Optimality Theory In Syntax*

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Moon, Seung-Chul. 1997. **Optimality Theory in Syntax.** *Linguistics*, 5-1, 235-253. The purpose of this paper is to show that Optimality Theory developed in phonology can also be applied to syntax. I discuss possibilities of some syntactic phenomena which may be explained by OT. And I focus on the binding facts of the unbounded reflexives and show that seemingly unbounded binding relation can be explained by the interaction of universal constraints, under Optimality Theory as proposed in Prince and Smolensky (1993). For syntactic binding, I follow Moon (1995) and assume a series of constraints, THC, LPC, SOC, CCC, DBC which affect binding by their mutual interaction with each other. I conclude this paper by showing that the five constraints on anaphoric binding interact to produce the best choice of antecedents. **(Hankuk Aviation University)**

1. Introduction

This study aims to show that Optimality Theory developed in phonology can also be applied to syntax. Focusing on the binding facts of the unbounded reflexives, I show that seemingly unbounded binding relation can be explained by the interaction of universal constraints, under Optimality Theory as proposed in Prince and Smolensky (1993), developed by Pesetsky (1997) and Speas (1997) among many others. The core of Optimality Theory lies in (1):

(1) a. Constraints are universal.
b. Constraints can be violated.
c. Grammars are rankings of constraints.

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An optimal output form for a given input is selected from among the class of competitors in the following way: A form which, for every pairwise competition involving it, best satisfies the highest-ranking constraint on which the competitors conflict, is optimal.

Under OT, violability is the norm, and it is this which makes it possible to have general constraints freely interacting. The generality of the constraints leads to systematic conflicts. The merits of using constraint-violability are as follows. First, it is possible to formulate a unified theory of abstract case-assignment, shifting the burden linguistic variation to the interaction between grammatical components, which is governed by the general abstract principles of constraint interaction (Prince & Smolensky 1993). This is a kind of interaction that is not available if grammatical requirements are inviolable. It is for this reason that many analyses of the Principles and Parameters tradition have to incorporate the theoretical devices responsible for linguistic variation inside specific components of grammar rather than outside it. Second, the same constraints responsible for linguistic variation within a specific language also determine variation across languages, favoring a theory where linguistic requirements are universal and linguistic variation follows from their interaction, rather than from parameter whose values are valid only within specific language groups. Third, binding relation which turns out to be affected by a variety of UG constraints can be nicely accounted for by ranking the relevant constraints.

2. Theoretical Implications of OT

The concepts of optionality, optimality and competition among possible candidates has never been regarded as a core issue in grammatical theory, though this concept has gradually surfaced throughout the history of generative syntax. Two recent works taking on these issues representing are Chomsky (1993) and Prince and Smolensky (1993). Chomsky proposes in his Minimalist Program that the grammar compare derivations with respect to economy-motivated conditions and choose a shortest distance or the most economical derivation among several options. On the other hand, Prince and Smolensky propose in

their Optimality Theory that the grammar compare competing candidates for well-formed representations with respect to universal ranked constraints. These proposals provide the means to capture phenomena which have resisted systematic analysis and have inspired a rapidly growing, but largely unpublished body of work in syntactic theory. Furthermore, they have the potential to open vast territories of underexamined and unexamined phenomena to systematic investigation.

Consider, for example, the issue of obligatory deletion up to recoverability in the analysis of French relative clauses by Kayne (1977) and in the analysis of English infinitival relatives by Chomsky (1977). As far as the latter is concerned, in sentence (1) the *wh*-expression must be deleted in an English infinitival relative. However, deletion is not required in (2), where it would violate the requirement of recoverability:

(2) a. This is a good pencil [to write with].
    b. *This is a good pencil [which to write with].
(3) a. *This is a good pencil [to write].
    b. This is a good pencil [with which to write].

