Headedness and scope rigidity

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This paper discusses parametric variation regarding scope rigidity. My proposal is that this parametric variation is reducible to the headedness. Specifically, under Fukui and Takano's (1998) theory of phrase structure, I will propose a mechanism for the locality of Quantifier Raising. Furthermore, I will propose a hypothesis that the visibility of a maximal projection to C_{HL} is determined by the visibility of its head. The theoretical consequence of the present analysis is that head movement takes place at narrow syntax, contrary to Chomsky (2000).

1.Introduction

Parametric syntax has been an important research area under the principles-and-parameters approach, where the theory of UG has invariant principles and parameters that are to be fixed by experience. Various kinds of parametric variation has been discussed under this approach. This paper discusses cross-linguistic variation of scope interpretation. As (1) shows, English allows inverse scope. In (1), the object quantifier, *everyone* can take wide scope over *someone*. May (1977) argues that *everyone* undergoes Quantifier Raising (QR) to the position where it takes wide scope over *someone* at LF.

(1) Someone loves everyone. (everyone > someone)

However, some languages exhibit scope rigidity, which does not allow inverse scope. As Kuroda (1965), Hoji (1985), among others, observe, Japanese is a language of this kind. This is shown in (2).[1]

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[1] It is important to mention that there are some cases where scope rigidity is not observed in Japanese. Hoji (1985) observes the following contrast.

(i) a.[John ka Mary]-ga daremo-o sonkeisiteiru (or > every, *every>or)
John or Mary-NOM everyone-ACC admire

b.[John ka Mary Ka]-ga daremo-o sonkeisiteiru (or > every, every>or)
John or Mary-NOM everyone-ACC admire
'John or Mary admires everyone.'

(2) Dareka-ga daremo-o aisiteru.
someone-NOM everyone-ACC love
'Someone loves everyone'. (*everyone > someone)

What is the source of this parametric variation? In this paper, I address this question.[2] Fukui (1986) reduces various kinds of differences between Japanese and English to the difference of functional categories in these languages. Following Fukui, I would like to reduce the difference concerning scope rigidity to the difference of functional categories in these languages.[3] In capturing the difference between Chinese and English concerning scope rigidity, Aoun and Li (1993) have already put forward this possibility. Under their analysis, the functional category Infl plays a crucial role. In this paper, departing from them, I will argue that the functional category *v* plays a crucial role for the relevant parameterization.

The organization of this paper is as follows. In section 2, I will review Aoun and Li's (1993) analysis and point out that Turkish fails to fall under their analysis. In section 3, I will propose an alternative analysis, under Fukui and Takano's (1998) theory of phrase structure. In section 4, I will propose one hypothesis, which is crucial to a proposal in this paper, that the visibility of a maximal projection to C_{HL} is determined by the visibility of its head. In section 5, I will discuss the locality of QR more. In section 6, I will reconsider Chinese cases, which seem to be a problem for a proposal in this paper. In section 7, I will conclude the paper.

2. Aoun and Li (1993)

In this section, I will review Aoun and Li's (1993) analysis, which discusses the parametric variation between Chinese and English. As Huang (1982), Aoun and Li (1993), among others, Chinese is a scope rigid language, like Japanese. The relevant example is given in (3).

(3) youyige xuesheng mai-le meiyiben shu. (*every> a/a > every)
one student buy-ASP every book
'A student bought every book.' (Huang 1982: 129)

In (ia), the object quantifier cannot take wide scope over the subject quantifier. In contrast, the inverse scope of the object is possible in (ib), where the disjunction marker is repeated. Watanabe (2000) suggests that the following example also exhibits inverse scope.

(ii) Darekasiraka-ga daremo-o sonkeisiteiru (some>every, every>some)
someone-NOM everyone-ACC admire
'Someone admires everyone.' (Watanabe 2000: 266)

In (ii), the existential quantifier with repeated *ka* allows inverse scope. In this paper, I leave this issue for future research.

