WORD ORDER, WORD ORDER FLEXIBILITY AND THE LEXICON

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1. INTRODUCTION

In this paper, I would like to address two related issues for which independent accounts have been sought in general: Locating the basic word order and word order flexibility of a language in the linguistic system. I believe that a theoretical treatment of these issues must come in a single package, preferably not specific to word order alone but as part of other combinatorial properties of grammar (since word order is a precedence relation, the other relation in this respect is dominance, i.e. constituency).

The theoretical assumptions about linguistic architecture and the role that word order is expected to play in a theory are crucial factors in locating the word order. For example, the transformationalist tradition—up to the Minimalist Program MP (Chomsky 1995)—considers word order in S-structure, in D-structure (e.g. McCawley 1970) and in PF (the latter for stylistic changes in word order). Locating it in D-structure was motivated by an attempt to relate word order and scope in the earlier multi-tiered transformationalist achitecture. In MP, it is to be handled before or after Spell-out. For nontransformationalists, the current view of lexicalism (e.g. in Categorial Grammar, Head-driven Phrase Structure Grammar, and Lexical-Functional Grammar) brings the lexicon to the fore together with principles that act as constraints on combinatorial aspects of the grammar. In the type-logical tradition where logic is grammar, the issue can be left to a logic of concatenation defined model-theoretically for the categories in the lexicon (e.g. Morrill 1994).

It is interesting that the current trend in MP is also to take word order out of grammar (the computational system) but in the other direction, i.e. by leaving it to the PF interface (Chomsky 1995:334). Since there is no transformational component in lexicalist architectures, their degree of freedom for locating the word order and its flexibility is less than that of the transformationalist theories. All we have is a surface grammar (either in the form of a lexicalized grammar, or something akin to the c-structure of LFG) as a consequence of Universal Grammar (UG), and no mediation on the projection of lexically specified structures. Unless we set principles for word order per se, it leaves the logic, the lexicon, or the surface grammar as the locus of word order and word order flexibility. In this paper I look at the consequences of grammar architecture on word order options, and maintain that a lexical alternative which keeps the word order *and* word order flexibility within the lexicalized grammar is tenable and desirable.

2. LOCATING WORD ORDER IN COMPETENCE GRAMMAR, UG OR THE LEXICON

Hawkins (1994, 2002) claims that both of the combinatorial properties (i.e. precedence and dominance) are shaped by processing constraints that sieve out computationally difficult but theoretically possible syntactic structures. Noting that there is no systematic relation of word order and pragmatics cross-linguistically, his theory is based on structural and procedural features: Immediate Constituents (ICs), Mother Node Construction (MNC), and Early Immediate Constituents (EICs). MNC and EIC are considered to be performance-driven constraints on a competence grammar that delivers ICs:

(1) Mother Node Construction (Hawkins 1994:62):

> In the left-to-right parsing of a sentence, if any word of syntactic category C uniquely determines a phrasal mother node M, in accordance with the PS rules of the grammar, then M is immediately constructed over C.

Early Immediate Constituents (ibid.:78):

> The human parser prefers linear orders that maximize the IC-to-non-IC ratios of constituent recognition domains. Orders with the most optimal ratios will be preferred over non-optimal counterparts in the unmarked case; orders with non-optimal ratios will be more or equally preferred in direct proportion to the magnitude of their ratios. For finer discriminations, IC-to-non-IC ratios can be measured left-to-right.

Hawkins tacitly assumes S-structure to be a level of representation because the EIC metric operates on the complexity of incomplete structures projected by the parser via principles such as MNC. This is a more parsimonious assumption than derivational theory of complexity which assumes both D-structure and S-structure as a level of representation because the structural difference is measured in the latter as a distance between D-structure and S-structure. But Hawkins leaves open the nature of competence grammar and its interaction with performance. For example, a) the competence grammar may only handle dominance by delivering unordered S-structures, leaving precedence to performance working with the EIC principle to linearize the trees, b) the competence grammar may define dominance completely and precedence partially, e.g. by fixing the position of heads and leaving the rest of linearization to performance via EIC, and c) the competence grammar may define both dominance and precedence. If word order is flexible in a language, options like (c) require all variations to be structurally different hence the very notion of basic word order may become questionable (as Hawkins noted). The definition of EIC in (1) also allows suboptimal word orders to be conventionalized as basic. These considerations indicate that rigidity and flexibility of word order may pull the competence-performance interaction and the nature of competence grammar in different directions cross-linguistically, and the

metric requires an extra level of representation in the grammar (S-structure) to formulate word order properties.

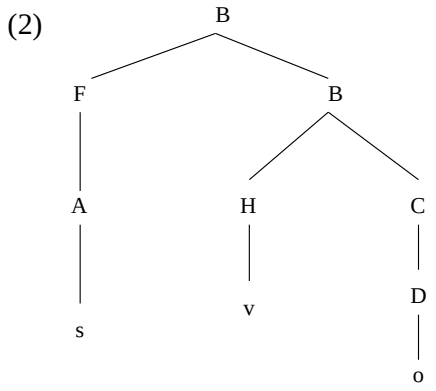
Kayne (1994) locates word order in UG. He dispenses with the directionality parameter in UG by positing a universal Specifier-Head-Complement ordering (i.e. Subject-Verb-Object, or SVO). There are no principles for word order alone because, via the asymmetric c-command, dominance completely determines precedence: The Linear Correspondence Axiom (LCA) postulates that only structures whose closure on asymmetric c-command relation is a total ordering of all terminals are valid phrase structures. This position has the consequence that the competence grammars—if we take competence grammar as the adult state of the initial state UG—of majority of languages obtain their basic word orders by movement; SVO languages constitute 42% of the world's languages. Kayne claims that such movement is always leftward. SOV derives from SVO by movement of O to the left of the head V, to a specifier position. VSO is leftward movement of the head V. Less frequent basic word orders OVS and VOS are leftward movements of OV or VO. OSV is the leftward movement of O to a higher head.

Apart from considerable cross-linguistic variation from UG to attain basic word orders, there is also the question of word order flexibility within a language. For example, for a VSO language which attains its basic word order by leftward movement of V, we would expect movement past S to be relatively frequent. Hence the VOS order, the leftward movement of O from the basic order VSO, would be common. Steele (1978) confirms that this is indeed the case: All VSO languages that allow variation have VOS, but not necessarily other word orders. Similarly, an SOV language has leftward movement past V, hence OSV would be expected if there is variation. This too is confirmed; most SOV languages have OSV as alternate word order. But the VSO analogue of OSV-from-SOV to reach OVS, i.e. the continuation of leftward movement of O past S, is not common at all (Dutch and German allow OVS, but in marked constructions (see e.g. Schlesewsky et al. 2000 for German), and as such their handling might appeal to reversal of directionality rather than basicness of OVS; cf. Section 3).