The rule of obligatory deletion up to recoverability makes little sense without the notion of optionality in competition. (1b) is ill-formed only because its competitor in (1a) allows deletion of the operator. In parallel, (2b) is well formed only because its competitor does not allow deletion. What is shown in this pair of examples is that a candidate from which an operator has been recoverably deleted is preferred to a candidate without deletion, which in turn is preferred to a candidate with non-recoverable deletion. For more details, see Barbosa, Pilar, Danny Fox and Martha Jo McGinnis (1995).

The resumptive pronouns as a last resort strategy of Chomsky (1977) also involves optionality in competition. Sentences in (4) and (5) demonstrate that a resumptive pronoun is allowed only where a trace is prohibited. The grammaticality of sentence with a resumptive pronoun can be determined only relative to the status of an optional competitor with a trace:

(4) a. the students that developed an OT.
b. *the students that **they** developed an OT.
(5) a. *the students that we wondered whether developed an OT.
b. the students that we wondered whether **they** developed an OT.

Many phenomena including those mentioned above indicate that notions of optionality and optimality might play a powerful explanatory role in syntactic theory. The previous literature has only discussed the periphery of those phenomena that have optionality, optimality and competition. The peripheral status of the phenomena in the published literature seems to come from the lack of systematic investigation into the concepts and mechanisms that might explain them. Optionality was treated as part of the periphery of linguistic discussion or as an exceptional phenomenon, since it was hard to explain within past frameworks.

The situation is different since the introduction of OT. The leading ideas in the OT allow us to reconsider the role of optionality, competition and optimality within the overall architecture of generative grammar. Thanks to its contributions, we can now open vast territories of underexamined and unexamined linguistic phenomena to systematic investigation and shed new light on old linguistic phenomena. LDA-binding is only one of many examples.

Let us turn our attention to case alternation phenomenon in Korean, which OT can elucidate. Examples (6a,b) illustrate dative and accusative case alternations:

(6) a. John-i Mary-**eykey** chayk-**ul** cwuessta.
John-nom Mary-**dat** book-**acc** gave
b. John-i Mary-**lul** chayk-**ul** cwuessta.
John-nom Mary-**acc** book-**acc** gave
John gave a book to Mary.

Korean grammarians have had trouble accounting for the double accusative marking in (6b), since the first accusative is not a true accusative marker. The Korean accusative marker *-lul* plays the role of focus marker as well. Thus the dative case marked NP in (6a) is less

focused than the accusative case marked NP in (6b). With respect to focusing, optionality is observed between two forms of case-marked NPs. If we suppose that there is a focus-related constraint in Korean to regulate the case alternation, then OT may be able to evaluate the optimality among two candidates. For example, if the focusing constraint (7) and case assignment constraint (8) are compete with each other, then evaluation will take place as in (9):

(7) Focusing Constraint (FC)
Assign *lul* to the dative NP in double-object construction when it is focused.

(8) Case Assignment Constraint (CAC)
Assign *eykey* to the dative NP in double-object construction.

(9)

INPUT	FC	CAC
NP-eykey NP-lul	*!	
NP-lul NP-lul ☞		

(*=violation, !=dropped off, null=satisfaction, shaded area=irrelevant, ☞=optimal output)

In (9) double accusative NPs will be chosen as the best choice with respect to focusing. In a similar way, this analysis can be extended to tackle more complicated case alternations, as illustrated in (10), where we see the case alternations between loc/acc/loc-acc case markers in Korean:

(10) a. Mary-ka paykhwacem-**ey** kassta.
Mary-nom department store-**loc** went
b. Mary-ka paykhwacem-**ul** kassta.
Mary-nom department store-**acc** went
c. Mary-ka paykhwacem-**ey-lul** kassta.
Mary-nom department store-**loc-acc** went
Mary went to the department store.

