

# Problems with Indices in the Minimalist Program

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Kim, Young-roung. 1997. **Problems With Indices in the Minimalist Program.** *Linguistics*, 5-2, 189-201. A fundamental notion of the minimalist program is that much of what happens in syntax is driven by morphology. Movement takes place because of the need to check off morphological features. Movement is explained by Copy Theory in the Minimalist program. In an Antecedent Contained Deletion (ACD) construction, copying a verbal content into the elided predicate [e] leads to an illicit coindexing, which is a principle C violation at LF. To circumvent the violation of a principle C at LF, Chomsky assumes that indices are not copied, saying "they are not real entities but simply annotate structural relations among elements." What I wish to point out in this paper is that several issues concerning the elided verb identical to the matrix verb, proper thematic relations, strict/sloppy readings, and Scope Indexing should be accounted for by the "real entities" of indices. (Woosuk University)

## I. Copy Theory of Movement

Chomsky (1993) assumes that indices are not copied<sup>1</sup>. However, some problems arise when indices are not copied. Chomsky's Minimalist Program adds an explicit endorsement of the copy theory of movement. Thus when a singularly transformation replaces a projected empty category in position X with a constituent from position Y, both position X and position Y--both members of the chain created by movement--contain a copy of the moved constituent (G. Webelhuth

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1. Chomsky (1993: 43 and n. 42) assumes that "A theoretical apparatus that takes indices seriously as entities, allowing them to figure in operations (percolation, matching, etc.), is questionable on more general grounds. Indices are basically the expression of a relationship, not entities in their own right. They should be replaceable without loss by structural account of the relationship they annotate."

1995: 373). Let us consider the following sentence.

- (1a) Which pictures of himself did Mary say John saw t.
- (1b) Which pictures of John<sub>i</sub> did Mary say he<sub>i</sub> saw t.
- (1c) \*Mary said he<sub>i</sub> saw those pictures of John<sub>i</sub>.
- (2a) Which<sub>x</sub>, Mary said John saw [x pictures of himself]
- (2b) Which x, x a picture of John, Mary said he saw x.

Treating (1a) with standard Binding Theory at LF necessitates finding the reflexive back in the trace position, as in (1a). Under a copy theory, at LF we may delete all but the *which* at the head of the chain and nothing but the *which* at the tail of the chain. This derives a possible input to interpretation and produces a suitable candidate for Binding Theory in (2a). In the case in (1b), where complete reconstruction would produce a Condition C violation, we may choose a different sort of deletion pattern at LF, as shown in (2b). Here we delete all the material at the tail of the chain and retain the material in the operator at the head of the chain. Let us further consider the contrast in (3).

- (3a) Which claim that John<sub>i</sub> made did he<sub>i</sub> regret?
- (3b) ?\*Which claim that John<sub>i</sub> runs did he<sub>i</sub> deny?

In (3a), the relative clause is adjoined to *which claim* after this constituent has raised to spec of CP. Thus the copy of the *which claim* in the position c-commanded by *he* in (3a) does not contain John, and no Condition C violation is expected. On the other hand, a complement to N must be incorporated into the structure when the N' is projected<sup>2</sup>. Thus in (3b), the complement that *John runs* must be part of the copy of the constituent *which claim that John runs* in the trace position c-commanded by *he*. We expect then a Condition C violation in (3b)

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2. For this explanation, Alec Marantz (1995) assumes that *that* clause in (3b) is the complement to the N claim, that relative clause, like that *John made* in (3b), are adjoined to DP, and that adjunction falls outside the requirement that an operation in the computational system before Spell-Out must always expand the targeted constituent.

but not in (3a), since there is a derivation of (3a) in which *he* does not c-command *John* at LF. Following the analysis of (1b) above, we might be able to delete most of trace copy of *which claim that John runs*, leaving *which x, x a claim that John runs* in the operator position and removing *John* from a position c-commanded by *he* at LF.

## II. Antecedent Contained Deletion Constructions and Indices

Let us consider the following antecedent contained deletion (ACD) sentence such as (4). The VP gap is interpreted as identical in meaning to the indicated VP<sup>3</sup>.