All variation of word order must of necessity be due to structural differences in Kayne's theory, unlike Hawkins (1994); there is no liberty for dominance to underspecify precedence. The UG word order Specifier-Head-Complement has the phrase structure in (2) according to Kayne (uppercase letters represent nonterminals, and lowercase letters, terminals). With Kayne's formulation of specifiers, heads, asymmetric c-command and adjunction, the phrase marker in (2) satisfies LCA since it gives a complete precedence ordering of the terminals s (the specifier), v (the head), o (the complement), denoted by ordered pairs <s,v>, <s,o> and <v,o>. <s,v> and <s,o> hold because F asymmetrically c-commands H and D. <v,o> holds because H asymmetrically c-commands D. VSO is obtained from the phrase marker in (2) by leftward movement of v as in (3), leaving the trace t(v). Note that (3) can only provide vso sequence of terminals because H asymmetrically c-commands A and D (hence <v,s> and <v,o>), and A asymmetrically c-commands D. Because of the latter condition, we have <s,o>, and not <o,s>. <v,s> and <v,o> alone would underspecify relative ordering of s

and o by allowing both vso and vos, but asymmetric c-command (hence LCA) disallows underspecification.

(2)



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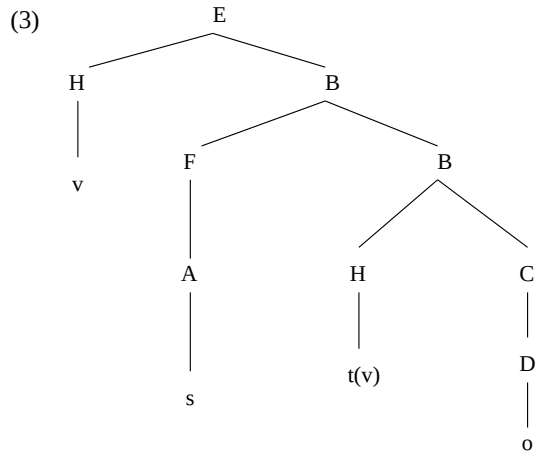

Similarly, SOV is obtained from the purported universal SVO as in (4). According to Kayne, C must move to a specifier position to the left of the head, and since B cannot have more than one specifier (a consequence of asymmetry), we have something like (4) for SOV, not (5). In (4), the subject F is neither the specifier (E≠B), the head, nor a complement. But, crucially, A asymmetrically c-commands D and H, and C asymmetrically c-commands H, hence we have the total ordering sov. The osv order could originate only from another phrase structure. If multiple adjunction of nonheads were allowed, (5) could yield both sov and osv because, in (5), A and D would c-command each other hence we cannot infer an ordering of s and o except with respect to v.

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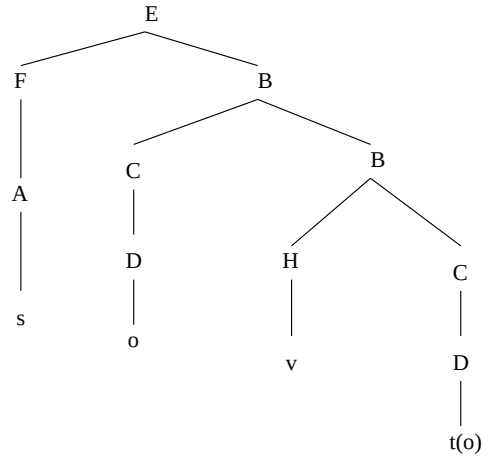

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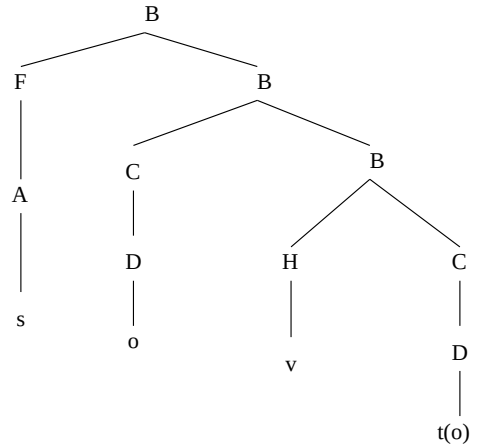


Since there is no room for underspecification of precedence, and dominance determines precedence completely, it follows that all leftward movements and all variations from SVO must be structurally distinct in any language. Objections to such predictions came from several fronts. I reiterate the ones from SOV languages, Turkish in particular. Kural (1994) and Kornfilt (1998) regard base-generation of O as lower D in (4) to be incongruent with the facts of quantifier scope in Turkish; postverbal quantifiers can outscope preverbal quantifiers, and this is possible only with rightward (and upward) movement. Göksel (1998) shows that scope is sensitive to linearity, independent of the dominance relations, such as the 'focus' as a pre-verbal position. Temürcü's (2001) data on scope and binding properties of various word orders indicate that OVS behaves exactly like SOV in Turkish (6), and, somewhat less consistently, SVO like OSV. If this is

indeed the case, then they must share the same phrase structure, but this is impossible in Kayne's approach because OVS and SOV orders must be the consequence of different dominance characteristics. Underspecification of precedence—even when allowed—could not bring OVS and SOV under the same structural description either. For example, the phrase structure in (5) would allow both so and os because there is no asymmetric c-command relation between A and D, but <s,v> (and <o,v>) is maintained hence vs order is not possible in (5).

