[Focus]$_F$ Restricts Scope: Quantifier in VP Ellipsis [1]

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1. Introduction

The notion of scope has been one of the central issues in both syntactic and semantic theories. However, the scope mechanisms previously proposed in the literature (e.g. Quantifying-In, Quantifier Raising, Cooper Storage) are known to be so powerful that they fail to exclude unavailable readings in some cases, and some additional constraints, such as syntactic island constraints, have proved to be useful to complement those mechanisms. In this paper, I argue that focusing effects also play an important role in constraining scope in some cases.

Our specific concern in this paper is the restriction on quantifier scope in VP ellipsis contexts, first noticed by Sag (1976) and Williams (1977). While the sentence (1) is ambiguous in terms of the relative scope of the universal quantifier and the existential quantifier, the ambiguity is lost when another sentence involving VP ellipsis is added, as in (2). The only interpretation available is the one with the existential quantifier taking wider scope with respect to the universal quantifier.

(1) Someone loves everyone.

(2) Someone loves everyone, and Chris does, too.

Sag's and William's generalization is the following. A quantifier in an elided VP can only take the VP scope, and the scope of the corresponding quantifier in the antecedent VP is also restricted to the VP level. This generalization is challenged by Hirschbühler (1982), who provides an example which constitutes a minimal pair with the Sag/Williams case. The sentence (3) is ambiguous in the same way as (1) is ambiguous.

(3) A Canadian flag is in front of every building.

Unlike in (2), however, the continuation of (3) by uttering '*and an American flag is, too*' does not eliminate the universal-wide-scope reading. Consider (4).

(4) A Canadian flag is in front of every building, and an American flag is, too.

(4) is still ambiguous: Either the universal quantifier or the existential quantifier takes the wider scope with respect to the other, although in this particular example, the pragmatically more salient reading is probably the one with the universal quantifier taking wider scope.[2] It seems, then, that a quantifier can

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move out of an elided VP to take wider scope with respect to elements higher than the VP. Why is this option not available in the Sag/Williams example?

2. Scope Relations and Derivational Economy - Fox (1994, 1995)

Amongst the previously proposed solutions for the puzzling scope phenomena outlined above, Fox (1994, 1995) is the most extensive and comprehensive account.[3] In this section, I will review his proposal in detail. Fox begins his analysis with the following descriptive generalization.

(5) Ellipsis Scope Generalization (ESG) (= Fox 1995, (10)): The relative scope of two quantifiers, one of which is in an antecedent VP of an ellipsis construction, may differ from the surface c-command relation, only if the parallel difference will have semantic effects in the elided VP.

Let us first take a look at the unambiguous example (2). Fox makes the following basic assumptions: (i) an elided VP is fully represented at LF (cf. Fiengo and May 1994), and (ii) QR may apply to a quantifier in an elided VP. Thus, the left conjunct of (2) can have either (2'a) or (2'b) for its LF representation, under the assumption that QR is either VP or IP adjunction.

(2') a. $[_{IP}$ everyone$_1$ $[_{IP}$ Chris $[_{VP}$ does love $t_1]]]$
b. $[_{IP}$ Chris $[_{VP}$ everyone$_1$ $[_{VP}$ does love $t_1]]]$

(2'ab), however, end up having the same interpretation because a proper name does not participate in any scope interaction. In other words, whether the quantifying expression *everyone* is raised to VP or IP, the truth condition of the sentence (2) is not affected. In a case like this, the corresponding quantifier in the antecedent VP fails to take IP scope. The situation is different in (4). After the syntactic reconstruction of the missing VP and the subsequent QR-ing, (4) can have the two LF representation, shown in (4').

(4') a. $[_{IP}$ an American flag$_1$ $[_{IP}$ t_1 $[_{VP}$ every building$_2$ $[_{VP}$ is in front of $t_2]]]]$
b. $[_{IP}$ every building$_2$ $[_{IP}$ an American flag$_1$ $[_{IP}$ t_1 $[_{VP}$ is in front of $t_2]]]]$

Unlike (2'ab), the landing site of the quantifying expression *every building* does matter for the semantic interpretation of the sentence because the indefinite subject *an American flag* participates in scope interaction. The sentence that contains the antecedent VP can have a similar ambiguity with respect to the scope of *a Canadian flag* and that of *every house*.