The three case markers are optional with the same proposition Mary went to the departmentstore. The locative NP in (10a) is the

context-independent standard form, the accusative NP in (10b) is the most focused form, and the double-case marking NP in (10c) is the next most focused form. These options are apparently controlled by a set of constraints. It is not clear to me that how many constraints and what kinds of constraints are needed to choose the optimal choice in this case. But what is clear is that OT may shed a light on this kind of optionality problem in Korean. I leave the details open for further research.

3. Constraints On Derivation or Representations?

Works inspired by Chomsky's Minimalist Program maintains that competition is relevant only during the course of a sequential derivation. Throughout the derivation, least effort economy considerations determine the choice among possible next steps in the derivation. Some of the analyses crucially depend on sequential derivations, as illustrated in (11) and (12) which show that Chomsky's (1994) account of the relative position of an expletive at SPELL-OUT:

(11) a. It$_i$ seems [$_{XP}$ t_i to be believed that Mary likes John].
b.*It seems [$_{XP}$ [that Mary likes John]$_i$ to be believed t_i].
(12) a. There$_i$ is believed [$_{XP}$ t_i to be a fountain in the garden].
b.*There is believed [$_{XP}$ a fountain$_i$ to be t_i in the garden].

He explains the contrasts in (11) and (12) by positing competition between (a) and (b) at the point in the derivation when the subject position of XP is to be filled. Given a designated choice of lexical items, two options arise. Taking one option, the associate undergoes NP-movement, as shown in (a). Taking the other, as shown in (b), an expletive is inserted. The first option, Chomsky suggests, is more economical, so the second is blocked. This analysis requires that economy considerations operate as the derivation proceeds. Notice that both the (a) and (b) examples involve the same amount of movement among the same structural positions. Only at a particular point in the derivation is there a clear choice which economy considerations might resolve.

On the other hand, it has been argued that optimality consideration may involve competition not among derivations, but rather among representations. Representational approaches to optimality in syntax are currently being developed by Grimshaw (1993), Legendre, Raymond and Smolensky (1993), and others. Grimshaw delays the comparison procedure until a level of representation arising from different derivations. Thus, certain facts falling under Chomsky's economy considerations such as movement as a last resort are captured in Grimshaw's work by a constraint on representations. Her constraint, *Stay*, prefers representations in which syntactic elements occupy their original positions over representations where these positions are occupied by a trace. In Grimshaw's proposal, this constraint is ranked among other conditions which affect such diverse phenomena as *do*-support, I-to-C Movement, and the distribution of complementizers.

However, it is important to note that derivational and representational approaches to optimality do not necessarily contradict each other. In principle, it is possible that optimality considerations operate during the course of the derivation as well as at levels of representation. In fact, however, there are certain incompatibilities among existing proposals. Thus, both Grimshaw (1993) and Legendre, Raymond and Smolensky (1993) reanalyze data that receives a derivational account in Chomsky's (1993) framework, arguing instead for an account based on competition among representations.

Turning to optimality, Chomsky restricts his notion of optimality to consideration of economy (the least effort principle). One important issue in his approach is the way in which effort is measured. A candidate violating one principle of economy may be more costly than a candidate violating another. Thus it is essential for such an account to establish the relevant economy principles and the costs associated with them. The extent to which these two approaches differ has yet to be determined. According to the notion The complicated behavior of LDA can be attributed to their location in the referentiality hierarchy of ranking familiar from Prince and Smolensky's OT, multiple violations of low-ranking constraints can never add up to equal a violation of a high ranking constraint. Whether such a notion plays a role in the Minimalist Program is unclear. Investigating the relationship between the principles

of Greed and Procrastinate might prove fruitful, as pointed out by Barbosa, Pilar, Danny Fox and Martha Jo McGinnis (1995).

If optimality considerations are to play a role in linguistic theory, we should find evidence to show whether they interact with more traditional rules and principles and if so, to what extent. In the Minimalist Program, comparison among competing options has a local character, involving only least effort considerations for derivation, while the rest of grammar is governed by more traditional mechanisms.

