and adjuncts. For example, Wechsler and Lee (1996) show that accusative-marked adverbials in Korean always delimit an event predicate as object NPs very often do. Thus this hybrid nature of accusative case in these languages poses an apparent puzzle for case theories that make a distinction between "Structural Case" and "Inherent Case" (or "Grammatical Case" and "Semantic Case"). How can the correlation between accusative case and the semantics of delimitation be captured?

I show that the hybrid category of semantically conditioned grammatical case can be given a natural account in LFG's model of mutually constraining information. In particular, I explore the idea that the solution to this problem lies in the use of case morphology to mark clause-level information such as clausal aspect and the configuration of the semantic and argument structure of a clause. The current analysis formulated in terms of the principled interaction between the semantic properties of verbal dependents, both thematic and aspectual, and case marking avoids considerable complexity which postulating profligate structures, phrasal projections headed by functional categories and derivations introduces into the syntax of Korean.

2 Case-Marked Adverbials in Korean

In Korean the domain of grammatical case assignment extends not only to arguments, but also to a range of adverbials. For example, in (1) we see the durational adverbial *twu sikan* 'two hours' marked with the accusative case marker *-(l)ul*.[1]

(1)   Haksayng-tul-i   chayk-ul   twu sikan-**ul**   ilk-ess-ta.
          student-PL-NOM   book-ACC   two hours-ACC read-PAST-DECL[2]
          'The students read books for two hours.'

Multiplicative adverbials and certain distance measures can also take the accusative, as shown in (2) and (3) respectively.

(2)   Wiwenhoy-ka Mary-lul   hoycang-ulo   twu pen-**ul**   ppop-ass-ta.
          committee-NOM Mary-ACC   chair-as two times-ACC elect-PAST-DECL
          'The committee elected Mary as chair twice.'

(3)   Tom-i   sip mail-**ul**   tali-ess-ta.
          Tom-NOM   ten miles-ACC run-PAST-DECL
          'Tom ran ten miles.'

Given the fact that temporal adverbials often bear accusative in a variety of languages (e.g., Albanian, Finnish, German, Hungarian, Icelandic, Lithuanian, Modern Greek, Polish, Russian, etc. See Haspelmath 1997 for further discussions of languages that extend the domain of direct case to include adverbials), the obvious question is what the source of accusative case on the adverbial NP is. As demonstrated in Maling (1989), Kim and Maling (1993) and Wechsler and Lee (1996), the accusative case on the Korean adverbial NPs shows a property characteristic of "Structural, Grammatical or Syntactic" Case, namely, case alternation.[3] Unlike in Germanic languages such as German or Icelandic where adverbials are often morphologically accusative, the accusative case on Korean adverbials alternates with nominative. This is illustrated by the examples in (4) and (5), the passive counterparts of those in (1) and (2). In (1) and (2), where there is an external argument, only accusative case marking is allowed on the verbal dependents including both arguments and adverbials. In contrast, either nominative or accusative case is possible on the adverbial but only nominative is allowed on the argument, as in (4) and (5).

(4)   Chayk-i   haksayng-tul-eyuyhay twu sikan-**ul/i**   ilk-hi-ess-ta.

book-NOM student-PL-by   twohours-ACC/NOM   read-PASS-PAST-DECL

‘Books were read by the students for two hours.’

(5)   Mary-ka   hoycang-ulo   twu pen-**ul/i**   ppop-hi-ess-ta.

Mary-NOM   chair-as two times-ACC/NOM   elect-PASS-PAST-DECL

‘Mary was elected as chair twice.’

Maling (1989) notes that adverbial case is further distinguished from case on arguments in its relation to stativity, and convincingly argues that adverbial case depends directly on the stative/non-stative distinction, while case on verbal arguments only generally depends on stativity.[4] Examples of case-marked adverbials in stative clauses are given below.

(6)   Mwun-ihan sikan-***ul/i**   yel-ie-iss-ta.

door-NOM   one hour-*ACC/NOM   open-PASS-be-DECL

‘The door remained open for an hour.’

(7)   Mary-ka   cha-ka   twu sikan-***ul/i**   philyoha-ta.

Mary-NOM   car-NOM   two hours-*ACC/NOM   need-DECL

‘Mary needs a car for two hours.’

The contrast between examples in (4-5) and those in (6-7) show that the duration adverbials cannot bear accusative case when they modify the stative verb, while they can be either accusative or nominative as a modifier of the non-stative verb with no external argument.