(4) John ate everything that Bill did [<sub>VP</sub> e].

At LF the relevant structure is as follows:

(5) [<sub>IP</sub> [Everything [that [Bill did [<sub>VP</sub> e]]]]]<sub>i</sub> [<sub>IP</sub> Bill ate *t<sub>i</sub>*]

If we copy *ate t<sub>i</sub>* into the null VP we obtain (6).

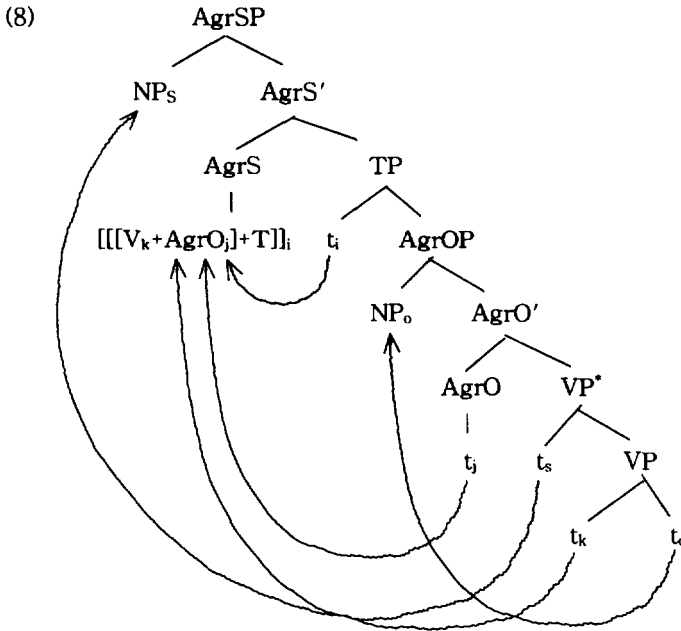
(6) [<sub>IP</sub> [Everything [that [Bill did [<sub>VP</sub> ate *t<sub>i</sub>*]]]]]<sub>i</sub> [<sub>IP</sub> Bill ate *t<sub>i</sub>*]

A Minimalist theory assumes LF V-movement to T<sup>0</sup> and then to AgrS in language like English. After all movement has taken place, an LF phrase maker has the following form.

(7) [<sub>AgrSP</sub> NP<sub>S</sub> [<sub>AgrS'</sub> [[[V<sub>K</sub> +AgrO]<sub>j</sub> + T]]<sub>i</sub> AgrS] [<sub>TP</sub> *t<sub>i</sub>* [<sub>AgrOP</sub> NP<sub>O</sub> [*t<sub>j</sub>* [<sub>VP\*</sub> *t<sub>s</sub>* [<sub>VP</sub> *t<sub>k</sub>* *t<sub>o</sub>*]]]]]]].

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3. N. Hornstein (1995: 72) notes "regress problem" that copying the first VP into the second leads to a regress with yet another empty VP that must be filled. For example, in (4), *ate everything that Bill did*, is the VP we must copy but copying it leads to yet another null VP in the resultant structure: *ate everything that Bill did ate everything that Bill did [ e ]*. He claims that the regress problem can be circumvented in ACD structures by assuming that QR applies at LF.



If NP<sub>o</sub> contains an elided predicate we cannot interpret it by copying AgrS' into it. It has the structure as follows.

- (9) [<sub>NP</sub> Q [<sub>N'</sub> N [<sub>CP</sub> WH-<sub>i</sub> [<sub>IP</sub> NP<sub>j</sub> did [e] . . . ]]]]

Given that in (4) *Bill* has the same theta role that *John* has, we need to complete the A'-chain headed by the relative WH-operator in CP and A-chain related to the subject NP<sub>j</sub>. If we copy AgrS' from (7) into [e], NP<sub>s</sub> is coindexed with NP<sub>j</sub>. We copy AgrS' into [e] to complete NP<sub>j</sub>'s A-chain. For NP<sub>j</sub>'s A-chain to be licit, NP<sub>j</sub> and the trace in the subject of VP\* have to be coindexed; S=j.<sup>4</sup> But this leads to a principle C violation at LF and so this indexing should be illicit. To circumvent this problem, Chomsky assumes that indices are not copied. According to Chomsky's assumption, we should not copy indices because they are not real entities. Thus, not copying indices seems to

4. As case and theta-role are assigned by chain, the indices should be identical for the proper theta-role.

solve the problem of violating a Principle C violation at LF<sup>5</sup>.