[2] See also Watanabe (2000) for an alternative proposal to the relevant parametric variation.

[3] As Naoki Fukui (personal communication) points out, another possibility to be considered is to reduce the relevant parametric variation to some different intrinsic properties between *everyone* and *daremo*. I leave the investigation of this possibility for future research.

In (3), the object quantifier cannot take wide scope over the subject, like Japanese. Aoun and Li (1993:22) argue that the difference in the interpretation of quantifiers in English and Chinese results from a different property of Infl between the two languages.[4] Their assumptions are as follows.

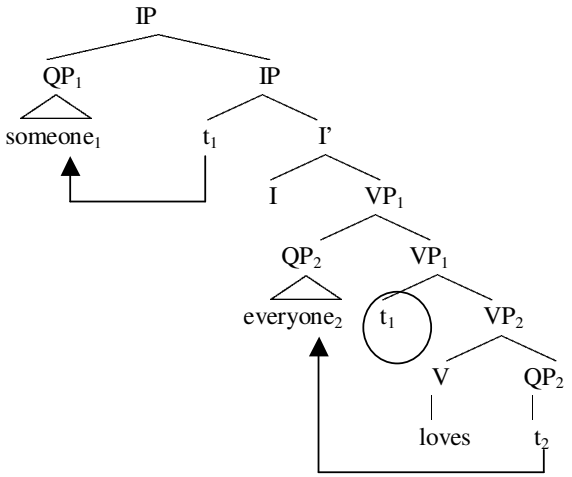
(4) *The Minimal Binding Requirement*
Variables must be bound by the most local potential A-bar binder.
(Aoun and Li 1993: 11)

(5) *The Scope Principle*
A quantifier A may have scope over a quantifier B iff A c-commands a member of the chain containing B. (ibid.: 11)

(6) Chinese subjects remain in [Spec, VP] due to the degenerate nature of Infl.
(ibid.: 23)

Under Aoun and Li's analysis, example (1) has the derivation given in (7).

(7)



Crucially, they assume that the subject raises to [Spec, IP], leaving the trace in [Spec, VP_1] at S-structure. At LF, the two quantifiers, *someone* and *everyone* undergo QR. They adjoin to IP and VP_1, respectively. Note that *everyone* c-commands a NP-trace of *someone*, which is in [Spec, VP_1]. The crucial assumption is that NP-traces are not relevant to the Minimal Binding Requirement but relevant to the Scope Principle. According to (5), *everyone* can take scope over *someone* because the former c-commands a member of the chain of *someone*, that is, the trace of *someone*. In this way, English has the

[4] See also Huang (1982) for an alternative analysis.

interpretation where the object takes wide scope over the subject.

Turn to example (3), repeated as (8a), which has the derivation given in (8b) and (8c) under Aoun and Li's analysis.

(8) a. youyige xuesheng mai-le meiyiben shu. (*every> a/a > every)
one student buy-ASP every book
'A student bought every book.' (Huang 1982: 129)

b. S-S:[$_{VP1}$ youyige xuesheng [$_{VP2}$ mai-le meiyiben shu]]

c. LF:[$_{VP1}$ youyige xuesheng$_1$ [$_{VP1}$ t_1 [$_{VP2}$ meiyiben shu$_2$ [$_{VP2}$ mai-le t_2]]]]

QR ***QR***

The crucial assumption is (6). Chinese does not show agreement morphology. Subjects in Chinese do not move to [Spec, IP]. At LF, the subject QP and the object QP undergo QR and adjoin to VP_1 and VP_2, respectively. QP_2 cannot adjoin to VP_1 because if it adjoined to VP1, it would bind the trace of QP_1 in [Spec, VP_1], which would lead to violation of the Minimal Binding requirement. The trace of *youyige xuesheng* 'one student' in [Spec, VP_1] is not an NP-trace but a variable and hence is subject to the Minimal Binding requirement. In (8) *youyige xuesheng* 'one student' c-commands *meiyiben shu* 'every book' and hence the former can take wide scope over the latter. However, *meiyiben shu* 'every book' cannot take wide scope over *youyige xuesheng* 'one student' because the former cannot c-command any member of the chain of *youyige xuesheng* 'one student'. To sum up, Aoun and Li reduces the parametric variation concerning scope rigidity to the nature of the functional category Infl.