Although it is traditional to assume the classic distinction between "Structural Case" and "Inherent Case" (Chomsky 1981) or between "Grammatical Case" and "Semantic Case" (Kurylowicz 1964) in many formal theories of case, it has long been observed that there is a class of cases that pattern syntactically with structural cases but are sensitive to various semantic factors other than thematic relations, such as specificity (e.g., accusative case in Hindi (Mohanan 1994), Korean (Lee 1992), Turkish (Enç 1991) and Urdu (Butt 1995)), volitionality (e.g., ergative case in Hindi (Khan 1987, Mohanan 1994), Acehnese (e.g., Van Valin 1990, Holinsky 1987) and Nez Perce (Woolford 1997)), animacy (e.g., accusative and ergative case in many South Asian languages), and aspectual affectedness and delimitedness (e.g., partitive case in Finnish (Kiparsky 1998) and accusative case in Korean (Hong 1991) and Japanese (Miyagawa 1989)). These connections between grammatical case and semantics thus present a challenge to standard treatments of case. It is not clear how these

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ties between grammatical case and semantics interact with the distinction between "Structural" and "Inherent Case" or "Grammatical" and "Semantic Case".

In this paper, I propose an analysis of the extension of case domain developing ideas in Wechsler and Lee (1996). In particular, I develop an account of direct case in Korean, a clear instance of semantically conditioned grammatical case, within the framework of Lexical-Functional Grammar (LFG). I show that the interaction of parallel structures constraining localized information, a defining characteristic of LFG, coupled with the morphosyntactic model of case developed by Nordlinger (1998), allows us to account for the extension of the domain of grammatical case and its hybrid nature in a natural and explicit manner.

3 The Notion of Situation Delimiter

What do the various case-marked adverbials in the previous section have in common? Why can direct case only mark certain types of non-arguments, including measure, duration and multiplicative adverbials, but not others? These questions are addressed in Wechsler and Lee (1996), who propose that the domain of direct case assignment be expanded to include a SITUATION DELIMITER, i.e., a (situation-quantifying) extensive measure function (see inter alia Krifka 1989, Dowty 1991, Tenny 1987, 1994, and Verkuyl 1972, 1993).

According to Wechsler and Lee (1996), extensive measures must satisfy the condition of ADDITIVITY ($\oplus$ is the concatenation operator):

(8)   additivity: $m(x \oplus y) = m(x) + m(y)$, if x and y do not overlap.

To illustrate this concept, consider an event x of driving at an average speed of 50 miles per hour for one hour. Both average speed and duration are clearly measure function with the property of transitivity. Now suppose we concatenate the event x and a second event y of driving at an average speed of 40 miles per hour for one hour. Their concatenation $x \oplus y$ has an average speed of 45 miles per hour and a duration of two hours. Hence duration is an extensive measure function (since $1 + 1 = 2$) while average speed is not (since $40 + 50 \neq 45$).

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Other extensive measures include cardinal count measures, in which individual events are counted up (e.g. *two times*) and *path length* (e.g. *ten miles*), but not manner (e.g. *quickly*), nor frequency in the sense of periodicity (e.g. *each day*) (Wechsler and Lee 1996: 645-646). This semantic difference in classes of adverbials correlates with different case marking possibilities in Korean. In particular, as I discuss in section 5 below, only the subclass of adverbials that serve as extensive measures permit grammatical case in Korean.

The case-marked adverbials share the important semantic property to quantify or temporally delimit the situation expressed by the predicate. Taking durative adverbials first, a durative adverbial specifies the length of an event. For example, in (1) above, the durative adverbial *twu sikan-ul* 'for two hours' sets a limit on the duration of the event of reading, forming the telic predicate out of the atelic predicate, as object NPs denoting an item of delimited quantity do. Similarly, the multiplicative adverbial *twu pen-ul* 'two times' in (2) quantifies the iterative or collective situation described by the verb, a single complex event composed of individual elections. A distance measure such as *sip mail-ul* 'ten miles' in (3) has the event-quantification property of an incremental theme (Dowty 1991). In the event described by (3) there is a correspondence (a homomorphism) between the parts of the running event and the parts of the distance: when half of the distance (5 miles) has been traversed then the event is half over, when the entire distance (10 miles) has been traversed then the event is complete, and so on. So the object-like marking of delimiting adverbials can be said to be motivated by their semantic function as temporal delimiters, which is a factor for the realization of an event participant as an object NP (Dowty 1991, Tenny 1987, 1994, Wechsler and Lee 1996). This parallelism also suggests that Case Theory does not draw a dinstinction between arguments and adjuncts, as argued by Maling (1989).

However, delimiting object NPs and delimiting adverbials are situation delimiters in different senses. The measure, durative and multiplicative adverbials delimit the event at the level of semantic structure (see Krifka 1989 and Verkuyl 1993 for detailed formalization). They are not the thematic participants of the situation denoted by the verb that they modify, but the elements of the semantic interpretation of the clause that contribute to the temporal individuation of the situation itself. But in the case of the delimiting object NP, its thematic role (i.e., incremental themes), which is assigned by event verbs themselves, has the property to quantize or individuate an event.
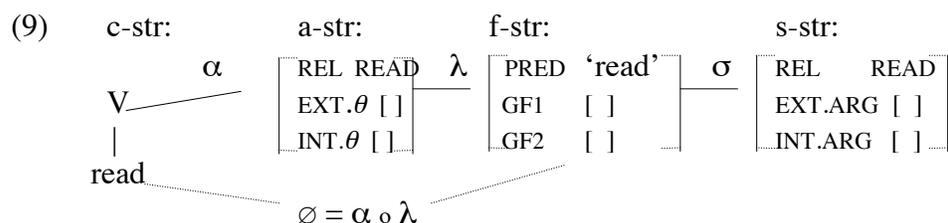
Moreover, not all objects are interpreted as an event delimiter (e.g. the objects of *see, find, push, drag,* and so on). So the differences between these two types of verbal