Fox derives the ESG from Derivational Economy in the sense of Chomsky (1992). He argues that Derivational Economy evaluates two or more LF representations that are semantically indistinguishable and rules out everything except for the most economical derivation. Compare the two LF representation, (2'ab), which are semantically equivalent. Since VP adjunction is a shorter movement than IP adjunction, (2'b) is more economical than (2'a), which is to be ruled out.

(2') a. $[_{IP}$ everyone$_1$ $[_{IP}$ ... $[_{VP}$ ..... t_1]]]
*

b. $[_{IP}$ .... $[_{VP}$ everyone$_1$ $[_{VP}$ .... t_1]]]
ok

Assuming some kind of parallelism requirement between the sentence containing the elided VP and the one containing the 'antecedent VP', Fox argues that the universal quantifier must be adjoined to VP in the left conjunct as well.[4] As a result, the left conjunct has only the universal-narrower-scope reading. Let us now turn to the ambiguous example (4). Since (4'ab) each receive a distinct semantic interpretation, the two representations cannot be compared in terms of Derivational Economy. Hence, both are considered to be legitimate LF representations. The ambiguity carries over to the left conjunct, and the left conjunct therefore yields an ambiguity corresponding to the ambiguity in the right conjunct.

In addition to the classic Sag/Williams/Hirschbühler examples, Fox provides diverse kinds of data that support his claim. Consider (6).

(6) a. Some girl admires every teacher, and some boy does, too. (Ambiguous)
b. Some girl admires every teacher, and every boy does, too. (Unambiguous)

When a sentence involves two universal quantifiers, their relative scope does not affect the truth condition of the sentence. Thus, the QRing of the object quantifier over the subject quantifier is prohibited by Economy consideration. In (6b), the reconstructed quantifier *every teacher* can only take VP scope, and the parallelism constraint provides that the same quantifier in the first conjunct must take VP scope as well. As a result, the first conjunct is unambiguous.

Economy also plays a role, Fox argues, for Quantifier Lowering (QL). It has been known that a quantifying expression manifests scope ambiguities with respect to an intensional operator like *seem*, as shown in (7).

(7) An American runner seems to Bill to have won a gold medal.(Ambiguous)

Following May (1977), Fox assumes that the ambiguity reflects whether the subject remains in its surface position or is lowered to the position under the scope of *seem*. It turns out that the scope relation between a quantifier and *seem* is also sensitive to VP ellipsis. Consider (8).

(8) a. An American runner seems to Bill to have won a gold medal, and a Russian athlete does, too. (Ambiguous)
b. An American runner seems to Bill to have won a gold medal, and Sergey does, too. (Unambiguous)

In (8a), both of the indefinite subjects are either under or beyond the scope of *seem*, whereas the first conjunct of (8b) allows only one reading in which the subject is outside the scope of *seem.* Assuming that QL is less economical than leaving a quantifier in situ, Fox derives the contrast from Economy considerations. In (8b), the scope of the proper name, *Sergey,* with respect to *seem* does not make any semantic difference, and it is more economical to interpret it in its surface position than in the QLed position. Then, according to the parallelism constraint, the subject of the first conjunct also must be interpreted in its surface position. The result is the unambiguous interpretation.

Fox's analysis is quite attractive in many respects. It is rather simple, and its empirical coverage is impressively broad. Before adopting Fox's analysis as a whole, however, one might want to think twice about is consequences. In particular, it brings about a drastic change in the nature of LF. A LF representation, which is considered to be a *syntactic* level of representation, must now directly interact with the semantic component. For example, (2'ab) are structurally ambiguous and, therefore, could be semantically ambiguous as well. The fact that they receive the same interpretation entirely depends on how expressions like proper names are interpreted, and this kind of information must be available at the level of LF in order for Derivational Economy to evaluate LF representations. I am not certain that such a drastic change is either necessary or desirable.