(6)	SOV	OVS
a.	Adam$_i$ kendini$_i$ gördü. man.NOM self-ACC saw 'the man saw himself.'	a'. Kendini$_i$ gördü adam$_i$.
b.	*Kendi$_i$ adamı$_i$ gördü. self.NOM man-ACC saw	b'. *Adamı$_i$ gördü kendi$_i$.
c.	Herkes üç kişiyi gördü. every.NOM three person-ACC saw 'everybody saw three people.' All (S) > 3 (O) 3 (O) > All (S)	c'. Üç kişiyi gördü herkes. All (S) > 3 (O) 3 (O) > All (S)
d.	Üç kişi herkesi gördü. three people.NOM every-ACC saw 'three people saw everbody.' 3 (S) > All (O)	d'. Herkesi üç kişi gördü. 3 (S) > All (O)

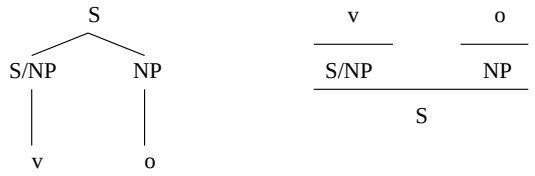
Such considerations seem to indicate that dominance and precedence are orthogonal concepts. The encoding of both relations must be in the formal vocabulary of a grammatical theory. This notion is quite common in lexicalist theories. I sketch in section 3 a monostratal way of achieving this in Categorial Grammar. As common ground I take Kayne's insight that asymmetry of linear order projects itself up to constituency. The point of departure will be whether the inheritance of asymmetry has to start from a universal base hypothesis, or a lexicalized word order hypothesis (i.e. word order in a lexicalized grammar) might predict systematic patterns of constituency and precedence in a language.

Although Hawkins-style functional explanation of word order phenomena is appealing, it can only provide reasons for the tendencies in the world's languages; although OVS and OSV basic word orders are quite rare,[1] around 4% in Tomlin's (1986) database, they are not non-existent, hence all combinations of S, O and V are potential candidates for becoming the basic word order in some language. Thus it is interesting to observe that languages show SO/OS *word order* asymmetry, justified by Hawkins (2002) in terms of the antecedent's overwhelming tendency to precede anaphors, and topics to precede dependent predication (but cf. Newmeyer (2002) for criticism on both counts). But, both SO and OS constituency are possible and empirically testable, and the asymmetry in their *surface constituency* is quite revealing for syntax because their nontraditional constituency allowed by an invariant UG puts different demands on the verb's surface category, i.e. on basic word order. Hence it is perhaps less interesting but

more revealing and open to syntactic scrutiny if we start with an assumption that is not motivated by functional concerns but one that can fix *any* hypothesis about basic word order in the lexicon which 'faces' the UG without an intermediary. Then we can look at the consequences that follow from the hypothesis in syntactic constructions and see whether these are congruent with the facts. This is a feasible practice if our assumptions about UG are explicit and formulable. Competence then becomes acquiring the language-particular accessibility of UG rules, and stabilizing the categories of the words in the lexicon so that they can be produced and interpreted in syntactic constructions involving them.

Kayne's suggestion of no directionality parameter in UG leaves open another way to give the responsibility of word order to UG: We can move directionality to the lexicon where directionality options are shaped by a fully directional UG. In other words, specification and underspecification of precedence—but not underspecification of dominance—could be an emergent property of the lexicon (and only the lexicon). Steedman (2000b) advocates a view of UG that can instantiate such lexicons, along with certain principles that a theory of grammar and a theory of lexicon must adhere to.

Dominance and precedence need to be encoded in the lexicon as a corollary of this view. Along with its account of constituency and long-range dependencies, this has been the hallmark of Categorial Grammar (CG) ever since its inception to linguistics by Bar-Hillel (1953). For example, we can surmise with oversimplification for the sake of introduction as follows: If English children consistently place the object after the verb, consistent with early exposure to motherese (as in early two-word syntax such as 'catch doggie'), they might be considered to have stabilized the verbs in the lexicon to the syntactic category S/NP, which encodes precedence (NP is to the right of the verb which together yield an S^2), and dominance (S dominates NP). In ordered tree representation and the traditional leaves-on-top categorial notation:



Exposure to subjects to the left of the verb along with cooccurence of objects would further categorize the verb as (S\NP)/NP in which (S\NP)=VP dominates the object NP, and the subject NP is to the left of the verb. Their lexicon could not stabilize to (S/NP)/NP because, upon interpreting the verb-object sequence to obtain S/NP, the other expression needed for a full interpretation would be to the left of this sequence (the subject), and UG principles to be discussed below could not combine the NP-S/NP sequence, hence the message would be uninterpretable. Similarly, Turkish children might acquire S\NP from the object-verb messages and then refine it to (S\NP)\NP. Through exposure to SVO, which is the second most frequent word order they utter at early three-word syntax stage (Slobin and

Bever 1982), they might hypothesize (S\NP)/NP as well as (S\NP)\NP, or they might generalize to (S\NP)|NP to cover both kinds of expressions.[3] Both options would be compatible with the principles of UG because, if UG is fully directional, it is able to instantiate the lexical generalization | to either \ or /, and both instantiations succeed in interpreting the messages. But the child would not converge to (S\NP)/NP *alone* because some of the messages would not be interpretable: UG constraints cannot combine NP-X/NP sequence (e.g. for OV) to an interpretable expression of type X. If UG were not fully directional, then it might leave the lexical | as is. In this case, the question would arise as to how the child could know that the grammatical | always instantiates to \ for subjects and / for others in English, but never stays as |. There must be another principled way to keep e.g. English children from overgeneralizing to (S|NP)|NP. I now turn to lexical specification of word order in this vein based on Combinatory Categorial Grammar (CCG; Steedman 1996, 2000b; for a recent tutorial on CCG, cf. Steedman and Baldridge 2003).

3. PROJECTING WORD ORDER AND WORD ORDER FLEXIBILITY FROM THE LEXICON

Steedman (2000b:54) proposes the following principles as part of UG:

(7) a. The Principle of Adjacency:
Combinatory rules may only apply to finitely many phonologically realized and string-adjacent entities.

b. The Principle of Consistency:
All syntactic combinatory rules must be consistent with the directionality of the principal function.

c. The Principle of Inheritance:
If the category that results from the application of a combinatory rule is a function category, then the slash defining directionality for a given argument in that category will be the same as the one(s) defining directionality for the corresponding argument(s) in the function(s).

A few descriptions are in order. A syntactic type such as S\NP is a function category because of the slash; it is the syntactic counterpart of the interpretation of functions from entities (syntactically, NP) to propositions (syntactically, S). NP is not a function category. The principal function in a rule is the one that determines the overall result type. The systematicity of the syntactico-semantic linguistic types is made explicit in Categorial Grammar as e.g. (8).