However, it seems to be difficult for Aoun and Li's analysis to accommodate Turkish. In Turkish, subjects agree with verbs on person and number features and subjects obligatorily move from the base-generated position like English, as shown in (9).

(9) a. Ben [herkes tarafindan] çabucak uyudu san-ıl-ı-yor-um.
I everyone by quickly sleep-PAST think-PASS-PRES-1SG
'I am thought by everyone to have slept quickly.'

b. *[Herkes tarafindan] ben çabucak uyudu san-ıl-ı-yor-um.
everyone by I quickly sleep-PAST think-PASS-PRES-1SG
'I am thought by everyone to have slept quickly.'
(Murat Kural personal communication)

Under the assumption that subjects must move to [Spec, IP], rather than staying in the VP-internal subject position, the contrast between (9a) and (9b) is captured. Example (9a) is grammatical because the subject *ben* "I' moves from the embedded clause to [Spec, IP] in the matrix clause, crossing the adverb which modifies the matrix clause. (9b) is ungrammatical because the subject stays in the embedded clause. It is concluded that subjects in Turkish are

moved into [Spec, IP] from [Spec, VP], like English.[5] However, Turkish exhibits scope rigidity, like Chinese.

(10) [Üç kişi]yi Herkesi dün aramiş. (*every> 3, 3>every)
three person-Nom everyone-Acc yesterday call-Past-3sg
'Three people called everyone yesterday.' (Kural 1997: 504)

As (10) shows, objects cannot take wide scope over subjects in Turkish. Under Aoun and Li's analysis, it is not clear why Turkish exhibits scope rigidity.

I would like to put forward the idea that head-finality plays a crucial role for scope rigidity.[6] Turkish and Japanese are a head-final language and exhibit scope rigidity. However, how can I connect headedness with scope rigidity? Chomsky (1995), among others, has argued that linear order does not exist in the narrow syntax. Linear order is one of the PF properties. If this approach is correct, then it seems to be difficult to connect headedness with scope rigidity. In the next section, I will resolve the dilemma.

3. Proposals

Before going to a proposal, I will review some theoretical assumptions made in this paper. I assume Fukui and Takano's (1998) theory of phrase structure. They assume that the universal word order is SOV, contrary to Kayne (1994). SVO word order is derived from SOV through verb movement. Specifically, they propose (11).

(11) a. Head movement for checking purposes always takes the form of "substitution into Spec".
b. *v* has the property of attracting V in English but not in Japanese.
(Fukui and Takano 1998: 44-45)

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[5] The assumption that Turkish subjects move to [Spec, IP] from [Spec, *v*P] is not uncontroversial. Kural (1997) observes that Turkish subjects do not exhibit the Subject Condition effects.
(i) [Op$_i$ [Ahmet'in t$_i$ kırması]nin beni üzdüğü] bardak.
Ahmet-GEN break-INF-3SG-GEN I-ACC sadden-PAST-3SG glass
'the glass that Ahmet's breaking (it) saddened me' (Kural 1997: 502)
Following Kural (1997), I assume that verbs undergo movement out of VP in Turkish and subjects stay within the c-commanding domain of verbs.

[6] However, there are important counterexamples to the present approach. As noted before, Chinese is SVO but exhibits scope rigidity. In section 6, I will reconsider Chinese cases. As S.-I. Takahashi (personal communication) points out to me, Serbian/Croatian also exhibits scope rigidity, although it is a SVO language. The relevant example is given in (i).
(i) Ne(t)ko voli svako-ga. (*every > some)
someone loves everyone-ACC
There is a person X such that X loves everybody.' (Progovac 1994: 31)
The present approach cannot give an explanation to this fact in a straightforward way. I need to say something about cases in Serbian/Croatian. I will this issue for future research.