There are also a few empirical issues to be addressed, concerning Fox's ESG, a descriptive generalization of scope in VP ellipsis context. First of all, it has a certain asymmetry between a clause containing an elided VP and one containing an antecedent VP. It states that a scope ambiguity in the clause with an antecedent VP will disappear or persist, depending on the semantic interpretation of scope in the clause containing an elided VP. What happens if the clause containing an elided VP is potentially ambiguous but the antecedent clause is not? I think Fox is essentially correct in not extending ESG to this case. Consider (9).

(9) a. Some boy admires every teacher, and Mary does, too.
b. Mary admires every teacher, and some boy does, too.
(= Fox 1995, (72))

Fox reports that the boys can vary for every teacher in (9b) but not in (9a). Let us call this problem the 'ordering asymmetry' problem. It is rather unfortunate that ESG does not apply to this case.[5]

Another point of debate is a case with two universal quantifiers. Recall the contrast illustrated in (6). In the unambiguous example (6b), the second conjunct contains *too*, a word which indicates that the meanings of the two conjuncts have something in common. Although I cannot elaborate the exact nature of the contribution *too* makes, my inclination is that this expression is incompatible with the absent reading of (6b). Consider (10), which is a paraphrase of the unavailable reading of (6b).

(10) Every teacher is admired by some girl, and/but every teacher is admired by very boy (???too).

(10) is fine without *too*, but its addition makes the entire utterance somewhat incoherent. If *too* is responsible for eliminating one of the readings of (6b), there should be some ambiguous examples with two universal quantifiers (but without *too*). The best I have come up with is (11).

(11) a. At most ten boys admire every teacher while every girl does.
b. While at most ten boys admire every teacher, every girl does.

Although the judgements on (11ab) are not crystal clear, they seem to succeed in describing the state of affairs in which every teacher is more popular among girls than among boys. Or at least, it shows a contrast with (6b), which is clearly unambiguous.

In this paper, I propose an alternative analysis of quantifier scope in VP ellipsis. The plot of this paper is the following. First, I will assume, following Rooth (1992ab), that ellipses are focus-sensitive phenomena, and that the parallelism constraint on a clause containing an elided VP and one containing an antecedent VP comes from focus interpretation. Once the constraint is properly implemented, the scope facts we have observed above can be explained without Derivational Economy.

3. An Alternative Analysis

3.1. The Alternative Semantics of Focus

First of all, consider that VP ellipsis results in relative phonological prominence on the leftover subject in the same way as a phonologically reduced counterpart does.

(12) a. Robin left early, and $[\text{Chris}]_F$ did, too.
b. Robin left early, and $[\text{Chris}]_F$ *left early*, too.

Under the assumption that prosodic prominence signals the presence of a focus feature (cf. Selkirk 1984), the focus structure in VP ellipsis is strikingly similar to the phonological reduction. Rooth (1992b) suggests that there is a licensing condition for expressing redundant information in general, which bundles the two strategies together and accords with a theory of focus interpretation proposed in Rooth (1992a). First of all, Rooth assumes the *Alternative Semantics* of Focus, first proposed by Rooth (1985) and later developed by Kratzer (1991), Rooth (1992a) and others. Under the framework of Alternative Semantics of Focus, it is argued that focusing elicits a set of alternatives to the element that is focused. For example, in (13), the focusing of the subject NP, *Chris*, results in the emergence of a set of alternative individuals to Chris, and at the level of the entire sentence, it is a set of propositions of the form "x left early", as in (14).

(13) $[\text{Chris}]_F$ left early.