(8) *read* := (S\NP)/NP : $\lambda x.\lambda y.$**read** *yx*

The word *read* is a lexical item whose structure-forming characteristic (both dominance and precedence) is specified by its syntactic type to the left of the colon, and its structured meaning to the right of the colon. Assuming that verbs

serialize consistently in a language,[4] the syntactic category can be generalized to TV=(S\NP)/NP. The lexicon encodes such combinatorial regularities, in contrast to MP's notion of lexicon, which only represents singularities (Chomsky 1995:130). For representation of structured meaning, I use lambda-calculus mainly to highlight the one-to-one correspondence of a syntactic type and its interpretation. λx is the interpretive counterpart of '/NP' because this category is the first argument to go in syntactic combination, and λx is the lambda binding for the first semantic argument *x*. Similarly, λy corresponds to '\NP'. **read** *yx* is the structured semantic expression signified by the word *read*.

It is clear from (7) that the kind of UG envisaged by CCG is purely combinatorial and only category-sensitive, and one which makes no reference to substantive categories such as S or NP. Steedman's Principle of Combinatory Type Transparency hypothesizes that natural languages draw on a small set of combinatorial options, and they turn out to be the kinds of things commonly associated with mathematical functions: application, composition, substitution. Their grammaticization as part of UG is constrained by (7). For example, function application can be (9a) or (9b), but not (9c-d), because (7b) eliminates (9c-d) from UG.[5] Similarly, (10a) and (10b) are possible, but not (10c), this time elimination being done by (7c) because the function Y/Z imposes '/' directionality for Z in the result.

(9) a. X/Y:*f* Y:*a* => X:*fa* (forward application: >)
b. Y X\Y => X (backward application: <)
c. *Y X/Y => X
d. *X\Y Y => X

(10) a. X/Y:*f* Y/Z:*g* => X/Z:$\lambda x.f(gx)$ (forward composition: >B)
b. Y\Z X\Y => X\Z (backward composition: <B)
c. *X/Y Y/Z => X\Z
d. X/Y Y\Z => X\Z (forward crossing composition: >Bx)
e. Y/Z X\Y => X/Z (backward crossing composition: <Bx)

These principles can be regarded as interpretability conditions on messages carried as concatenation of signs through a perceptual-articulatory modality (speech, gesture etc.). Dominance and relative precedence both project from the lexicon, and a grammar shaped by (7) preserves both properties.[6] Since structure-forming is now the responsibility of lexical items, their specification must encode both local and nonlocal behaviour in constructions headed by them. This is a meta-theoretical requirement that we need a theory of lexicon as well, most likely coextensive with a theory of grammar. Such a theory might predict the combinatorial properties of possible lexicons, given the combinatorial alternatives in the grammar. Steedman offers a principle for such a theory (11).

(11) The Principle of Lexical Head Government (Steedman 2000b:32):
Both bounded and unbounded syntactic dependencies are specified by the lexical syntactic type of their head.

A projection principle like (11) makes it the responsibility of heads to define the structure for the grammar to project. CG also appeals to duality principles for heads: Since a function expressed by the head specifies arguments, it is possible to visualize the same relationship from the perspective of the arguments by treating them as functions requiring functions looking for such arguments. The type raising schema in (12) accomplishes that as follows: If X is an argument, it is an argument of some syntactic function T (i.e., T\X or T/X). If it is a left argument of T (i.e., T\X), then the expression with category T\X is to the right of X which together yield T, hence the category T/(T\X) for X (similarly, for right arguments using (12b)). For example, the subject NP in English type raises as S/(S\NP); it needs a VP=(S\NP) to the right to become S.

(12) a. X => T/(T\X) (forward type raising: >T)
b. X => T\(T/X) (backward type raising: <T)

The 'T' in the type raising schema can be thought of as a lexical generalization for syntactic functions onto S, e.g. S, S\NP, S\NP/NP for English, and S, S\NP, S\NP\NP for Turkish. Type raising preserves dominance and precedence (Dowty 1988, Moortgat 1988). Such duality is the main source of flexible notion of constituency. For example, without (12), *John likes* could not be made a constituent in *John likes and Mary hates cats*; there is no empty category to make [*likes* _] a VP (cf. UG principle 7a). Furthermore, *John* is an NP, which is not a function category, and it corresponds to the inner '\NP' of the verb's category (S\NP)/NP, not to the outer '/NP' (the object). However, (10a) and (12a) can deliver it as a constituent (13).[7] The fact that type raising is structure- and order-preserving makes it a likely candidate to be part of UG. But its restriction of X to argument types (such as NP and PP) and T to lexical functors (verbs) make reference to substantive categories, hence it can be thought of as a lexical schema as well, as in Steedman and Baldridge (2003). Its potential for appearance in stages during language acquisition has been discussed by Dowty (1988) and Partee and Rooth (1983).

(13)

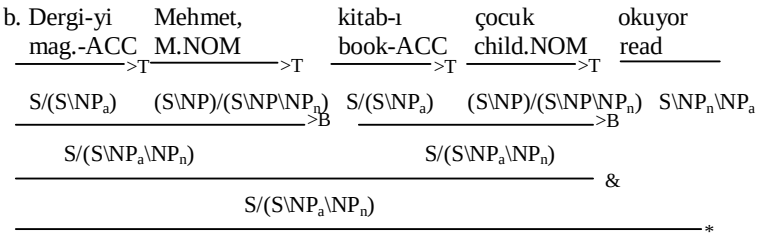
John	likes
NP	(S\NP)/NP
——>T	
S/(SNP)	
——————————>B	
S/NP	

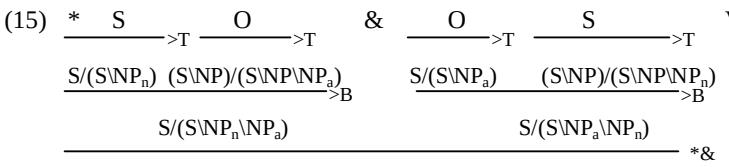
The principles outlined through (9-12) allow us to hypothesize lexical word orders and investigate the consequences of the hypotheses. This would amount to taking the closure of the lexicon on UG. Vennemann and Harlow (1977) is an early example of making a lexical assumption (VSO for Maori in their case) and scrutinizing it using the organizing principles of the lexicon (viz. consistent basic serialization, which allows the lexicon to systematically derive combinatorial characteristics of e.g. all verbs).