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dependents suggest that there are two different sources of direct case–lexical and aspectual. How can the interaction between these two independent sources of direct case be captured in a principled way? In what follows I develop a highly modular approach to direct case-marking within LFG (Bresnan (ed.) 1982, Kaplan and Bresnan 1982, Dalrymple et al. (eds.) 1995, Bresnan forthcoming). Specifically, I will propose that direct case is induced by the argument structure feature [-r(estricted)] (Bresnan and Kanerva 1989, Bresnan and Zaenen 1990) and by the semantic structure feature [ADD(itivity) +]. I then consider the consequences of this proposal for case alternation phenomena in Korean.

4 Grammatical Case in LFG

4.1 The Formal Framework

The crucial interaction between several different modules of grammar and case marking that we saw in previous sections can be naturally captured by the LFG's correspondence-based architecture of linguistic information, where parallel but separate levels of grammatical representation are related to each other not by derivation but by local structural correspondences (Dalrymple et al. (eds.) 1995, Butt, Dalrymple and Frank 1997).[5] The overall architecture is depicted in (9):

(9)   c-str: a-str: f-str: s-str:

$$\begin{array}{llll}
 & \alpha & \left[\begin{array}{l}\text{REL READ}\\ \text{EXT.}\theta\ [\ ]\\ \text{INT.}\theta\ [\ ]\end{array}\right] \lambda & \left[\begin{array}{ll}\text{PRED} & \text{`read'}\\ \text{GF1} & [\ ]\\ \text{GF2} & [\ ]\end{array}\right] \sigma & \left[\begin{array}{ll}\text{REL} & \text{READ}\\ \text{EXT.ARG} & [\ ]\\ \text{INT.ARG} & [\ ]\end{array}\right]\\
\text{V} & & & \\
| & & & \\
\text{read} & & & \\
& & \varnothing = \alpha \circ \lambda &
\end{array}$$

In (9) the α projection function maps nodes of the c(onstituent)-structure tree to pieces of the a(rgument)-structure. A-structures are related to f(unctional)-structures by the linking function λ, and f-structures to s(emantic)-structures by the projection function σ. The projection ∅ relating the c-structure to the f-structure can be seen as a composition of the α and λ functions.

Some of the details of the s-structure are not relevant to the current discussion. What is relevant is the distinction between delimited events and non-delimited events,[6] and the particular s-structure associated with delimited events. I propose a feature-based s-structure in which delimiting roles and non-delimiting roles are distinguished by the feature [ADD(itivity) +/-] (see the discussion in section 3). I further assume that s-structure and a-
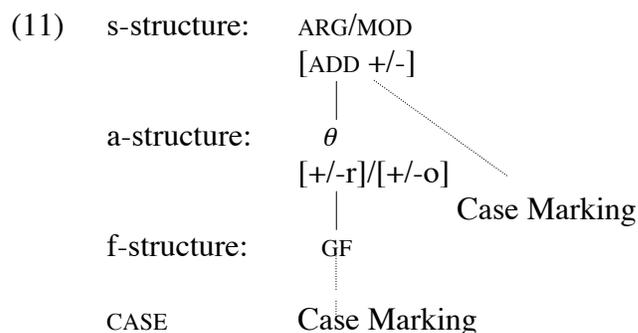
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structure encode a distinction between external argument, internal argument and arguments that are neither internal nor external. Following Grimshaw (1990), I define an external argument as an argument that is most prominent in both a-structure and s-structure (Aspectual Tier in Grimshaw (1990)). In accusative languages like English, it must map to the subject function. An internal argument is the kind of argument that can alternatively map to an object or to a subject function. Arguments that are neither internal nor external, which we can call *indirect arguments*, can only be expressed as oblique functions.

The elements of a-structure, expressed as thematic relations, are linked to grammatical functions via the two features [+/-o] (objective or not) and [+/-r] (thematically restricted or not):

(10)　　Grammatical Functions　　　　Features
　　　　SUBJ　　　　　　　　　　　　[–r, –o]
　　　　OBJ　　　　　　　　　　　　 [–r, +o]
　　　　OBJ*θ*　　　　　　　　　　 [+r, +o]
　　　　OBL*θ*　　　　　　　　　　 [+r, –o]

Only subjects and objects are [-r]; obliques and restricted objects are [+r]. The feature [-o] refers to a *nonobjective* syntactic function, the kind of function which complements intransitive predicators such as N or A. Only subjects and obliques are [-o]; objects and restricted objects are [+o].[7]

The type of representation that I will use for Korean case marking is given in (11).