(14') $\{p: \exists x(p = (\textit{left early}(x)))\}$

For any meaningful expression α, there are two semantic values. One is the ordinary value $[\![\alpha]\!]^0$, and the other is the focus value $[\![\alpha]\!]^f$. When α contains a focused element, $[\![\alpha]\!]^f$ is a set of alternatives of the same type as the denotation of the focused element. When α has no focus, its focus value is the singleton set whose sole member is $[\![\alpha]\!]^0$. Rooth further argues that focus interpretation is akin to the strategy of anaphoric resolution, which is now familiar to us in the case of nominal anaphora (Also see Schwarschild 1994, von Fintel 1994.) Focusing triggers a two place operator $\sim$, the arguments of which are the focused phrase (or some phrase containing the focused phrase) and a focus anaphor. The semantics of the $\sim$ relation is the following.

(15) Let $[\![\alpha]\!]^0$ be the ordinary value of α and $[\![\alpha]\!]^f$ be the focus value of α.

a. $[\![\phi \sim \Gamma]\!]^0 = [\![\phi]\!]^0$
b. $[\![\phi \sim \Gamma]\!]^f = \{[\![\phi]\!]^0\}$
c. Presuppositions:

When Γ denotes a set:		When Γ denotes a non-set:	
(i)	$[\![\Gamma]\!]^0 \subseteq [\![\phi]\!]^f$	(i')	$[\![\Gamma]\!]^0 \in [\![\phi]\!]^f$
(ii)	$[\![\phi]\!]^0 \in [\![\Gamma]\!]^0$	(ii')	$[\![\Gamma]\!]^0 \neq [\![\phi]\!]^0$
(iii)	$\exists\xi\ (\xi \in [\![\Gamma]\!]^0\ \&\ \xi \neq [\![\phi]\!]^0)$		

When Γ denotes a set, it must be the case that the ordinary value of the focus anaphor Γ, introduced by the $\sim$ operator, is a subset of the focus value of the other argument of $\sim$ (i.e. ϕ above), which is a set of alternatives to the expression ϕ. The presupposition (ii) provides that the ordinary value of the expression ϕ be included in the ordinary value of Γ, and it is required by the presupposition (iii) that there be at least one more element in the ordinary value of Γ. When Γ denotes a non-set, the ordinary value of Γ is presupposed to be an element of the focus value of ϕ (according to (i')), and it is also distinct from the ordinary value of ϕ.

In this paper, I follow Rooth (1992ab) and assume that focus anaphors in VP ellipsis are non-set type. I depart from Rooth (1992ab), however, by assuming that (15cii') is superfluous and can be dropped. What Rooth had in mind in proposing (15cii') is a case like (16).

(16) #Robin left, and then $[\text{Robin}]_F$ did, too.

The infelicitous example (16) confirms our intuition that it is not possible to contrast some expression with another which has exactly the same denotation. (15cii') is intended to illegalize the focus structure in (16). However, as Heim (1995) pointed out, focusing on *Robin* in (16) has no effects on the condition (15ci'). Suppose that the second conjunct has no focus at all. Then, its focus value is a singleton set whose sole member is the ordinary value of the second conjunct, namely the proposition that Robin left. Therefore, even under this situation, the ordinary value of the first conjunct is still a member of the focus value of the second conjunct, and (15ci') is satisfied. It seems reasonable, as Heim suggested, to reduce (15cii') to a general principle of prohibition against a redundant focus.

With this small amendment to Rooth's condition of focus, let us go back to VP ellipsis cases. Essentially, Rooth argues that the focus structure is governed by the same principle both in VP ellipsis and phonological reduction, and that the difference is the syntactic reconstruction requirement for VP ellipsis. Rooth's formulation of the condition on the focus structure in VP ellipsis is the following.

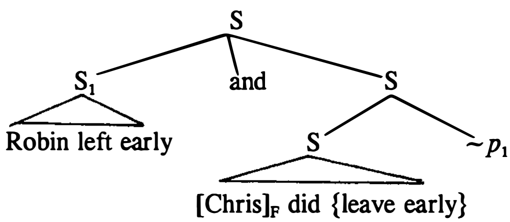
(17) Some phrase identical with or dominating the reconstructed phrase can be related by the ~ relation to some phrase identical with or dominating the reconstruction antecedent, as indicated by the possibility for prosodic reduction in a non-ellipsis variant. (Rooth 1992 pp.18)

Let us now take a moment to see how Rooth's condition works for our previous example (12a).