We can also appeal to the syntactic constructions that inextricably correlate constituency and word order to put such a combinatory lexicon to the test. Relativization and coordination are constructions of this kind. In particular, gapping (Ross 1970) is considered to be sensitive to basic word order because it applies to root sentences.[8] For example, the so-called nonconstituent coordination in Turkish shows a clear asymmetry. SO & SOV is possible in Turkish, and so is OS & OSV. However, *SO & OSV and *OS & SOV are impossible. If we stick to (7a), SO and OS must be constituents without the need of an empty category to handle coordination of like categories, but crucially, they must be different *kinds* of constituents to predict *SO & OSV and *OS & SOV. Assuming monotonic projection of lexical properties by the grammar, these facts require that we posit at least two word orders in the Turkish lexicon: $S\backslash NP_n\backslash NP_a$ for SOV, and $S\backslash NP_a\backslash NP_n$ for OSV.[9] (14) shows why they are necessary; without the first assumption, SO & SOV is impossible because SO constituency require an $S\backslash NP_n\backslash NP_a$ verb on the right (14a), and without the second, OS & OSV is not possible because OS constituency require an $S\backslash NP_a\backslash NP_n$ verb (14b). The other possibilities for the constituency of SO/OS allowed by the UG either demand a verb on the left or a non-verb-final verbal category (we show later in (19) that all these possibilities can be scrutinized one by one). Moreover, the two hypotheses predict *SO & OSV and *OS & SOV because coordination requires like categories, cf. the crashing derivation in the last line of (15).

(14) a. Mehmet dergi-yi, çocuk kitab-ı okuyor
M.NOM magazine-ACC child.NOM book-ACC read
>T >T >T >T
$S/(S\backslash NP_n)$ $(S\backslash NP)/(S\backslash NP\backslash NP_a)$ >B $S/(S\backslash NP_n)$ $(S\backslash NP)/(S\backslash NP\backslash NP_a)$ >B $S\backslash NP_a\backslash NP_n$
$S/(S\backslash NP_n\backslash NP_a)$ $S/(S\backslash NP_n\backslash NP_a)$ &
$S/(S\backslash NP_n\backslash NP_a)$ *

'Mehmet is reading the magazine, and the child, the book.'

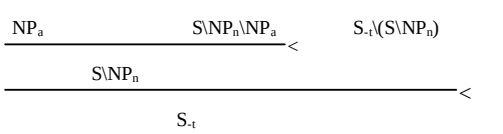




Note that the two hypotheses together make explicit the fact that Turkish is a verb-final language, which implies both SOV and OSV. Let us see what these hypotheses predict about word order flexibility. There is a pattern of combination that are closely related to type raising in (12), except that, in keeping with the lexicon's inability to underspecify dominance and its leeway in specifying precedence, they assume the reverse directionality of the arguments specified by the head. Such constructions are marked expressions cross-linguistically, such as topicalization of O in English (*This book I like*), topicalization of S in Hixkaryana (an OVS language; more on this later), and backgrounding in Turkish (*Okur kitabı sonunda*: read book-ACC eventually '(he/she) will eventually read the book'). It is important that these constructions are reversals of directionality (the argument that is supposed to be on one side of the head appears on the other side), not underspecifications of word order. As such, they can be conceived as combinatorial possibilities that a fully directional UG licences. Let us call this reversal *contraposition* (Bozsahin 2002) and formulate it as in (16). As in type raising, contraposition might be conceived as a lexical schema because it refers to substantive categories. The markedness of the construction is made explicit as a syntactic feature of the result S as +t (topicalized) or –t (detopicalized). The schema in (16a) handles leftward topicalization of right constituents (hence the argument type S/X), and (16b) handles rightward extraposition of left constituents (hence the argument type S\X).[10] Examples (17a-b) respectively show backgrounding (>xp) and topicalization (<xp) as instances of contraposition.

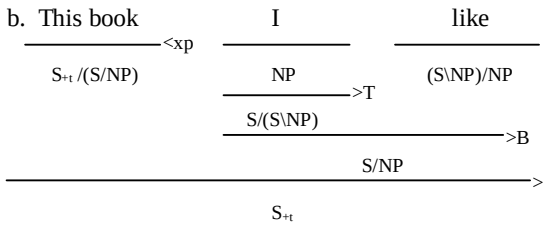
(16) a. $X \Rightarrow S_{+t}/(S/X)$ (backward contraposition: <xp)
b. $X \Rightarrow S_{-t}\backslash(S\backslash X)$ (forward contraposition: >xp)

(17) a. Kitabı okuyor adam
Book-ACC read-TENSE man.NOM



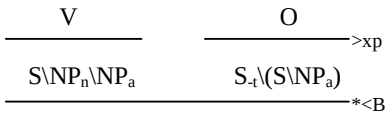
'The man is reading the book.'

b. This book I like

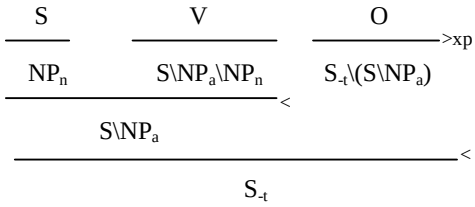


With (16), the SOV-and-OSV hypothesis in the lexicon predicts that all word orders be possible in Turkish; (18) shows derivations for some orders. SOV-only hypothesis would predict that VO is not possible (18a), i.e. *SVO and *VOS because these are precisely the orders in (18b-c) that make crucial use of the $S\backslash NP_a\backslash NP_n$ category for the verb, i.e., the lexical presence of OSV order. As presence of SVO is taken to be the indicator of forward gapping (Ross 1970, Steedman 2000b), its absence would be implied by the absence of forward gapping. This is indeed the case for Japanese, Korean and Siouan, which have no forward gapping (Rosenbaum 1977, Koutsoudas 1971; Maling 1972) and considered to be canonical SOV, in contrast to Turkish, which exhibits forward gapping (Hankamer 1971; Kornfilt 2000; Bozsahin 2000a), and allows postverbal placement of arguments.

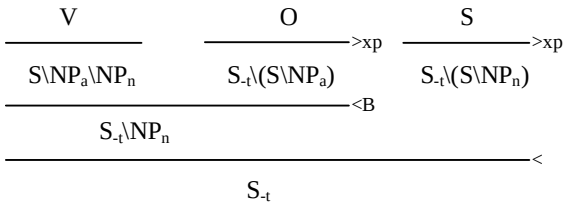
(18) a.



b.



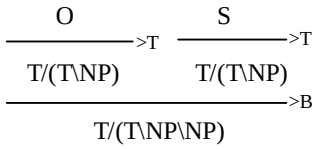
c.