(11)　　s-structure:　　ARG/MOD
　　　　　　　　　　　 [ADD +/-]
　　　　　　　　　　　　　|
　　　　a-structure:　　θ
　　　　　　　　　　　 [+/-r]/[+/-o]
　　　　　　　　　　　　　|　　　　　　Case Marking
　　　　f-structure:　　GF

　　　　CASE　　　　Case Marking

This type of multi-dimensional representation thus allows us not only to characterize semantics (i.e., delimitedness of an event) independent of grammatical function and thematic relations but also to clarify the domain of grammatical case assignment, which has not been given precise representation in most formal theories of case. Given the conception of

interacting information structures outlined above, case marking conventions can be keyed to either grammatical function values of arguments (defaults as indicated by broken lines) or semantic/aspectual properties of dependents, and this is precisely the kind of situation we would expect to find.[8] With these preliminaries, we turn to semantically conditioned grammatical case in Korean.

4.2 The Analysis of Adverbial Case Marking

As noted in section 2, the nominative/accusative split in Korean reflects the external and internal argument distinction. Accusative is the case of objects and delimiting adjuncts of a predicate which takes an external argument as a subject. Nominative is the case of arguments available for direct case and delimiting adjuncts of a predicate which takes a subject with the aspectual prominence of the internal argument as well as the case of subjects. In other words, it is clear that the case markers in Korean provide clause-level information such as the externality and the internality of the clause subject, apart from just information about their immediately dominating NP.

This function of case morphology is naturally captured by the LFG model of constructive case developed by Nordlinger (1998). In this model, instead of the verb's lexical entry determining the case of its arguments, case-markers themselves construct the grammatical relations of arguments to the verb. When a case marker is specified with constructive case, it contributes information about the higher f-structures within which it is contained, via an 'inside-out' (IO) function application (e.g. (SUBJ ↑)), as well as providing the traditional case features.[9] As an illustration of how this system works, take (12) and (13), which show the information carried by the Korean nominative case markers *-i/ka* and the accusative case markers *-(l)ul* respectively:

(12)   *-i/ka*:   (SUBJ ↑)
                    (↑ CASE) = NOM
(13)   *-(l)ul*:   (OBJ ↑)
                    (↑ CASE) = ACC

These case markers carry two pieces of information: (i) that the innermost f-structure to which the case marker belongs (i.e. that denoted by ↑) is the value of the SUBJ attribute ((12)) and the OBJ attribute ((13)) of the immediately higher f-structure denoted by (SUBJ ↑

)); (ii) that the f-structure denoted by ↑ (i.e. that to which case marker belongs) contains the information CASE NOM ((12)) and CASE ACC ((13)).

This approach to case marking also provides a natural analysis for the hybrid category of Korean direct case as semantically conditioned grammatical case. The appearance of the accusative case on both objects and adjuncts can be captured by modifying the lexical entry in (13) to include an ADJ, as in (14). Thus, the accusative case marker in Korean can construct two grammatical relations.

(14)　　*-(l)ul*:　(↑ CASE) = ACC
　　　　　　　　　(OBJ ↑) ∨ (ADJ ↑)

The grammatical function alone will not account for the distribution of the accusative case, since its distribution is restricted to a clause with the subject that has the aspectual prominence of an external argument. Under the present model this can be easily captured by encoding the semantic restriction into the accusative case marker, as in (15).

(15)　　σ(((GF ↑) SUBJ)) = EXT.ARG
　　　　　($↑_\sigma$ ADD) = +
　　　　　((GF ↑) ASP) = DELIM

In this entry, σ is a projector defining a mapping from f-structure to s-structure and $↑_\sigma$ represents the semantics associated with the f-structure denoted by ↑ (i.e. that to which the case marker belongs). Thus, the equation σ(((GF ↑) SUBJ)) = EXT.ARG identifies the SUBJ of the clause (represented by ((GF ↑))) with the external argument in s-structure. Importantly, the use of the accusative to mark situation delimiters is captured by the two additional equations. The equation ($↑_\sigma$ ADD) = + encodes the fact that the nominal to which the accusative marker belongs has the semantic property of ADDITIVITY, and the equation ((GF ↑) ASP) = DELIM specifies the clause as having the aspect value DELIM(ITED).[10]

The use of the accusative marker to mark non-situation delimiter OBJs can be captured by assuming that it has an alternative specification for the ADDITIVITY of the nominal to which it belongs, as in (16).

(16)　　($↑_\sigma$ ADD) = −
　　　　　(OBJ ↑)

In the same way, the alternative functions of the nominative case markers can be captured by the following modified lexical entry, where α is a projector defining a mapping from f-structure to a-structure.