As (11a) shows, they reanalyze head movement as a substitution operation rather than head adjunction. The difference between VO and OV order is due to the property of the light verb, according to (11b). Under their analysis, the derivation of VO order such as English and OV order such as Japanese is schematically given in (12), respectively.

(12) a. $[_{vP}$ Subj $[_{v'}$ V $[_{v'}$ $[_{VP}$ Obj t_V] v]]] -- > SVO
b. $[_{vP}$ Subj $[_{v'}$ $[_{VP}$ Obj V] v]] --- > SOV

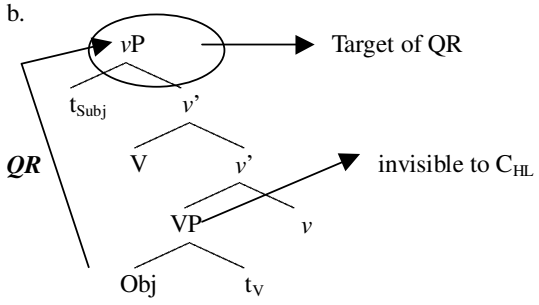
In this paper, I make the following proposal.

(13) a. A quantifier α must adjoin to the first maximal projection which dominates α.
b. A maximal projection of α is not visible to C_{HL} if α undergoes head movement.

Condition (13a) says that QR is subject to some economy condition like *Shortest Move*.[7] I will justify the assumption given in (13b) on independent grounds in the next section.[8]

In what follows, let us see how the present analysis works. In English, the verb is moved to [Spec, *v*P], which makes VP invisible in the computation and hence VP does not work as an adjunction site of QR. That is why the object quantifier cannot adjoin to VP. According to (13a), the adjunction site should be the next higher maximal projection *v*P. I assume with Aoun and Li (1993) that the Scope Principle given in (5) plays a crucial role for scope interpretation. The object adjoins to *v*P and c-commands the trace of the subject. According to the Scope Principle, the inverse scope is possible. This is shown in (14b).

(14) a. Someone loves everyone. (everyone > someone)
b.



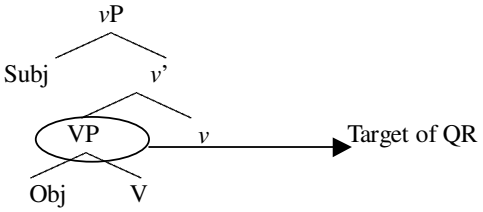
[7] See also Bruening (2000), Fox (2000), and Sauerland (2000) for the locality of QR.

[8] The present analysis that head movement is crucially involved in the locality of movement is reminiscent of Law's (1991) proposal that bounding domains should be defined in terms of head movement. Specifically, in his theory, projections with an empty head cannot be a bounding node. See Law (1991) in detail.

Next, take a look at Japanese cases.

(15) a. Dareka-ga daremo-o aisiteru
someone-NOM everyone-ACC love
'Someone loves everyone'. (*everyone > someone)

b.



In (15b), in order for *daremo-o* 'everyone-Acc' to adjoin to *v*P, the verb must undergo movement to the next higher head, like English. However, as (15b) shows, Japanese does not have verb movement and hence *daremo-o* cannot adjoin to *v*P because (13a) requires that the object quantifier should adjoin to VP, which is visible in Japanese. In Japanese, object quantifiers cannot take wide scope over subject quantifiers.[9]

4. Visibility to C_{HL}

So far, I have assumed that a maximal projection whose head undergoes head movement out of it is invisible to C_{HL}. In this section, I will argue that this assumption is justified on independent grounds.