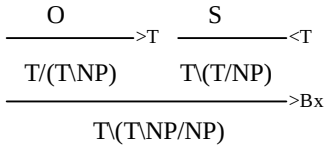
Moreover, different lexicalizations of word order yield predictable consequences for word order in the *presence* of forward gapping, whether we assume that there are no mirror image rules in syntax (hence no such thing as backward gapping (Hankamer 1971 1972)), or that backward and forward gapping reveals the asymmetry in syntax because they both boil down to the asymmetry of constituency (Steedman 1990). In English, the gapping pattern is SVO & SO, and *SVO & OS is not possible. In Turkish both SOV & SO and SOV & OS are possible, and that is to be expected: Both SO and OS are constituents in the language, and the OS in the SOV & OS pattern requires the verbal category $S\backslash NP_a\backslash NP_n$ (i.e. OSV). English does not have *SVO & OS because the SVO assumption (with the category (S\NP)/NP for the verb) cannot make OS an interpretable constituent even with type raising and topicalization (19a-d), hence its rigid word order (SVO-only) allows only SO constituency (19e). (19a) fails because the verbal category (S\NP)/NP cannot match what is required by OS, T\NP\NP. (19b-c) attempt to use combinatory alternatives provided in the UG by the principles in (7b-c), i.e. crossing compositions. (19b) fails because, although OS looks for the syntactically familiar verbal category T\NP/NP, it looks for the subject and the object in the wrong direction (right and left, respectively); the SVO & OS pattern could not be interpreted by UG as SVO & OS because in this case the '/NP' corresponds to S and the '\NP' to O, hence the argument category S\NP/NP means OVS for the verb in (19c), which is non-existent in the English lexicon.[11] (19c) fails because OS requires T/NP\NP which cannot match (S\NP)/NP. (19d) makes use of direction reversal for topicalization, but OS requires S/NP\NP which cannot match either.

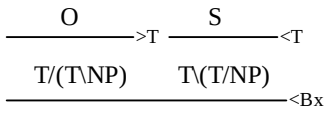
(19) Impossibility of OS constituency in English:

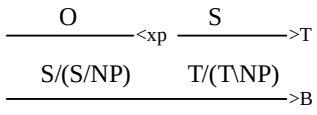
a.

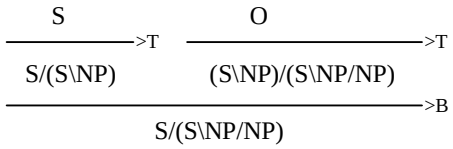


b.



c.


d.


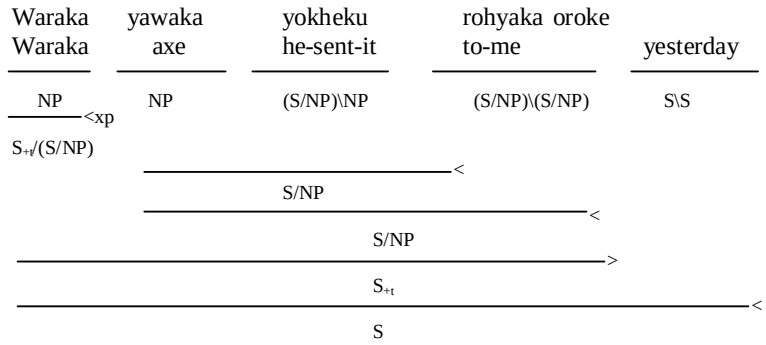
e.


A lexicalist conception of word order would also be concerned (as part of the theory of lexicon) about the economy of representations and generalizations in the lexicon. I have already mentioned the nondirectional slash | as a way of making gradual but conservative generalizations in the lexicon. Other options have been proposed as well. For example, one way to collapse the SOV and OSV word order into a unified representation is to associate directionality with a *set* of arguments, rather than with individual arguments, e.g. $S\backslash\{NP_n,NP_a\}$ to generalize $S\backslash NP_n\backslash NP_a$ (SOV) and $S\backslash NP_a\backslash NP_n$ (OSV).[12] This leads to multimodal set-based Combinatory CG (MCCG), which Baldridge (2000) shows to be strongly equivalent to conventional item-based CCG. With this expressive power, frequent appearance of VOS as second most basic word order in VSO languages can be captured as $S/\{NP_n,NP_a\}$.

Predictions from this kind of directionality and order specification are quite revealing. For example, it predicts that an SVO language (in the sense that the lexicon has only SVO category for the verb) would be more likely to be rigid on word order than a language in which arguments consistently appear on one side, i.e., SOV and VSO languages. Such a language would get whatever flexibility is offered (not too much) by direction-reversing resources like contraposition, as English does for topicalization (16a), but otherwise remain quite rigid because SVO cannot underspecify precedence due to the opposing directionality of subjects and nonsubjects. SVO is represented in MCCG as $(S\{\backslash NP\})\{/NP\}$, which serializes the same as the item-based category $(S\backslash NP)/NP$. Steele's (1978) classification of 63 languages seems to confirm this prediction; among the SOV, SVO, VSO, VOS languages, SVO shows the least amount of flexibility (except for Czech, which is considered to be SVO but exhibit all word orders; more research on extraction and coordination in Czech might reveal other hypotheses about its basic word order). The theory would make the same prediction for lack of word order flexibility about an OVS-only language, and the prediction seems to

hold: Derbyshire (1977) provides evidence that OVS is the basic word order in Hixkaryana, a Carib language of Brazil. Derbyshire claims that it gets the second most frequent word order SOV via topicalization from OVS, and that other orders are very rare. Hixkaryana topicalized word order SOV works the same way (20) as English OSV topicalization (17b), except that the subject is topicalized.

(20)



'(It was) Waraka (who) sent the axe to me yesterday.' (Derbyshire 1977:4b)

The tension that Hawkins (1994:88) noted between fixing one order as basic and attempting to justify the relative basicness of other word orders is also relaxed by the organizing principles of directionality in the lexicon. For XV or VX languages which take all arguments in one direction, ordering flexibility provided by e.g. the single lexical category S\{X} or S/{X} endorses both SOV and OSV as basic, or VSO and VOS, confirming the observation noted earlier about the appearance of second basic word orders in SOV and VSO languages. Thus, all XV or VX orders can be base-generated without redundancy, the base being the lexicon in our case, and not be treated as cases of scrambling. Miyagawa (1997; this volume) supports this view from the GB framework, and Fanselow (2001) from MP. In case the language does not allow such basic order flexibility, e.g. SOV as basic but OSV as nonbasic, the proper characterization of the language in the lexicon would be $S\backslash NP_n\backslash NP_a$, not $S\backslash\{NP_n,NP_a\}$.