### III. Problems Arising from Not Copying Indices

When indices are not copied, several problems arise. First, we must confine strict readings to a sentence in which both strict and sloppy readings are available. Let us consider the following sentences as noted by Steve Anderson<sup>6</sup>.

(10) John gave his letter to everyone that Bill did [<sub>VP</sub> e].

When we assume that *his* refers to someone other than *John* or *Bill* in (10), the elided VP can not be interpreted as anaphoric to *Bill* despite the fact that (11) can be so interpreted.

(11) John<sub>i</sub> gave his<sub>j</sub> letter to everyone that Bill<sub>k</sub> gave his<sub>k</sub> letter to.

Accordingly, a non-anaphorically interpreted pronoun cannot become a bound pronoun under VP ellipsis. In fact, the copied pronoun must retain the interpretation of the pronoun copied, i.e. if the copied pronoun is anaphoric so is the copy, if it is deictic so is the copy.

When we think of non-anaphoric pronouns as structurally distinct from anaphoric ones, we can assume that these sorts of pronouns function like deictic pronouns and that these are interpreted as contextually specified temporary names. We could then analyze (10) along with the lines of (12), with the deictic pronoun in place of Fred.

(12) John gave Fred's letter to everyone that Bill did.

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5. If free indexing is allowed, the right results will be yielded. If NP<sub>j</sub> is not tied to a trace in Spec VP, its chain receives no theta role and so the LF structure crashes. If the WH in CP in (8) is not linked to a well-formed A-chain with a theta position and a case-marked position it will be a vacuous operator and this will suffice to crash the derivation.

6. N. Hornstein (1995: 215) quotes Steve Anderson as noting the problem arising from the assumption that indices are not copied.

This is needed to analyze strict readings. Confining a sentence to strict readings is another problem. Let us consider the following sentences in Korean and English.

- (13) a. 창수는<sub>i</sub> 그가 이길 거라고 믿는데, 철수도 그러하다.  
 b. 창수는 자기<sub>i</sub>가 이길 거라고 믿는데, 철수도 그러하다.  
 (14) a. John<sub>i</sub> thought that he<sub>i</sub> would win, and Bill did too.  
 b. John<sub>i</sub> likes himself<sub>i</sub>, and Bill does too.

While both strict and sloppy readings<sup>7</sup> are possible in (13a) and (14a), only sloppy readings are allowed in (13b) and (14b). As is shown in sentences (13) and (14), both strict and sloppy readings should be allowed in the case of sentence (10). However, when we follow Chomsky's assumption that indices are not copied, there arises a problem that only the analysis of strict readings is possible. In effect we are reducing coreferential and deictic uses of the pronoun to the same structure.

Second, when we follow Chomsky's assumption, we can see another problem arising therefrom. We will have too many tenses inside the relative clause, the one provided by the relative itself and the one copied into the relative.

(15) [<sub>AGRSP</sub> NP<sub>S</sub> [<sub>AGRS'</sub> AgrS [<sub>TP</sub> T<sub>i</sub> [<sub>AGROP</sub> NP<sub>o</sub> [<sub>AGRO<sub>j</sub></sub> [<sub>VP</sub> t<sub>s</sub> [<sub>VP<sub>1</sub></sub> V<sub>k</sub> t<sub>o</sub>]]]]]]]]].