On the other hand, Prince and Smolensky, and Grimshaw insist that optimality plays a much broader role in grammar, leaving little if any room for traditional mechanisms. If grammar as a whole is essentially an optimality system, as argued in Prince and Smolensky, such a system must be shown to accommodate data that have previously fallen under a more traditional rules-and-principles approach. On the other hand, if Optimality plays a limited role within the grammar, its scope and interaction with other grammatical components must be worked out. The discussion of these issues are in their infancy at this point.

4. Universal Constraints Proposed in Syntax

Vieri Samek-Lodovici (1996) proposed the universal constraints which should be relevant to the syntactic relations as follows:

(13) Phrase-structure constraints:

SUBJECT: The highest A-specifier of a clause must be structurally realized. This constraint requires that the specIP position be structurally realized. It is violated whenever the specIP position is left structurally unrealized.

OBHD: Avoid empty heads. Violated by contentless heads.

(14) Constraints related to case and agreement:

CASEGOV: A case-assignee is locally proper-governed by its case-assigner. It is violated if the case-assignee is not locally properly governed by its case-assigner.

NO /-FTS: Avoid agreement-feautures. violated once by each agreement feature.

LooseAgr/H: A head H should host clause-bound agreement between an agreemnt feature and the referential role of potential nominal constituent. violated when no clause-bound agreement occurs on H.

Agr/H: A head H should host spec-head agreement between an agreement feature / and the referential role of a potential nominal constituent. violated when no spec-head agreement occurs on H.

(15) Faithfulness constraints:

PARSE: Structurally realize input items into phrase-structure. violated by unrealized input items.

FULL-INT(erpretation): Lexical conceptual structure is parsed. Violated by uninterpreted lexical material.

STAY: Traces are not allowed. Violated once by each trace left by constituent movement.

(16) Constraints related to topic and focus:

DROP TOPIC: Do not realize arguments which have topic antecedents. Violated by structurally realized arguments coindexed with antecedents with topic status.

ALLIGNFOCUS: Align the left edge of the focused constituent XP with the right edge of a verbal YP in the clausal extended projection. Violated by non-aligned focused constituents.

Lodovici (1996) show how the notions of constraint violability and constraint hierarchy, at the core of the OT framework, play an important role also in the Minimalism framework. Economy principle 'Last Resort' in Minimalism states that a step in the derivation is legitimate only if it is necessary to convergence." An important application of this principle concerns movement. Movement is costly, and Last resort ensures that it cannot occur freely. However, if it is necessary to feature checking, and therefore to convergence, it can occur nevertheless. This amounts to saying that a requirement against movement is violated in order to satisfy the requirement on feature checking. Like OT, Minimalism thus uses the notion that a syntactic requirement can be violated in order to satisfy other higher-ordered syntactic requirements.

In OT terms, this insight can be formalized by stating that the constraint against movement STAY is ranked lower than the constraint

on convergence Feature Checking. Consider for example the three derivations in the first column of the tableau below (17): in (a) the subject moves from specVP into specIP to check its case and agreement features, in (b) the subject remains in specVP, and in (c) it moves into specIP and beyond. When more movement than is necessary for convergence occurs, as in (c), the derivation is excluded by the presence of the more economical derivation in (a), which has one less STAY violation. When too little movement occurs, as in (b), the higher Feature Checking constraint is violated, and the derivation is once again excluded by the existence of derivation (a), which constitutes a more economical derivation because it satisfies the higher ranked Feature Checking constraint.

(17) Movement in Minimalism: Feature Checking >> STAY

INPUT	Feature Checking	STAY
a. $[_{IP}$ DP_i Aux [VP t_i V]]] ☞		
b. $[_{IP}$ -- Aux [VP DP_i V]]]	*!	
c. DP_i $[_{IP}$ t_i Aux [VP t_i V]]]		

An interesting aspect of the OT formalization in (17) is that the ungrammatical status of the structures in (b) and (c) follows from the same cause: the existence of the less costly optimal derivation in (a). In Minimalism, on the other hand, only derivation (c) is excluded through Last Resort on the basis of the existence of the more economical derivation in (a). In fact, derivation (b) is ungrammatical only because its unchecked features make it a non convergent derivation. By making the notions of constraint violability and constraint-ranking explicit, the above OT analysis thus derives in a unified way what is now derived on separate grounds in Minimalism. The existence within Minimalism of the notions of constraint violability and constraint ranking becomes more evident when economy principle conflict with each other.