Takano (2000) makes the generalization given in (16).[10]

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[9] I would like to mention that the present analysis has to allow the adjunction to VP, which is a one-place predicate (type <e,t>). Heim and Kratzer (1998) assume that quantifiers adjoin to a clause-denoting expression (type t) by QR. They assume that λ -abstraction applies to a clause-denoting expression and a one-place predicate is formed. Then, a quantifier (type <<e,t>,t>) adjoins to the one-place predicate. Under Heim and Kratzer's approach, if quantifiers were adjoined to VP, semantic mismatch would appear. This is because λ -abstraction applies to VP and forms <e,<e,t>>, which raises a type mismatch with <<e,t>,t>. In this paper, I employ flexible types for quantifiers. I shift semantic type of quantifiers from <<e,t>,t> to <<e,<e,t>>,<e,t>>, which resolves type mismatch mentioned above. In fact, Heim and Kratzer (1998:217-220) also suggest that it is necessary to allow VP as an adjunction site on independent grounds.

[10] Akira Watanabe (class lecture @ University of Tokyo, 2001) points out a counterexample to the generalization given in (16).

(i) They all said that John was shrewd and [$_{VP}$ t_{was} [$_{AP}$ t_{he} shrewd]] he was t_{VP}.

(ii) *They all said that John was shrewd and [$_{AP}$ t_{he} shrewd] he looks t_{AP}.

The ungrammaticality of (ii) shows that AP cannot undergo predicate fronting and hence it must be the case that the fronted category is VP, where *was* moves out in (i). He suggests that (i) is a counterexample to the generalization that phrases whose head undergoes movement cannot be moved. I have to give an alternative account to the contrast above but this is an issue for future research. See Kuno (2000) for related discussion.

(16) Remnant movement of α is impossible if the head of α has moved out of α.
(Takano 2000: 146)

In German, remnant movement of a maximal projection whose head undergoes head movement out of it is impossible, as discussed in Haider (1990), Takano (2000), among others. The relevant example is given in (17).

(17) *[Ihr ein Buch t_1]$_2$ gab$_1$ Hans t_2.
her a book gave Hans
'Hans gave her a book.' (Haider 1990: 96)

One might say that (17) falls under Müller's generalization. However, (17) does not because head movement and remnant VP movement are not the same type of movement.

(18) a. [Dato t_1 a Gianni]$_2$, non l$_1$'ho ancora t_2.
given to Gianni not it. (I).have yet
'Given it to Gianni, I have not yet.' (Rizzi 1990: 39)
b. ?dab [t_1 zu lessen]$_2$ es$_1$ keiner t_2 versucht hat.
that to read it no one tried has
'that no one has tried to read it.' (Müller 1996: 380)

As examples in (18) show, head movement and remnant movement are different movement, under the assumption that a clitic undergoes head movement.[11] Through consideration of the grammaticality of (18), it is impossible to say that the ungrammaticality of (17) is due to Müller's generalization. Takano (2000) claims that the ungrammaticality of (17) falls under the generalization given in (16).

Following Chomsky (1995: chapter 4), Takano assumes that every movement is feature-driven and movement of the category α takes place when formal features of the head of α is attracted. Assuming that topicalization/focus movement is also feature-driven, Takano claims that remnant movement of VP in (17) results from the overt application of Attract to the formal features of the head of VP. However, the condition given in (19) prevents Attract/Move F from applying to traces.

(19) Only the head of a chain CH enters into the operation Attract/Move.
(Chomsky 1995: 304)

Since the head of VP is a trace in (17), remnant movement is impossible.

In the previous section, I have argued that V undergoes head movement and VP does not work as an adjunction site of QR in English. In this section, I have reviewed that remnant movement of a maximal projection whose head moves

[11] Following Müller (1996), Takano (2000) assumes that the German pronominal clitics undergoes head movement.

out of it is impossible. In this paper, I would like to unify these two things in terms of a maximal projection's loosing its head. In both of the cases, a maximal projection looses its head and is invisible to C_{HL}. In the first case, XP is not qualified as a landing site and in the second case, XP cannot be a target of Move. Why does loosing a head make XP invisible to C_{HL}? I would like to claim that whether XP is visible to C_{HL} or not is determined by the visibility of its head. In this case, the head of XP is a trace. I assume that traces are invisible to C_{HL}. I argue that this assumption is not implausible, if we consider (19). As (19) says, the tail of the chain, that is, traces are not a target of Attract/Move. In this sense, it is possible to say that traces are invisible to C_{HL}. In this paper, I propose the following hypothesis.