(17)   *-i/ka*:   (↑ CASE) = NOM
                    (SUBJ ↑)
                    ∨
                    (ADJ ↑)
                    α(((GF ↑) SUBJ)) = INT.θ
                    (↑ₐ ADD) = +
                    ((GF ↑)) ASP) = DELIM
                    ∨
                    (OBJ ↑)
                    α(((GF ↑) SUBJ)) = INT.θ

(17) encodes the information that the subject of the clause to which the case marker attached to an adjunct belongs is an internal argument at the level of a-structure as well as the aspect information of the clause.

The lexical entries in (15) and (17) correctly predict the restriction of accusative objects and adjuncts to clauses with an external argument at **s-structure** and nominative objects and adjuncts to clauses with no external argument at **a-structure**. In what follows I will show two phenomena where this prediction turns out to be true: case marking in adversity passives and regular lexical passives in Korean.

Korean has so-called adversity passives or affected constructions, which are formed with the affixes in the same form as the passive and causative morphemes but exhibit interesting case-marking properties quite different from ordinary passives. For example, in adversity passives multiplicative adverbials may not take the nominative, as in active sentences (see (1) and (2)). In passive sentences with an inanimate subject, however, multiplicative adverbials must occur in the nominative. Relevant contrasts are provided in (18) and (19), examples taken from Kim and Maling (1993: 369).

(18)   Chelsoo-ka   kay-eykey   sey pen-ul/??i   mwul-li-ess-ta.
        Chelsoo-NOM   dog-by   three times-ACC/NOM   bite-PASS-PAST-DECL
        'Chelsoo got bitten by a dog three times.'
(19)   Mun-i   cecello   twu pen-i/*?ul yel-li-ess-ta.
        door-NOM   by itself two times-NOM/*?ACC open-PASS-PAST-DECL
        'The door opened two times by itself.'

There is independent evidence that the adversity passive in Korean has an external argument. First, the subject of the adversity passive exhibits the same sort of control property as that of an active sentence, controlling participial adjuncts (see Kim and Maling (1993) for relevant examples). Secondly, the part NP in the part-whole construction (or inalienable possession constructions) can be marked accusative in the adversity passive, but cannot if the subject (or the whole NP) is inanimate.[11] These are precisely what is expected if the adversity passive has an external argument.

Kim and Maling (1993) argue that the lexical passive morpheme is structurally ambiguous between an active and a true passive, as sketched in (20) (the * indicates recursion) and that case marking on multiplicative adverbials and part NPs reflect this structural ambiguity.

(20)   a. [$_{NP}$ EXP] [$_{VP}$ (NP-ACC*)   V-lex.pass]
        b. [$_{NP}$ e   ] [$_{VP}$ (NP-NOM*)   V-lex.pass]

There are, however, passive sentences in which adverbials can be marked either accusative or nominative. Consider the example given in (4) above, repeated here:

(21)   Chayk-i   haysayng-tul-eyuyhay   twu sikan-ul/i   ilk-hi-ess-ta.
        book-NOM student-PL-by   two hours-ACC/NOM   read-PASS-PAST-DECL
   'The books were read by the students for two hours.'

Example (19) describes the event that can occur spontaneously without an external argument, which is involved in an activity or is the causer in the initial subevent in an accomplishment event structure (Grimshaw 1990, Levin and Rappaport Hovav 1995). The compatibility with the adverbial *cecello* 'by itself' indicates the absence of an external argument in the event described by (19). In contrast, (21) describes the event intentionally brought about by the suppressed external argument and hence is incompatible with *cecello* 'by itself'. This means that the external argument suppressed by the morphological operation on a-structure is still present at s-structure, even though it is not available for argument linking.

(22)   *Chayk-i   cecello   ilk-hi-ess-ta.

book-NOM   by itselfread-PASS-PAST-DECL
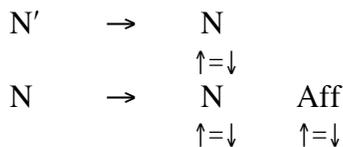
'The book was read by itself.'

The possibility of both the accusative and nominative in (21) cannot be explained by the syntactic ambiguity analysis because the sentence itself is not ambiguous. It is also important to note that the case on the delimiting adverbials does not necessarily copy the case of the arguments. So the observed adverbial case pattern cannot be accounted for solely by case agreement or spreading. The constructive approach to case marking taken here, coupled with the parallel structure approach in LFG, provides a simple answer to this problem. The adverbial can be associated with the nominative since it is the case of dependents of the predicates which lack an external argument at a-structure. It can also be associated with the accusative by virtue of its function as a delimiter of the event brought about an intensional agent; it indicates the presence of the external argument at s-structure.

Let us now see how this analysis of case marking interacts with the rest of the Korean clause structure. Following the analysis of phrase structure proposed by by Sells (1994) and Cho and Sells (1995) for Korean and Fukui (1995) for Japanese, I assume that the phrase structure for Korean is characterized by the presence of an exocentric category S. The basic schema for c-structure and the basic rule for nominal constituents that I assume for Korean are in (23) and (24).