(12) a. Robin left early, and [Chris]$_F$ did , too.

Focusing on the subject of the second conjunct is licensed by the presence of the ~ operator which is adjoined to the second conjunct. The ~ operator introduces a focus anaphor, p_1, a propositional variable. The ordinary value of p_1 is an element of the focus value of the S "*[Chris]$_F$ left early*", which is a set of propositions of the form "x left early". The first conjunct, *Robin left early,* denotes a proposition of the form "x left early". Thus, the focus anaphor p_1 can take the first conjunct as its antecedent, as indicated by co-indexing in (18).

(18)



The right conjunct which dominates the reconstructed VP is associated via the ~ relation with the left conjunct which dominates the antecedent VP, which satisfies Rooth's condition (17) for VP ellipsis.

3.2. Unambiguity Explained

Armed with the Roothian condition for ellipsis, let us now turn back to the problem of quantifier scope in VP ellipsis. Consider the unambiguous example, which is repeated below.

(2) Someone loves everyone, and $[\text{Chris}]_F$ does, too.

Since the subject of the right conjunct *Chris* is focused, after the reconstruction of the elided VP, it has the following LF representation with the ~ operator and a focus anaphor adjoined to S.

(19) ....and $[_S\ [_S\ [_{NP}\text{Chris}]_F\ [_{VP}\ \text{does}\ \{\text{love everyone}\}]]\ \sim p_5]$

The quantifier *everyone* undergoes QR after (19), either adjoining to S or to VP. As Fox mentioned, it doesn't matter as far as the semantic interpretation is concerned. Thus, let us assume that both are possible landing sites. The ordinary value of the focus anaphor p_5 is an element of the focus value of the sentence *[Chris]$_F$ does {love everyone}*, which is a set of propositions of the form "x loves everyone". To be more precise, we may say that the focus value of the right conjunct is formally represented as in (20).

(20) $\{p: \exists x(p = \forall y(love(y)(x)))\}$

Our licensing condition for ellipsis provides that the second conjunct be associated with the first conjunct via the ~ relation. More precisely, the focus anaphor introduced by focusing *Chris* takes the first conjunct as its antecedent. The first conjunct *"Someone loves everyone"* has two possible interpretations when it stands by itself, and let us assume that the ambiguity is the result of the two possible ways to QR (or apply a similar operation to) the quantifiers. The two interpretations are structurally represented as in (21). To make the computation a little simpler, I assume that QR is uniformly adjunction to S, and that the relative scope is determined in terms of c-command in the sense of Reinhart (1976).[6]

(21) a. $[_{IP}$ someone $\lambda_1[_{IP}$ everyone $\lambda_2[_{IP}\ t_1\ [_{VP}$ loves $t_2]]]]$ (the $\exists > \forall$ reading)
b. $[_{IP}$ everyone $\lambda_2[_{IP}$ someone $\lambda_1[_{IP}\ t_1\ [_{VP}$ loves $t_2]]]]$ (the $\forall > \exists$ reading)

Following Heim (1992) and Heim and Kratzer (1993), I assume that QR is a predicate abstraction operation: when an NP is raised, a trace with an index is left, and when the raised NP is adjoined to some phrase, a λ-operator is also adjoined immediately below the QR-ed phrase. The λ-operator bears the same index as the trace. (21a) represents the reading in which the existential quantifier takes wider scope with respect to the universal quantifier, and (21b) represents the reading with the opposite scope relation. Let us now look at how each IP constituent is semantically computed in (21ab). (22) and (23) correspond to (21a) and (21b), respectively.