Japanese and Korean can now be characterized as languages with flexible basic word order due to the presence of SOV and OSV in the lexicon. They make no use of contraposition, which is consistent with the lack of postverbal placement of arguments and absence of forward gapping. Turkish can be regarded as a flexible basic word order language too (SOV and OSV), but one that makes use of contraposition, which is consistent with the possibility of postverbal placement of arguments and the presence of forward gapping. English is a rigid basic word order language with contraposition, which is consistent with the presence of forward gapping, and topicalization as an instance of contraposition (16a). It is rigid word order for two reasons: SVO as a lexical category does not allow precedence flexibility due to opposing directionality of subjects and nonsubjects, and English has only SVO lexical word order.

Similarly, Hixkaryana as an OVS-only language is rigid word order with contraposition. Although I have no access to gapping data on Hixkaryana, forward gapping is to be expected due to postverbal arguments. And, due to its rigid word order (OS serialization), OVS & OS pattern is likely, and OVS & SO pattern is unlikely as patterns of gapping. But this prediction should be tested against the backdrop of another line of inquiry: Baker (2001:165-7) questions the OVS hypothesis for Hixkaryana, mainly because of DO-V-S-IO order for ditransitives. He assumes Kayne's analysis of Hixkaryana as an SOV language with movement of DO-V phrase to the beginning of the sentence, which would explain the word order in ditransitives (both objects would be base-generated on the same side of V). Baker also cites occasional appearance of SOV order in nonfinite embedded clauses (21), but as Steele (1978) argued, word orders that are morpho-syntactically distinct from the basic word order (such as in subordinate clauses of many languages) are not variations in word order, so it is questionable whether SOV order in nonfinite clauses constitute evidence for basicness of SOV in Hixkaryana.

(21) Ro-wy wewe yamatxhe, itehe harha owo hona.
Me-by tree after-felling I-go back village to
'After I fell the tree, I will go back to the village.' Baker (2001:167)

Returning to our proposal for testing the OVS assumption against syntactic constructions, Derbyshire (1979:45) reports that there is no coordination construction in Hixkaryana; juxtaposition of sentences can serve the coordinating function, nevertheless his data involving the 'additive' particle (22a) and or-coordination (22b) show OVS & O(VS) pattern only.

(22) a. Txorofofo yakihtoy ha karaw xarha.
black-nunbird he-made-it INTENS (species-of)-bird ADDTV
'He created the black nunbird and the (species of) bird.' Derbyshire (1979:47)

b. Kasawa hona hana iten ha, Mutuma hona (haxa) hana (iten ha).
Kasawa to UNCERT. I-go INTENS, Mutuma to (CONTR) UNCERT (I-go INTENS)
'I may go to Kasawa or to Musuma.'

The only occasion where the object follows the verb and the subject in the matrix clause to yield SO order is heavy NP shift (23):

(23) nahohsatxkon hati, amryehxahotho hati
he-grabbed-them HEARSAY one-that-had-gone-hunting HEARSAY
'He used to grab them, the ones that had gone hunting.' Derbyshire (1979:76)

This is in fact the reverse of (20); the object is extraposed (i.e. rightward contraposed) with the category $S_{-t}\backslash(S\backslash NP)$, in contrast to $S_{+t}/(S/NP)$ category of the topicalized (leftward contraposed) subject in (20). The subject in constructions such as (23) is always expressed as a verbal prefix (Derbyshire 1979:87). Thus

there is no reason to assume that a) SO order is base-generated, or, in our terminology, lexicalized, as this order seems to be the result of topicalization of the subject from OVS, or heavy NP shift of the object from OVS, or b) the language exhibits SO constituency.

4. CONCLUSION

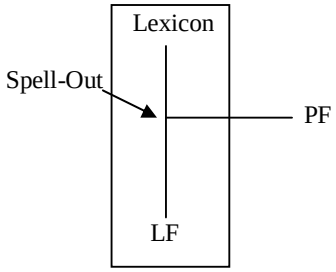
In summary, the proposal is that a) the basic word order(s) in grammar be moved down to the lexicon as part of a lexicalized grammar, and b) grammatically distinctive word order flexibility be conceived as closing the lexicon on UG directionality alternatives exploited in a language.

The motivation for the current research was to treat word order and word order flexibility as a grammatical resource where the constructions that depend on them (such as gapping) can make use of this resource, and to hypothesize about basic word order based on principles that not only shape the lexicon but also the UG itself. The solution that is proposed is compatible with Categorial Grammar's notion of grammar as proposed by Steedman (1996, 2000b) and Baldridge (2002), which is a lexicalized grammar in which there is a fix combinatory component and all surface syntax emanates from the lexicon so that in effect languages differ only in their lexicons and how much of the combinatory invariant (which is the CCG's notion of UG) is accessible in a particular lexicon.

If basicness of several word orders can be justified for a language, the theoretical apparatus should be able to cope with it. This flexibility does not appear to be a random property, due to consistency in the directionality of heads; VOS appears frequently if a VSO language allows word order flexibility. Similarly, OSV order for SOV languages. And if the effects of lexical assumptions about these alternative basic word orders can be observed in surface syntax (as in distinct gapping patterns), their lexicalization is perhaps justifiable as long as their capture in the lexicalized grammar is principled. Once we decide to lexicalize a surface grammar, the next question is how to decide the basic word order that is to be represented in the lexicon. I sketched a method in this paper, but a programmatic way of looking at this is proposed in Bozsahin (2000b).

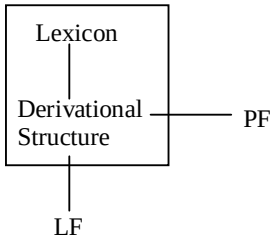
Finally, I would like to look at the consequences of moving the directionality parameter out of UG, a conclusion that nontransformational theories and the current trend in transformational theories seems to share. The common tendency was to move word order towards interfaces. I put the representational part of each architecture in a box to highlight the differences. As the MP architecture shows clearly (24), its attempt to move word order towards the PF interface renders word order a nonissue in the computational system. But Özsoy (this volume) argues that word order variation has semantic content, and Fanselow (2001) claims that it is base-generated for arguments, hence it has to take place along the path from the lexicon to LF, i.e. some aspects of it must be resolved in the computational system.