(20) The visibility of a maximal projection is determined by the visibility of its head.

According to (20), under the assumption that a trace is invisible to C_{HL}, it follows that a maximal projection whose head is a trace is invisible to C_{HL} and hence it does not work as an adjunction site and as a target of movement.

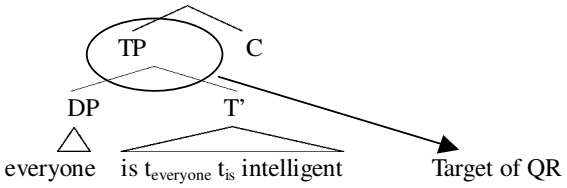
5. More on locality of QR

So far, I have assumed that a syntactic head which undergoes head movement makes its maximal projection invisible to C_{HL}. In other words, the visibility of a head determines whether its maximal projection is visible to C_{HL} or not.

The present analysis so far can give a natural explanation to the clause-boundedness effect of QR.[12]

(21) a. Someone believes that everyone is intelligent.(*everyone> someone)

b. ……. C'



I assume that the subject *everyone* is base-generated in [Spec, *v*P] and moves to

[12] It is important to note that there are some counterexamples. Farkas and Giannakidou (1996) (henceforth F &G) point out that there are counter examples to the clause-boundedness.

(i) A student made sure that every invited speaker had a ride. (F &G 1996: 36)

According to F &G, in (i), *every speaker*, which is the subject of the embedded clause, can take wide scope over *a student*, which is the subject of the matrix clause. They claim that some semantic factor plays a crucial role for the relevant clause-boundedness. Specifically, their claim is that two scopally related expressions are co-participants in some eventuality. See F &G (1996) in detail. I leave examination of their analysis of the clause-boundedness for future research.

[Spec, TP] within the embedded clause. Given (13a), the adjunction site of *everyone* is the embedded TP because the first maximal projection which dominates *everyone* is the embedded TP. *Everyone* cannot take wide scope over *someone* because *everyone* does not c-command any member of the chain of *someone*.

In contrast to finite clauses, however, it has been observed that ECM subjects of infinitival clauses can take wide scope over subjects of the matrix clause. The relevant example is given in (22).

(22) Someone believes everyone to be intelligent. (everyone > someone)

I assume that the subject of the infinitival clause *everyone* is also base-generated in [Spec, *v*P] and moves to [Spec, TP] in the embedded clause for the EPP. Under the present analysis so far, TP should be a target of adjunction site of QR like finite clauses and hence the inverse scope given in (22) cannot be predicted. In order to resolve this problem, I would like to suggest that not only traces of head movement but also *to* in the ECM construction is invisible to C_{HL}.

There is a good reason to believe that *to* in (22) is invisible to C_{HL}. Lobeck (1991) argues that only agreeing functional categories license ellipsis of their complement. This is shown in (23).

(23) a. John [$_{VP}$ likes syntax] and Mary does [$_{VP}$ e] too.
b. *Bill believes John to like syntax and he believes Mary to [$_{VP}$ e] as well.