(23)   The basic schema for c-structure

$$(\uparrow (\text{GF})) = \downarrow \qquad \uparrow = \downarrow$$
$$\text{Y}' \qquad\qquad \text{V}'$$
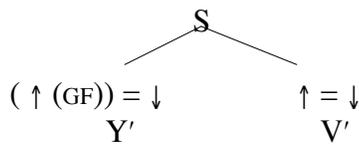
(24)   The basic rule for nominal constituents

$$\text{N}' \quad \rightarrow \quad \text{N}$$
$$\qquad\qquad\qquad \uparrow = \downarrow$$
$$\text{N} \quad \rightarrow \quad \text{N} \qquad \text{Aff}$$
$$\qquad\qquad\qquad \uparrow = \downarrow \qquad \uparrow = \downarrow$$

The subject *chayk-i* 'book-NOM' of the passive sentence in (21) then has the morphological structure in (25a), projecting the f-structure in (25b).

(25)   a.

N′
|
↑=↓
N
         ⟋   ⟍
↑=↓   ↑=↓
N   Aff
| |
chayk   -i

b. f_2 [SUBJ f_1 [PRED 'book' / CASE NOM]]
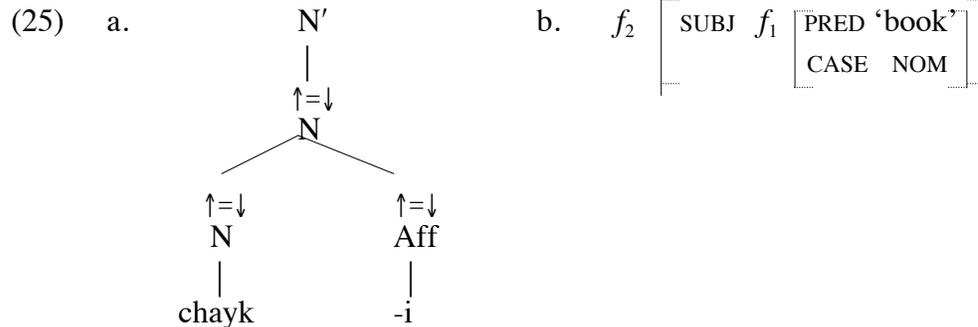
Rather than simply providing the traditional case feature NOM for a lower f-structure, namely f_1, the case markers also carry information about how it participates in the larger structure f_2. Thus, in this analysis, a nominal inserted into the syntax already constructs its grammatical function by virtue of the case marker attached to it. The information associated with the other constituents of the sentence (21) and their c-structure are given in (26).

(26)   a. *ilk-hi-ess-ta*:   (↑ TENSE) = PAST
                                (↑ PRED) = 'read < (EXT.θ), INT.θ >'

b.
f_3 [TENSE PAST / PRED 'read < (EXT.θ), INT.θ >' / SUBJ [ ]]

c. *twu sikan-ul*: (ADJ ↑)
                (↑ PRED) = 'hours'
                ((GF ↑) ASP) = DELIM
                (↑ CASE) = ACC
                (↑ ADJ PRED) = 'two'

d.
f_4 [ASP DELIM / ADJ [f_5[PRED 'hours' / CASE ACC] / ADJ [PRED 'two']]]

e. *twu sikan-i*: (ADJ ↑)
                (↑ PRED) = 'hours'
                ((GF ↑) ASP) = DELIM
                (↑ CASE) = NOM
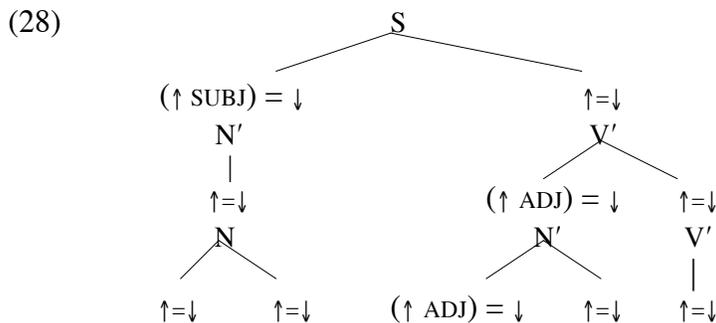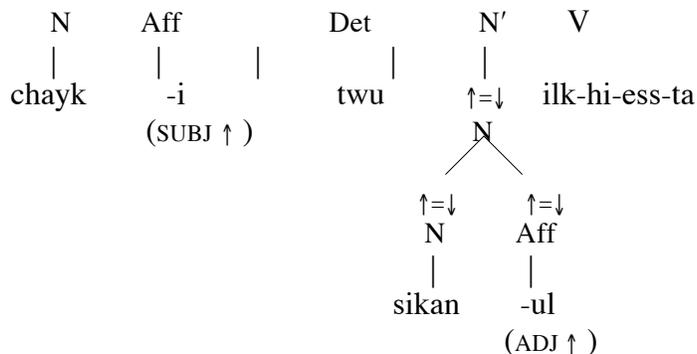   (↑ ADJ PRED) = 'two'

f.
f_6 [ASP DELIM / ADJ [f_7[PRED 'hours' / CASE NOM] / ADJ [PRED 'two']]]

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The f-structure (f_3) associated with the passive verb (26b) is unified with the f-structure (f_2) for its argument (25b) and the f-structure (f_4) for the accusative adverbial (26d), resulting in the f-structure associated with S as a whole in (27a); when the f-structures f_2 and f_3 get unified with f_6, that projected from the nominative adverbial, we get the f-structure for the whole S in (27b). The unification is shown below with the partial s-structure associated with a suppressed argument, SUBJ and ADJ.