In OT, constraint reranking determines crosslinguistic variation. In Minimalism, the hierarchy of grammatical requirements is fixed once and for all, and the source of crosslinguistic variation is rooted in the lexicon, in the language specific distinction between items with strong and items with weak checking features. I leave a detailed assessment of

the empirical and theoretical consequences of this difference to further research.

5. OT in Binding

Throughout the history of research on anaphoric binding, most linguists have agreed that the anaphoric binding is sensitive to multiple constraints, such as thematic hierarchy, subject-orientedness, and c-command condition, among others. In the case of languages like English, which has only one reflexive, it might be adequate to characterize its anaphoric pattern by structural conditions alone. However, in languages like Korean, Chinese, and Japanese, among others, which allow two or more reflexives in their lexical inventory, the distributional patterns are not easily handled by purely syntactic mechanisms. This section attempts to apply OT to anaphoric binding to account for the appropriate choice of antecedent. The basic idea of OT is that different components of grammar interact to yield the best choice among a set of candidates of antecedents.

Korean reflexives are those which show both short-distance and long-distance binding and thus are not regulated by the current standard Binding Theory. They include monomorphemic anaphors such as Korean *caki*, Japanese *zibun* and Chinese *ziji*. They may behave in a manner similar to the English reflexive anaphor *himself*, pronominal *him* or even PRO. Reflexives allowing different choices of antecedents are illustrated in (18):

(18) John$_i$[1]-un [Tom$_j$[2]-i caki$_{i/j}$-lul pipanhayss-ul ttay] amwu-malto an hayssta. John-top Tom-nom self-acc criticize-comp when anything did not say. John did not say anything when Tom criticized himself.

These reflexives have been noted in English as well. Chomsky (1986:174) noted that the English reflexives *each other* and *himself* behave similarly in the so-called picture noun construction, as in (19) and (20):

(19) They$_i$ told us$_j$ that [[pictures of each other$_{i/*j}$] would be on sale].
(20) John$_i$ thinks that [[pictures of himself$_i$] would be on sale].

In examples (19) and (20) reflexives are bound by the NPs outside the embedded clauses, suggesting that they behave in a similar way to Korean type reflexives.

Thus, following Moon (1995) I propose a series of constraints which affect anaphoric binding by their mutual interaction with each other and their ranking respectively in (21) and (22):

(21) Constraints for Binding
  a. Thematic Hierarchy Constraint (THC)[2]
     Reflexives must be bound by the thematically higher NP than itself according to the following thematic hierarchy:
     Agent>Experiencer>Goal, Theme, Patient, Source>Locative
  b. Larger Domain Preference Constraint. (LPC)[3]

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2. THC constraint is based upon an interesting statistical observation on the thematic use of anaphor. Korean reflexives are very frequently used as an agent role in the sentence according to Kang (1997) as illustrated in (i):

(i) Thematic roles of Korean reflexives

	caki	casin	cakicasin
Agent	107	196	33
Experiencer	36	108	29

As seen in (i), among two thematic roles of reflexives, Agent is dominating in the thematic relation of reflexives. This implies that binding relation of Korean reflexives heavily resort to thematic hierarchy constraint.