(22) a. The lowest IP: *loves*(2)(1)
b. The middle IP: *everyone*(λ_2 (*loves*(2)))(1) = $\forall_2$ (*loves*(2)(1))
c. The highest IP: *someone*(λ_1(*everyone*(λ_2 (*loves*(2))(1)))
= $\exists_1$ $\forall_2$ (*loves*(2)(1))

(23) a. The lowest IP: *loves*(2)(1)
b. The middle IP: *someone*(λ_1 (*loves*(2)(1))) = $\exists_1$ (*loves*(2)(1))
c. The highest IP: *everyone*(λ_2 (*someone*(λ_1 (*loves*(2)(1)))))
= $\forall_2$ $\exists_1$ (*loves*(2)(1)))

In (23), we cannot find any syntactic constituent the denotation of which is a proposition of the form 'x loves everyone'. Thus, the context variable, p_5, cannot take the first conjunct as its antecedent as long as the universal quantifier has wider scope with respect to the existential quantifier. Therefore, the focus structure in the second conjunct is not licensed when the universal quantifier takes wider scope. Hence, the absent reading is successfully eliminated under our analysis. In (22), on the other hand, the denotation of the middle IP (= (22b)) is indeed a proposition of the form 'x loves everyone', making itself a good candidate for an antecedent of p_5. Note, however, that (22b) is an assignment-dependent proposition because of the free variable which corresponds to the unbound trace of *someone.* If it's dependent on assignments, how could we know that it is a member of the focus value of the second conjunct? To avoid this problem, we probably need to change the denotation of a sentence to be a function from assignment functions to propositions (cf. Rooth 1985). The meaning of the middle IP is revised as (24).

(24) The middle IP:$\lambda g.\forall_2$ (*loves*(2)(g(1))

We also need to re-evaluate the semantic values of the second conjunct. Its ordinary value is shown in (25a). With the focus on *Chris* and the assumption that a proper name denotes a constant function from assignments to individuals, the focusing evokes a set of alternative functions from assignments to individuals. Thus, the focus value of the entire sentence would be (25b).

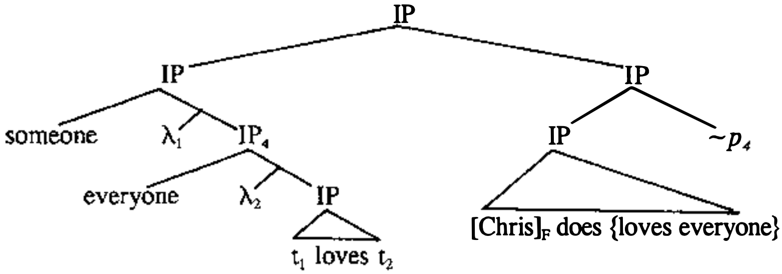
(25) a. $\lambda g.\forall_4$ (*loves*(4)(*chris*))
b. {p: $\exists f$ [p = $\lambda g.\forall_4$ (*loves*(4)(f(g))): f is a function from assignments to individuals]}

With this modification, (24) is considered to be a member of (25b). (26) shows how it is so.

(26) Let f_1 be $\lambda g.g(1)$.
Then, for all g, $f_1(g) = g(1)$.
Therefore, $\lambda g.\forall_2$ (*loves*(2)(g(1)) = $\lambda g.\forall_2$ (*loves*(2)(f_1(g))
$\lambda g.\forall_2$ (*loves*(2)(f_1(g)) is a member of {p: $\exists f$ [p = $\lambda g.\forall_4$ (*loves*(4)(f(g)))}.

As a result, the first conjunct (or a sub-tree thereof) can serve as the antecedent of the propositional variable in the second conjunct, only under the reading that the universal quantifier takes lower scope, as shown in (27).

(27)



For simplicity, I will go back to the more conventional semantics (e.g., a sentence denotes a proposition), otherwise mentioned.

3.3. Some Complications

So far, we have succeeded in accounting for the unambiguity of the sentence (2). Once a principle of focus interpretation is taken into consideration, the unavailable universal-wide-scope reading is successfully eliminated. Before proceeding to the ambiguous Hirschbühler case, however, we need to address one potential problem with our analysis, which was brought to my attention by Irene Heim. In proposing a principle of focus interpretation, Rooth was not very strict about the syntax of the ~ operator. In particular, it is unclear what kind of constraint, if any, should apply to the syntactic positions of the ~ operator. In the previous subsection, we were also very informal about the position of the operator and simply assumed the structure like (28a) below, where the focus operator has scope over the universal quantifier. However, nothing seems to prevent it from adjoining to the lower IP, as shown in (28b).