(27)　a.

$$
\begin{bmatrix}
\text{TENSE} & \text{PAST} \\
\text{ASP} & \text{DELIM} \\
\text{PRED} & \text{'read} < (\text{EXT.}\theta)\ \text{INT.}\theta >\text{'} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'book'} \\ \text{CASE} & \text{NOM} \end{bmatrix} \\
\text{ADJ} & \begin{bmatrix} \text{PRED} & \text{'hours'} \\ \text{CASE} & \text{ACC} \\ \text{ADJ} & [\quad\text{PRED}\quad\text{'two'}] \end{bmatrix}
\end{bmatrix}
\quad (=f_2+f_3+f_4)
$$

σ: [EXT.ARG students]
σ₂: [INT.ARG book]

σ₄: $\begin{bmatrix} \text{MOD} & \begin{bmatrix} \text{REL for} \\ \text{ARG […]} \\ \text{ADD +} \\ \text{DURATION two} \end{bmatrix} \end{bmatrix}$

hours

b.

$$
\begin{bmatrix}
\text{TENSE} & \text{PAST} \\
\text{ASP} & \text{DELIM} \\
\text{PRED} & \text{'read} < (\text{EXT.}\theta)\ \text{INT.}\theta >\text{'} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'book'} \\ \text{CASE} & \text{NOM} \end{bmatrix} \\
\text{ADJ} & \begin{bmatrix} \text{PRED} & \text{'hours'} \\ \text{CASE} & \text{NOM} \\ \text{ADJ} & [\ \text{PRED}\quad\text{'two'}\ ] \end{bmatrix}
\end{bmatrix}
\quad (=f_2+f_3+f_6)
$$

σ: [EXT.ARG students]
σ₂: [INT.ARG book]

σ₆: $\begin{bmatrix} \text{MOD} & \begin{bmatrix} \text{REL for} \\ \text{ARG […]} \\ \text{ADD +} \\ \text{DURATION two hours} \end{bmatrix} \end{bmatrix}$

The c-structure for the sentence (21) with the accusative adverbial is given below.

(28)

```
                          S
              _____/ _____
        (↑ SUBJ) = ↓              ↑=↓
             N′                    V′
             |                 ____/ \____
            ↑=↓          (↑ ADJ) = ↓      ↑=↓
             N                N′           V′
          __/ \__          __/ \__         |
        ↑=↓    ↑=↓   (↑ ADJ) = ↓  ↑=↓     ↑=↓
```

14

```
        N       Aff          Det        N′      V
        |        |       |     |        |
      chayk     -i             twu     ↑=↓    ilk-hi-ess-ta
              (SUBJ ↑ )                 N
                                       / \
                                    ↑=↓   ↑=↓
                                     N     Aff
                                     |      |
                                   sikan   -ul
                                        (ADJ ↑ )
```

Notice how the information about grammatical function from two sources, namely case morphology and the annotation in the phrase structure, combines to constrain each other in order to produce a consistent and coherent analysis of the clause: the IO designator (e.g. (SUBJ ↑)) associated with the case markers constructs the object and adjunct relations, identifying the f-structure associated with the nominal in N as its value. The (OBJ ↑) = ↓ and (ADJ ↑) = ↑ annotations in the c-structure likewise identify the f-structure for N with the object function of the clause. Therefore, unification of the information projected from the two sources is possible.

An analysis of case that does not treat case morphology as clause-level information will have difficulty accounting for the function of direct cases to place a semantic requirement on the clause. In contrast, since in this analysis the IO designator (e.g., (SUBJ ↑)) carried by case markers refers directly to the clause, other types of extended functions of case to contribute information to the clause as a whole can receive a unified account. Although this effect could also be achieved by allowing phrase structure to represent information other than grammatical categories through the use of functional categories (e.g., AspP, AgrOP, etc.), one of the strengths of this approach is that it provides a unified account for many extended functions of case that have been seldom investigated from an integrative perspective in most formal accounts of case. In particular, the constructive approach to direct case assignment is further supported by the data that involve non-aspectual adverbials, case alternations in movement verb constructions and post-verbal negation. See Lee (1999) for detailed discussion of how the case-marking properties of non-aspectual adjuncts, path/place expressions and main verbs in post-verbal negation constructions follow from constraints simultaneously imposed by a-structure and s-structure.