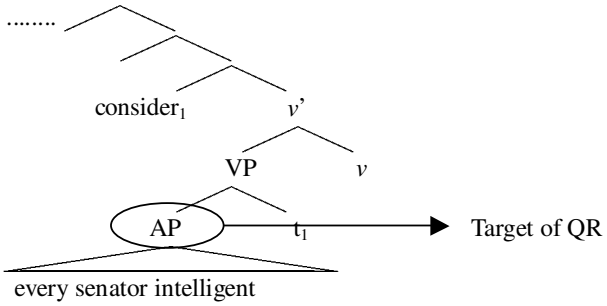
Finite T in (23a), which establishes Case/Φ agreement, licenses ellipsis site. In contrast, as (23b) shows, *to* cannot license ellipsis of its complement. I assume that the property of heads plays a crucial role at licensing ellipsis of their complement. It is possible to claim that finite T is visible but *to* in the ECM construction is not visible regarding licensing ellipsis of their complement.

Hornstein (1995) observes that small clause subjects cannot take wide scope over matrix subjects. In (24), *every senator* cannot take wide scope over at *least one person*.

(24) At least one person considers [every senator smart]. (Hornstein 1995: 76)

It has been a mystery why small clause subjects cannot take scope over the matrix clause in (24), unlike (22). The present analysis can capture the contrast given in (22) and (24). I assume that *every senator* stays in AP, without going out of the lexical projection, unlike (22) and hence the target of QR is AP, as shown in (25).

(25)



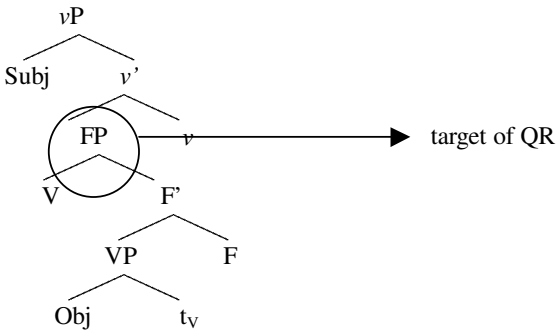
The contrast between (22) and (24) cannot be captured under A-movement approach to quantifier scope, proposed by Kitahara (1996), Hornstein (1995), among others. This is because ECM subjects in infinitival clauses and small clauses behave in the same way in that they undergo A-movement to the higher clause and can have interaction with matrix subjects. In contrast, the present approach can explain the relevant contrast, by assuming that *to* is invisible to C_{HL} and hence TP headed by *to* does not work as an adjunction site.

6. A reconsideration of Chinese

In this section, I will reconsider Chinese cases. Chinese seems to be problematic for the present analysis. Chinese exhibits scope rigidity while it is a verb-initial language. If Chinese had the same phrase structure as English, it is predicted that Chinese would not exhibit scope rigidity.

I suggest that Chinese verb movement is shorter than that in English. [13] Specifically, I would like to propose that Chinese has a projection between VP and *v*P, which provides a landing site for raised verbs, as shown in (26).[14]

(26)



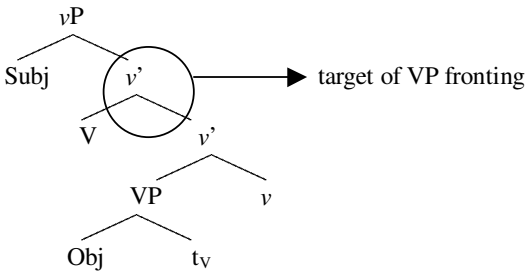
[13] Fukui and Takano (1998: 52) also make a suggestion that Chinese verb movement is shorter than that in English on independent grounds.

[14] I leave the status of FP an open question.

As (26) shows, according to (13a), FP is a landing site of QRed object quantifiers and hence Chinese exhibits scope rigidity, like Japanese.

I will provide evidence for the existence of the projection between VP and *v*P, based on VP fronting. I make the following assumptions. First, following Aoun and Li (1993), Chinese does not have subject raising. Rather, subjects stay in [Spec, *v*P]. Second, intermediate projections cannot undergo movement. If there were no projection between VP and *v*P, it must be the case that VP fronting applies to *v*'. This is inconsistent with the second assumption.

(27)



However, Chinese allows VP fronting, as shown in (28). The structure given in (27) cannot generate an example in (28).