(16) [<sub>NP</sub> Q [<sub>N'</sub> N [<sub>CP</sub> WH-<sub>i</sub> [<sub>IP</sub> NP<sub>j</sub> did [<sub>AGROP</sub> t<sub>i</sub> [<sub>AGRO</sub> [<sub>VP</sub> t<sub>j</sub> [<sub>VP</sub> e ]]]]]]]]]].

By copying VP<sub>1</sub> in (15) into [VP e ] in (16), the A-chain required for interpretation is completed. If indices are not copied, it is difficult to identify traces in (15-16).

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7. (14a) can be paraphrased as follows:

John<sub>i</sub> thought that he<sub>i</sub> would win, and Bill<sub>j</sub> thought that he<sub>j</sub> would win.

When the embedded sentence pronoun *he* means the matrix sentence subject *John*, it has "strict reading"; when the embedded sentence pronoun *he* means *Bill*, it has "sloppy reading".

Third, if the verb raises to AgrS, we cannot copy the verb into the gap. Let us consider the following phrase marker.

- (17) [<sub>AgrSP</sub> NP<sub>S</sub> [<sub>AgrS'</sub> [[[V<sub>K</sub> [AgrO<sub>j</sub>]] T<sub>i</sub>] AgrS] [<sub>TP</sub> e<sub>j</sub> [<sub>AgrOP</sub> NP<sub>o</sub> [<sub>AgrO'</sub> e<sub>j</sub> [<sub>VP</sub> t<sub>S</sub> [<sub>VP1</sub> e<sub>k</sub> t<sub>o</sub>]]]]]]]]].

Instead, we must copy a trace of the verb, e<sub>k</sub> and the verb + AgrO complex e<sub>j</sub> as is shown in (17). The problem is to get determinate content on the assumption that indices of verbs are not real entities. When the structure of the raised NP object is as in (18) prior to VP interpretation and what is copied into e is AgrO' from (17), this results in (19)

- (18) [<sub>NP</sub> Q [<sub>N'</sub> N [<sub>CP</sub> WH-i [<sub>IP</sub> NP<sub>j</sub> did [<sub>AgrOP</sub> t<sub>i</sub> [e]]]]]]].

- (19) [<sub>NP</sub> Q [<sub>N'</sub> N [<sub>CP</sub> WH-i [<sub>IP</sub> NP<sub>j</sub> did [<sub>AgrOP</sub> t<sub>i</sub> [<sub>AgrO'</sub> e<sub>j</sub> [<sub>VP</sub> t<sub>S</sub> [<sub>VP1</sub> e<sub>k</sub> t<sub>o</sub>]]]]]]]]].

To circumvent a Principle C violation, we must assume that the indices from (17) have not been copied and that NP<sub>j</sub> and t<sub>i</sub> can bind t<sub>s</sub> and t<sub>o</sub> in (19). It appears that copying can do without the indices on the indicated NP traces inside VP in (19). This yields (20).

- (20) [<sub>NP</sub> Q [<sub>N'</sub> N [<sub>CP</sub> WH-i [<sub>IP</sub> NP<sub>j</sub> did [<sub>AgrOP</sub> t<sub>i</sub> [<sub>AgrO'</sub> e<sub>j</sub> [<sub>VP</sub> t<sub>j</sub> [<sub>VP1</sub> e<sub>k</sub> t<sub>i</sub> ]]]]]]]].

However, we must bind e<sub>k</sub>. If *did* binds this verbal trace, it must have the same index *did*<sub>k</sub>. To guarantee that in an ACD structure, the elided verb must be interpreted as identical to the matrix verb, we must admit that indices of verbs should be copied. Without this assumption, we cannot derive the required coindexation between *did* and V<sub>k</sub>. Therefore, verbal traces have indices that can get copied and traces of NP<sub>s</sub> do not get copied. With this, *do* can be anaphoric of the matrix verb<sup>8</sup> and inherit its content as claimed by Pollock (1989).

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8. In an ACD structure, the elided verb must be interpreted as identical to the matrix verb. Thus, *did* in (17) must be coindexed with the matrix verb V<sub>k</sub>. Let us consider the following examples.

Lastly, another problem arising from the assumption that indices are not copied is related to a theta role. Let us consider ACD constructions once again.