3. Kang(1997)'s corpus-based statistics of Korean reflexives show an interesting behavior of Korean reflexives as in (i):

(i) Corpus based frequency of Korean reflexives

	caki-lul	casin-ul	cakicasin-ul
short-distance	151	311	66
long-distance	165	123	5
total	316	434	71

As seen in (i), among the distributional characteristics of *caki, casin,* and *cakicasin, caki* shows the strongest long-distance orientation and *cakicasin* shows the strongest short-distance orientation. What is interesting here is that all three anaphors allow both short and long distance binding even though *caki* behaves

Reflexive must be bound by the antecedent NP in the larger domain.

c. Subject-Orientedness Condition (SOC)
Reflexive must be bound by a subject NP.

d. C-Command Constraint (CCC):
Reflexive must be c-commanded by an antecedent NP.

e. Discourse Binding Constraint (DBC)[3]
Reflexive must be bound by a prominent discourse NP if no sentential antecedent is available.

(22) Constraint Ranking For Anaphoric Binding
THC > LPC > SOC > CCC > DBC

The five constraints on anaphoric binding in (21) and their ranking (22) interact to produce the best choice of antecedents in sentences like (18-20). Let us consider whether constraints (21) and ranking (22) correctly predict the optimal output in the various sentences. First, I will show how OT predicts the best choice of antecedent in sentence (18) where there are two possible choices of antecedents, in tableau (23):

(23) John$_i$[1]-un [Tom$_j$[2]-i caki$_{i/j}$-lul pipanhayss-ul ttay] amwu-malto an hayssta.

INPUT	THC	LPC	SOC	CCC	DBC
caki=John ☞					
caki=Tom		*!			
caki=Dis NP	*!	*			
caki=null	*!	*			

more frequently like long-distance anaphor. Korean anaphor prefers sentential antecedent if given in the sentence. If there is no sentential antecedent, discourse NP is selected. If there is no prominent discourse NP in a certain discourse context, arbitrary NP is selected for full interpretation. Thus, there seems to be a certain optimal hierarchy for antecedentship of Korean reflexives in terms of domain. It is not easy question to ask what kind of domains we need and how they have to be defined formally, At this point, it is important to note that an NP in larger domain takes preference in selecting an antecedent for Korean anaphor and determining antecedent must resort to the interactive combination of relevant constraints.

In (23), I suggest four possible candidates for OT analysis; that is, 'John,' 'Tom,' Discourse NP, and null candidate. Notice here that discourse antecedent and null candidate fail to satisfy any of the constraints because there are already sentential antecedent competing each other. Among two sentential antecedents, 'John' is selected as an optimal output because it satisfies LPC, whereas the rest fail to do so. In sentence (23), constraints SOC, CCC and DBC are irrelevant since the best choice is already pick up at THC and LPC column.

(24) [$_{S2}$[$_{S1}$**Caki$_i$**-ka sungcinhayssta-nun] sosik-i **John$_i$**-ul kippukeyhayssta.]
self-nom promote-comp news John-acc pleased
'The news that he was promoted pleased John.'

INPUT	THC	LPC	SOC	CCC	DBC
caki=John ☞	*				
caki=Dis NP	*	*!			
caki=null	*	*!			

Sentence (24) is very notorious in the configurational approach to binding relation since anaphor comes structurally higher position, violating c-command constraint. And any thematic approach has difficulty accounting for the binding relation between anaphor and its antecedent 'John' since anaphor takes agent role and 'John' takes experiencer role, thus violating thematic constraint. However, in OT 'John' can be selected as an optimal output by satisfying LPC even though it violating THC and the rest. This is the result of interaction of multiple constraints which is only allowed in the mechanism of OT.

In order to explain parametric variation of particular languages, I can propose different constraint. For example, for English binding relation, I suggest a Locality Constraint as illustrated in (25):

(25) Locality Constraint
Anaphor must be bound by an NP in a local domain.

Furthermore, I should modify constraint ranking given in (22) for Korean binding relation in order to capture correct binding relation of

English-type languages, as depicted in (26).