(24) MP Architecture:



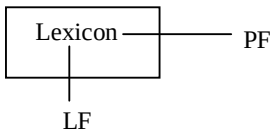
It is worth noting that the current nontransformational theories of grammar started with the assumption that word order is related to PF, and then gradually shifted towards the view that it can be moved into the representational system as much as possible, eventually to the lexicon. Montague's (1973) architecture as a starting point of lexicalism makes this evident (25):

(25) Montague's Architecture:



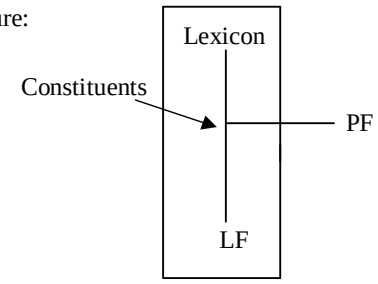
Montague's rule-to-rule correspondence of syntax-semantics left word order to a morphological component of the syntactic rules, a path through the derivational structure to PF. Since LF is not a linguistic level of representation but a model-theoretic (logical) interpretation of derivational structures in Montague, bringing semantic content into word order and word order variation would naturally take it out of the grammar, i.e. realign it on the path from derivational structure to a nonlinguistic LF. Morrill (1994) offers a logical alternative to this issue. His architecture, which can be called a radically minimalist architecture, is shown in (26). Derivational structure is dispensed with in this architecture, and, as in Montague, LF is not a linguistic level of representation. Thus the only way word order can be specified is as part of the interpretation of categories emanating from the lexicon, in Morrill's formulation, via a logic of concatenation. But since logic *is* grammar in this view, word order is part of the system of grammar.

(26) Morrill's Architecture:



Another lexicalist alternative, one that also keeps word order in grammar, has been proposed by Steedman (1996, 2000a). The architecture is shown in (27). Derivational structure is not a level of representation in this system either, but LF is; structural relations such as binding are predicated over the structured semantic representation called the predicate-argument structure. LF can (and should) reflect the semantic differences in word orders because it is part of the grammar. But since, unlike MP architecture in (24), there are no operations to mediate projection of lexical properties on the way to PF or LF, word order can only be specified in the lexicon part of the representational system.

(27) Steedman's Architecture:



The divergence among the theories appears to be in what direction towards the interfaces word order is moved, and whether to stop short of taking it out of grammar. MP takes it out of grammar in the direction of PF, but bringing semantic content to word order variation might realign with LF; this is a degree of freedom that current theorizing in MP allows, mainly because word order could be handled by move and/or merge, hence before or after spell-out. Steedman's and Morrill's architectures keep it in the grammar, and the only place left for word order is the lexicon. This is a theoretical advantage rather than an architectural weakness, because the hypotheses about word order (and in fact, about any syntactic construction) stand or fall on their own assumptions, for nothing mediates between the lexicon and the interfaces. The convergence seems to be the removal of the directionality parameter (but see Saito and Fukui's (1998) attempt to bring it back in MP as part of merge operation). Since directionality was the last remnant of S-structure, there is no need for S-structure, and syntax does not need any level of representation. All three architectures agree on this minimalism.

NOTES

[1] The rarity of object-before-subject can be seriously questioned as well, if we reconsider the case of ergative languages and Phillipine languages, as Manning (1996:21-3) suggested. Most Eskimo languages would fall under OSV if we take the absolutive NP to be the syntactic subject, and VOS becomes more common due to Phillipine languages.

[2] The *syntactic* type S is for 'sentence', not to be confused with the shorthand label S for subject.

[3] Incidentally, OVS, which the (S\NP)|NP generalization also captures, ranks the same as SVO in early syntax (Aksu-Koç and Slobin 1985).

[4] This is in fact not something to be assumed, but something to be explained by a theory of lexicon. Since such a theory has not been fully developed yet, I will consider it as an assumption for the time being.

[5] In the remainder of the paper, I only show the syntactic combinations for simplicity. But in fact semantic combination occurs in lock step, as exemplified in (9a) and (10a). A '*' in a rule or derivation indicates an ill-formed configuration.

[6] Notice that in case of crossing compositions such as (>Bx), precedence is preserved in a global sense but not in the local sense. For example, the sequence of elements with categories C A/B B\C can be combined to yield A by (>Bx) and (<), and having C after A/B does not affect the result but only how we get the result: A/B C B\C yields A by (<) and (>) . Hence, locally, C's position may vary, but no rule of UG can deliver A for the configuration A/B B\C C, and this is the important part for B\C, because A/B does not specify any ordering for C, but B\C does, and its restriction that C be to the left is honored.

[7] The derivations show the range of derivation as a line and the rule used as an index to the line. For example, in (13), forward type raising (>T) applies to the NP, and forward composition (>B) applies to S/(S\NP) and (S\NP)/NP. No index is used for lexical type assignments, all of which appear on the top line of a derivation. A '*' as a rule type indicates that no rule is applicable to the current configuration. An example is shown in (14). An asterisk with a rule name, e.g. *&, indicates that coordination cannot apply at this point in the derivation, as exemplified in (15).

[8] Ross (1970) formulated the problem in terms of word order in D-structure, but the observation appears to hold for surface word order (Steedman 2000), and that is what is captured in a lexicalized grammar.

[9] Feature decorations n (nominative) and a (accusative) are used to make the case of NP explicit.

[10] The schema in (16) is a generalization of the topicalization rule proposed by Steedman (1985). The generalization covers topicalization and extraposition, whose combinatory roots seems to be similar but syntactically they differ in information structural aspects.

[11] Notice that OSV is possible in English only with the bracketing O[SV], via topicalization (16a). Hence its possibility does not allow for *SVO & OS, which requires OS constituency.

[12] The common slash '\' can be factored in to write $S\backslash\{NP_n, NP_a\}$ as $S\{\backslash NP_n, \backslash NP_a\}$, as done by Baldridge (2002). The slash in Baldridge's system not only carries order but also the accessibility of UG rules (via slash modalities) for the argument associated with the slash (NP_n or NP_a, but not necessarily both). Thus it is in fact necessary to factor in the slash to lexically specify syntactic constructions. Our main concern here is word order, not accessibility of UG rules modeled by the slash modality, so we ignore the slash modalities in the remainder

of the paper and use the set notation as a lexical generalization over finite and well-defined set of categories.

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