(21) John ate everything that Bill did.

In (21), *Bill* has the same theta role that *John* does. We end up with the structure in (22) at LF.

(22) John<sub>i</sub> [<sub>Agro</sub> [everything that Bill did [e]]<sub>j</sub> [t<sub>i</sub> ate t<sub>j</sub>]]

With the VP copied into [e], the relative clause has the structure in (23). This allows *Bill* to link to t<sub>i</sub> and thereby get its proper theta role.

(23) Everything that Bill<sub>i</sub> did [<sub>VP</sub> t<sub>i</sub> ate t<sub>j</sub>]

The trace requires an antecedent at LF and *Bill* serves as its antecedent. Accordingly, by allowing *Bill* to link to its index t<sub>i</sub>, *Bill* can get its proper theta role.

- (1a) John kissed everyone that Bill did.
- (1b) John kissed everyone that Bill kissed.
- (1c) John kissed everyone that Bill saw.

Thus, only when we assume that verbal indices are copied can we guarantee that (1a) is interpretable as (1b) not (1c).

VP deletion in English is somewhat idiosyncratic. Spanish has an elliptical analogue but does not have VP deletion.

- (2a) Juan vio un coche y Pedro tambien.  
Juan saw a car and Pedro too.
- (2b) Juan illego, y creo que Pedro tambien.  
Juan arrived and I think that Pedro too.
- (3) Juan ne vio nada que Pedro \*(vio)  
Juan saw nothing that pedro (saw)

As is shown in (2-3), Spanish has an elliptical analogue. However, what does not occur in Spanish is the equivalent of English ACDs.



#### IV. Scope Indexing

Let us consider the following sentence in which universal quantifier takes place in subject position and existential quantifier takes place in object position.

(24) Every student admires some professors.

The sentence (24) is ambiguous<sup>9</sup>. The first interpretation is that 'every student respects each professor, respectively'; the second interpretation is that 'every student has a professor whom he respects.' Let us consider another sentence.

(25) Some student admires every professor.

The sentence (25) has ambiguity as opposed to its Korean counterpart<sup>10</sup>. The reason why sentence (15) has ambiguity can be easily accounted for through QR. When QR applies to sentence (25), two structures take place as follows:

- (26) a. [some student<sub>i</sub> [every professor<sub>j</sub> [e<sub>i</sub> admires e<sub>j</sub>]]]  
 b. [every professor<sub>j</sub> [some student<sub>i</sub> [e<sub>i</sub> admires e<sub>j</sub>]]]

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9. Its Korean counterpart sentence is also ambiguous.

이 교실 안에 학생 누구나 누군가를 사랑한다.

This sentence has two interpretations: one is that 'every student in the classroom has each person he loves' and the other is that 'every student in the classroom loves a specific person.'

10. Its Korean counterpart has just one interpretation, thus it is not ambiguous.

누군가가 이 교실에 있는 모든 학생을 사랑한다.

The above sentence has only the interpretation that 'there is a specific person who loves every student in the classroom.' That is, the interpretation that universal quantifier in object position takes scope over existential quantifier in subject position is not possible in Korean.

*some student* has scope over *every professor* in (26a) and *every professor* has scope over *some student* in (26b). This fact gives an account of the ambiguity of the sentence (25).

Scope Indexing in Haik (1984) can solve ambiguity problem. Scope Indexing is as follows:

(27) Scope Indexing

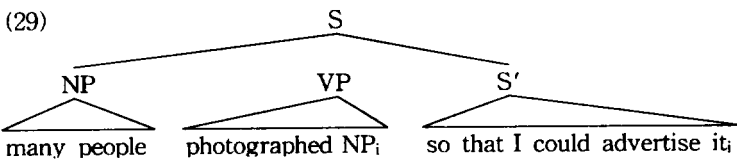
- a. If  $NP_i$  is to be interpreted as in the scope of  $NP_j$ , then append  $/_j$  to the index of  $NP_i$ ; that is, a structure containing  $NP_{i/j}$  is unambiguously interpreted with  $NP_i$  as in the scope of  $NP_j$ .  $i/j$  is a referential index.
- b. Scope is transitive; therefore, if  $NP_i$  is construed as in the scope of  $NP_j$  ( $NP_{i/j}$ ) and  $NP_j$  as in the scope of  $NP_k$  ( $NP_{j/k}$ ), the  $NP_{i/j/k}$ .