(26) THC > SOC > LOC > CCC > DBC

What is interesting thing is that this OT mechanism, with slightly changing constraints as in (26), can nicely explain the exceptionally treated binding relation in English sentences like (19) and (20) including picture nouns, as in (27) and (28) respectively:

(27) They$_i$ told us$_j$ that [[pictures of each other$_{i/*j}$] would be on sale].

INPUT	THC	SOC	LOC	CCC	DBC
caki=They ☞			*		
caki=us		*!			
caki=Dis NP	*!		*	*	*
caki=null	*!		*	*	*

First of all, both 'they' and 'us' satisfy THC since the former takes agent role and the latter theme. In second column, only 'they' satisfies SOC and the rest of column are irrelevant any more since an optimal output is selected in the second column. In this way OT correctly predicts 'they' as an optimal output in (28).

(28) John$_i$ thinks that [[pictures of himself$_i$] would be on sale].

INPUT	THC	SOC	LOC	CCC	DBC
caki=John ☞			*		
caki=Dis NP	*!		*	*	*
caki=null	*!		*	*	*

In parallel to (27), 'John' can be selected as an optimal output in (27). The only difference between (27) and (28) is that the former has 4 candidates, whereas the latter has 3 candidates.

Now, let's look at English psych construction with two potential antecedents as in (29):

(29) That $Bill_i$ hates $himself_{i/*j}$ bothers $John_j$.

INPUT	THC	SOC	LOC	CCC	DBC
caki=Bill ☞					*
caki=John		*!	*		*
caki=Dis NP	*!	*	*	*	*
caki=null	*!	*	*	*	*

In the first column both 'Bill' and 'John' satisfy THC since the former takes agent role and the latter experiencer role contrasting to 'himself' taking theme role. However, in the second column only 'Bill' passes SOC because it is exclusively in the subject position and 'John' in object position.

Finally, consider sentence (30) where there are two potential antecedent with the first one preferred:

(30) $John_i$ knows that pictures of $himself_{i/j}$ annoys Tom_j

INPUT	THC	SOC	LOC	CCC	DBC
caki=John ☞			*		
caki=Tom		*!			
caki=Dis NP	*!	*	*		
caki=null	*!	*	*		

In the first column, 'pictures of himself' is thematically source role. Thus, 'John' and 'Tom' satisfy THC since they take agent and experiencer roles, respectively. In the second column, only 'John' passes SOC since 'Tom' is in object position differently from 'John' standing in subject position.

One more interesting thing is that this OT mechanism can predict the preference relation between antecedents. For example in sentence (30), 'John' is preferred antecedent and OT predicts correctly 'John' as an optimal output. If the optimal output 'John' is rejected during the process of interpretation, the whole procedure comes back to the tableau and should choose the second best choice 'Tom' in this example.[4]

4. I do not argue further about how to choose the second best choice in OT since it is on-going topic under discussion in OT people. For example, many OT scholars are trying to establish correct ways to explain parametric and free

In sum, what I have tried to show in this section is that the constraints indeed interact to yield the ordered ranking of possible antecedents for anaphoric binding. I am optimistic that anaphoric binding in other languages might be amenable to a similar type of analysis.

6. Further Implication

There is a clear affinity between the optimality theoretic model presented here and research using notions like "economy." Optimality theory provides a way to understand such notions as "economy," as just subcases of the total universal set of violable constraints. Moreover, under OT there is an explicit way to determine how constraints will interact with each other. This is of course essential to making sense of any theory in which there is constraint interaction. For example, the idea that short derivations are less costly than longer ones, and that universal divides are less costly than language particular ones. Without a means of computing the comparative cost of the two expensive items, there is no way to calculate the results of interaction between them. What happens when we have to choose between a derivation with fewer steps but more language particular devices and one with more steps and fewer language particular devices? OT provides a theory of constraint interaction which makes such questions answerable: the choice will depend on the ranking of the constraints in the grammar.

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variations in natural languages. One possible way to choose the second choice would be to make a loop making OT return to original tableau as roughly mentioned in this paper.

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