(28) a. $[_{IP}$ $[_{IP}$ everyone λ_4 $[_{IP}$ [Chris]$_F$ does {love t_4}]] $\sim p_5$]
b. $[_{IP}$ $[_{IP}$ everyone λ_4 $[_{IP}$ [Chris]$_F$ does {love t_4}] $\sim p_5$]]

Suppose now that (28b) is a possible structure. The ordinary value and the focus value of the lower IP are (29a) and (29b), respectively. The propositional variable p_5 is presupposed to be a member of (29b).

(29) a. *loves*(4)(*chris*)
b. $\{p: \exists x\, [p = loves(4)(x)]\}$

Turning to the first conjunct of (2), recall the denotation of the three IPs when the object has wider scope with respect to the subject.

(23) a. The lowest IP: *loves*(2)(1)
b. The middle IP: $\exists_1$ (*loves*(2)(1)
c. The highest IP: $\forall_2$ ($\exists_1$ (*loves*(2)(1)))

The denotation of our interest is (23a). The numbers 1 and 2 in the denotation correspond to the indices left by the movements of the quantifiers. During those operations, the actual indices they leave to the traces are not significant for the denotation of the entire sentence. Thus, we cannot exclude the possibility that the index left by the universal quantifier in the first conjunct happens to be the same as the one on the trace in the second conjunct. If that is the case, the denotation of the lowest IP is (30).

(30) The lowest IP: *loves*(4)(1)

(30) is indeed a member of (29b), the focus value of the second conjunct, and should qualify as a perfect candidate for the antecedent of the focus anaphor.[7] It is not an easy task to find a way to block this undesirable consequence. One obvious choice is to keep a $\sim$ operator and a focus anaphor from adjoining to a constituent which has an unbound trace. Or alternatively, we may wish to ban the use of the same index for variables bound by different quantifiers even though it does not affect the semantics at the end. This second choice may be regarded as an extension of Heim's (1995) working hypothesis. In her re-interpretation of Sag's (1976) 'alphabetical variant' notion, Heim hypothesizes the following.

(31) No Accidental Coindexing: An LF α is ill-formed unless the following condition is met:
For any β and γ in α that are occurrences of the same variable: the maximal subtree of α in which β is free is also the maximal subtree of α in which γ is free. (Heim 1995 pp.6)

This proposal is intended to rule out two kinds of coindexing which are semantically inert: cases where the same variables occur free and bound, and cases where bound occurrences of the same variable have different binders. It is still unknown whether or not (31) should be extended to our cases where the coindexing does not seem to do any harm, apart from the licensing of focus structure. Although I am far from conclusive on this issue, I assume that something along the line Heim proposes could be done.

3.4. Ambiguity Explained

So far, we have had modest success in accounting for the unambiguous example (2). How about the ambiguous example (4)? Can we also make a correct prediction?

(4) A Canadian flag is in front of every house, and an [American flag]$_F$ is, too.

The most notable difference in (4), compared to (2), is the location of focus. The focus is on the N', *American flag*, as indicated in the above example. Under the assumption that focusing on an element of some type evokes a set of alternatives of the same type, (4) evokes a set of alternative properties (i.e. type $<e,st>$). Depending on the scope relation between the subject and the object, the second conjunct of (4) has one of the two sets of propositions shown in (31).

(31) a. $\{p: \exists k_{<e,st>}(p = \exists x(k(x) \;\&\; \forall y(house(y) \rightarrow in\text{-}front\text{-}of(y)(x))))\}$
b. $\{p: \exists k_{<e,st>}(p = \forall y(house(y) \rightarrow \exists x(k(x) \;\&\; in\text{-}front\text{-}of(y)(x))))\}$

According to the Roothian theory of focus, the focusing in the second conjunct means the presence of a $\sim$ operator and a propositional focus anaphor p_4, as shown in (31).