The Scope Indexing, though proposed to solve the problems concerning variable binding, can be conducive to solving the problem of the scope of quantifier. Based on Scope Indexing, because subject *some student* is coindexed with object *every professor*, the preceding quantifier is *every professor* in the sentence (25).

Let us consider the case of Indirect Binding.

- (28) a. [ $NP_i$ ] photographed [ $a\ car$ ] $_{i/j}$  so that I could advertise  $it_i$ .
- b. \* $NP_i$  photographed [ $every\ car$ ] $_i$  so that I could advertise  $it_i$ .

(28b) is ill-formed because the pronoun  $it_2$  is not bound by its antecedent, and inherent quantifier, violating a condition on variables. This is because, presumably, the *so that* clause is a sister of VP, barring the object of V from c-commanding it and its internal constituent.



In (28a), however, the pronoun *it* is coreferential with the variable *a car*, indirectly bound by *many people*<sup>11</sup>. Since the wide scope NP is an indirect binder of *a car*, it may also indirectly bind the pronoun. Since *c-command* holds between *many people* and the pronoun, the pronoun is properly, indirectly, bound in the sentence. The contrast between (28a) and (28b) is thus due to the fact that the object of *photograph* does not have scope over the adverbial clause--and hence over the pronoun--rendering direct binding unavailable. Since *every car* is an inherent quantifier, direct binding is required, and since direct binding is ruled out, the sentence is ill-formed. In contrast, in (28a) the two occurrences of the variable NP<sub>*i*</sub> are indirectly bound by the wide scope NP. Let us consider the following sentence.

- (30) \*John persuaded someone<sub>*i*</sub> that three people were trying to kill  
 {the poor fellow<sub>*i*</sub>/him<sub>*i*</sub>}

The reading that is ruled out in (30) is the one in which NP<sub>*i*</sub> is construed as in the scope of *three people*. For *three people* to be assigned scope over NP, it must be scope-indexed with the NP that it *c-commands*, namely, the epithet. To avoid producing (30), the epithet must be invisible for Scope Indexing, along with pronouns. Thus (30) shows that pronoun and epithets are on a par with respect to binding and scope indexing. Considering that epithets have the property of being definite NPs that do not contain a restrictive complement<sup>12</sup>, they may be identified at S-structure, along with pronouns, making possible the task of omitting them from the rule Scope Indexing. Thus, the domain in which an epithet may occur and be interpreted as a variable is the domain of indirect binding of a wide scope NP that does not intersect with the domain of binding of its antecedent.

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11. That is, *many people* has scope over *a car*.

12. A restrictive complement contains a relative clause, a nonsubcategorized PP, or a restrictive adjective.

#### IV. Conclusion

I have so far examined the problems with the indices in the Minimalist Program. To circumvent a Principle C violation that clearly arises in ACD constructions, Chomsky assumes that indices are not real and are not actually copied. I, however, have shown that his such assumption has several problems as follows: we have to confine strict readings to a sentence that both strict and sloppy readings are available; there are too many tenses inside the relative clause, thus it is difficult to identify traces; we cannot guarantee that the elided verb is identical to the matrix verb; an Argument NP cannot get its proper theta role.; and Scope Indexing requires the real entities of indices as opposed to Chomsky's assumption. As long as several problems are so clearly revealed that we cannot apply to ACD constructions any more, a separate assumption of indices should be made: the assumption of a verb index and that of a noun index. This is because, when we assume that indices of verbs are get copied, the problems concerning the violation of a C principle, too many tenses in a relative clause, the elided verb in an ACD construction identical to the matrix verb, thematic roles, and Scope Indexing can be clearly accounted for.

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