(28) [Piping ziji$_1$ de pengyou, Zhangsan$_1$] juedui bu hui.
criticize self's friend Zhangsan definitely not will
'Criticize his friend, Zhangsan definitely will not.'

However, given the structure in (26), it is possible to generate (28), by fronting FP in (26). The existence of VP fronting in Chinese is supporting evidence for the projection between VP and *v*P.[15]

7. Concluding remarks

In this paper, I have claimed that the parametric variation with respect to scope rigidity is reducible to the property of *v*. Specifically, English light verbs have the property of attracting V while Japanese light verb does not attract V. Further more, I have put forward the idea that the visibility of a maximal projection is determined by the visibility of its head. I have argued that there are at least two

[15] I speculate that FP is active in Chinese on independent grounds. Chinese allows objects to appear in the preverbal position, unlike English.
(i) Ta ba Lisi pian-le.
he BA Lisi cheat-ASP
'He cheated Lisi.' (Huang 1982: 27)
Example (i) has been called "BA construction", where objects of verbs appear in the preverbal position, marked with *ba*. I speculate that the phrase marked with *ba* moves from the complement position to [Spec, FP].

elements which make their maximal projection invisible to C_{HL}. One is a trace which are left behind by head movement. The other is *to* in the ECM construction.

The consequence of this paper is that head movement takes place at narrow syntax, not at PF component. If head movement took place at PF, then the correlation of head movement and scope rigidity would not be captured. However, Chomsky (2000:68n.146) suggests that head movement is part of the phonological component, not at syntax. This suggestion is inconsistent with the claim of this paper. Under the present analysis, head movement plays a crucial role for the locality of QR and hence it must be the case that head movement takes place at narrow syntax, not at PF.

Before concluding the paper, I will review some pieces of evidence for the claim that head movement is involved in semantic interpretation. The first evidence is that head movement plays a crucial role for the licensing of negative polarity items.

(29) a. *Anybody didn't come.
b. Didn't anybody come? (Uribe-Etxebarria 1996: 573)

As (29a) shows, negative polarity items in the subject position cannot be licensed. However, when auxiliaries like *didn't* undergo head movement, then it is possible to license negative polarity items in the subject position. This is shown in (29b). I assume that the licensing of negative polarity items takes place at LF. If the relevant movement takes place at PF, it is not possible to explain the grammaticality of (29b).

The second evidence is based on English negative questions. In English, a question like (30) has two possible readings: *Yes-no*-reading given in (31a) and Alternative-reading given in (31b).

(30) Did John drink coffee or tea?

(31) a. *Yes-no*-reading: "Is it the case that John drank any of these two things, coffee or tea?"
b. Alternative-reading: "Which of these two things did John drink: coffee or tea?"
(Han and Romero 2001: 101)

Under the yes-no-question, the answer can be (32a) and under the alternative-question, the answer can be (32b).

(32) a. Yes, John drank coffee or tea./ No, John didn't drink coffee or tea.
b. John drank coffee./ John drank tea.

However, in the case of negative questions, examples with non-inverted negation like (33) have both of the readings but examples with inverted negation like (34) does not allow the alternative-reading, as discussed in Han

and Romero (2001). The contrast between (33) and (34) also shows that head movement is crucial for semantic interpretation.

(33) Did John not drink coffee or tea?
  a. *Yes-no*-reading answers:
     Yes, John did not drink coffee or tea. / No, he did drink coffee or tea.
  b. Alternative-reading answers:
     John did not drink coffee./ John did not drink tea.

(34) Didn't John drink coffee or tea?
  a. *Yes-no*-reading answers:
     No, John did not drink coffee or tea./Right, he did drink coffee or tea.
  b. #Alternative-reading answers:
     John did not drink coffee. / John did not drink tea.

(Han and Romero 2001: 101-102)

If head movement were PF phenomena, then it is not possible to capture the difference between (33) and (34), under the assumption that auxiliaries like *did* and *didn't* undergo head movement. Therefore, it is difficult to claim that head movement is PF phenomena.

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