5 Conclusion

In this paper I have demonstrated that the hybrid category of semantically conditioned grammatical case and dynamic relations between case morphology and different modules of the grammar can be given a natural analysis in LFG's model of mutually constraining information. The basic point is that a promising account of the extension of the domain of grammatical case assignment beyond arguments can be formulated by referring to independently motivated and necessary dimensions of information. These dimensions include the semantic properties of a clause and verbal dependents, the argument structure configuration of a predicate, and grammatical relations.

Notes

[1] The initial *l* of the accusative marker *-lul* is elided when it immediately follows a consonant. Also the nominative marker is *-ka* after a vowel and *-i* after a consonant. The accusative case marking is generally optional in Korean for arguments as well as adverbials, and this optionality will not be indicated with parentheses in the examples.

[2] The abbreviations used in this paper are as follows: ACC 'accusative', ADJ 'adjunct', AFF 'affix', ASP 'aspect', CL 'classifier', COMP 'complementizer', DAT 'dative', DECL 'declarative sentence ending', LOC 'locative', NEG 'negation', NOM 'nominative', PASS 'passive suffix', PAST 'past tense suffix', PL 'plural marker', TOP 'topic'.

[3] Bjoern Wiemer (in the LINGTYP archives) pointed out that Polish also distinguishes temporal adverbials syntactically from arguments in that they do not change genitive morphology if the respective transitive predicate is negated. However, it is intriguing that in colloquial speech these adverbials are sometimes subject to the accusative-genitive alternation, like direct objects. The same is true in Finnish, Lithuanian and Russian (Haspelmath 1997).

[4] Maling (1989) gives the example below, in which the durative adverbial *twu-sikan-tongan-ul* 'for two hours' bears accusative case as a modifier of the non-stative verbal noun *swuli-ka* 'fixing-NOM' combined with the passive auxiliary verb *toy-ess-ta*, while the verbal noun *swuli-ka* is nominative, in contrast.

Cha-ka twu sikan-tongan-ul/*i	swuli-ka	toy-ess-ta.
car-NOM two hours-during-ACC/*NOM	fixing-NOM	become-PAST-DECL
'The car got fixed for two hours.'		

[5] See Kaplan 1995 for the formal theory of correspondence.

[6] This classification of event types has been adopted by a number of different linguists including Mourelatos (1981), Bach (1986), Moens and Steedman (1988), Jackendoff (1990), Tenny (1994) and Ritter and Rosen (1998).

[7] Not all languages make use of all these possibilities. See Bresnan and Kanerva (1989), Bresnan and Moshi (1990), Bresnan and Zaenen (1990) and Alsina and Mchombo (1993) for the most common formulations of linking theory in LFG.

[8] See Mohanan and Mohanan (1990), Mohanan (1994), Ackerman (1995) for applications of this multidimensional approach to case marking in Hindi, Malayalam and Polish.

[9] Inside-out function application is well-established in LFG through the use of Inside-out function uncertainty to model such things as anaphora and topicalization (e.g. Bresnan (forthcoming), Dalrymple (1993), Halvorsen and Kaplan (1988)).

[10] This is analogous to Nordlinger's analysis of the function of the Kayardild case to mark mood/tense/aspect.

[11] The adversity passive also exhibits two properties characteristic of a causative construction, argument addition and no case absorption (see Chung (1993) for detailed discussion).

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Another definition distinguishes grammatical categories from lexical categories, such that the elements in a grammatical category have a common grammatical meaning - that is, they are part of the language's grammatical structure.Â The concept of `semantic field', like the concept of `semantic frame', opened up new domains of semantic research, first in Germany in the 1930s and then in the United States in the 1970s.Â A grammatical category is a property of items within the grammar of a language; it has a number of possible values (sometimes called exponents, or grammemes), which are normally mutually exclusive within a given category. Grammatical functions play an essential role in Lexical Functional Grammar; however, they have no intrinsic significance and are situated at the interface between the lexicon and the syntax. LFG imposes the restriction of Direct Syntactic Encoding, which prevents any syntactic process from altering the initial assignment of grammatical function. Each lexical entry consists of a pairing of arguments and grammatical functions.Â It is also possible have constraint equations in a lexical entry; in such a case the f-structure would only be well-formed if the equation holds, but the information expressed by the equation would not be added to the functional structure. Lexical functional grammar (LFG) is a grammar framework in theoretical linguistics with constraint-based and generative varieties. It is a type of phrase structure grammar, as opposed to a dependency grammar. The development of the theory was initiated by Joan Bresnan and Ronald Kaplan in the 1970s, in reaction to the direction of research that transformational grammar was taking. It mainly focuses on syntax, including its relation with morphology and semantics.Â The LFG conception of language differs from Chomskyan theories, which have always involved separate levels of constituent structure representation being mapped onto each other sequentially, via transformations. The LFG approach has had particular success