(32) ... and [$_{IP}$ [$_{IP}$ an [American flag]$_F$ is {in front of every house}] $\sim p_4$], too.

The ordinary value of p_4 is an element of the focus value of the second conjunct, namely (31a) or (31b), depending of the two QR possibilities. Let us concentrate on (31b), the universal-wide-scope reading that is missing in (2). If (31b) is the focus value of the second conjunct, the ordinary value of the focus anaphor is presupposed to be (i) a proposition of the form 'For every house, a thing of some kind k is in front of it'. It is easy to see that the first conjunct satisfies the presupposition if the universal quantifier takes wider scope there as well. The proposition, "For every house, a Canadian flag is in front of it", is a member of the focus value of the second conjunct. Therefore, we could correctly expect that VP ellipsis in (4) does not eliminate the universal-wide-scope reading.

3.5. Extension to Phonological Reduction

One of the advantages of adopting Rooth's theory is that it is easily extended to phonological reduction cases. Compared to ellipsis, phonological reduction is much more permissive in that it does not require syntactic identity for reduced phrases. Consider (33).

(33) Yesterday, Chris left early, and Pat *went home early*, too.

The phonological reduction is licensed despite the fact that there is no syntactically identical phrase in the previous sentence. In the previous section, we assume that VP ellipsis and phonological reduction are alike in terms of their focus structure. For example, (33) has the focus structure shown below.

(34) Yesterday, Chris left early, and [$_{IP}$ [$_{IP}$ [Pat]$_F$ *went home early*] $\sim p_8$], too.

The propositional variable, p_8, is a member of the second conjunct's focus value, which is a set of propositions of the form, 'x went home early'. How could the focus structure in (34) be licensed if there is no proposition of exactly the same form? Following Rooth (1992b), I assume that the condition (15ci') is a little looser than I have described before. Intuitively speaking, the two expressions, *leave early* and *go home early*, are quite similar in their meanings in that the following holds: if A goes home from some place B early, then A leaves B early. This relation, which Rooth (1992b) calls "implicational bridging", suffices to satisfy (15ci').

Our focus-based approach to quantifier scope predicts that the same kind of scope phenomenon arises with phonological reduction as well. Consider (36).

(36) a. Someone loves everyone, and [Chris]$_F$ *loves someone*, too.
b. A Canadian flag is in front of every building, and an [American flag]$_F$ is *in front of every house*, too.

As expected, the scope possibility of (36ab) is the same as their ellipsis counterparts: (36b) is ambiguous but (36a) is not. Now consider (37).

(37) Yesterday, a Canadian flag was in front of every house, and today, *they put* an American flag *in front of every house.*

Although the two conjuncts are not syntactically isomorphic, they have the same scope ambiguity as in (36b). With focus on *[$_{N'}$ American flag]* and the universal quantifier taking wider scope over the indefinite, the focus value of the second conjunct is a set of propositions of the form "they put a thing of some kind *k* in front of every house", or a little more formally, (37).

(37) $\{p\text{: } \exists k_{<e,t>}(p = \forall y(house(y) \rightarrow \exists x(k(x)\ \&\ put(x)(in\ front\ of\ (y))(they)))\}$

Although the first conjunct does not denote a proposition of the form shown above, it is not hard to see what is going on between the two conjuncts. It seems true enough that if they (some contextually salient group of people) put some kind k thing in front of every house, then the k thing is in front of every house. Hence, the ~ relation can be established between the two conjuncts, as long as the relative scope of the two quantifiers is the same in them, no matter where the quantifiers are positioned at LF.

In this section, I have demonstrated how the focus structure involved in VP ellipsis interacts with constraints on scope. With the Alternative Semantics of focus, which is well-motivated on independent grounds, we are able to account for the otherwise puzzling Sag/Williams/ Hirschbühler problem of quantifier scope in VP ellipsis and similar phenomena in phonological reduction in a uniform fashion.

4. Some Complicated Cases

4.1. The Ordering Asymmetry Problem

Recall that a scope ambiguity of a clause containing an elided VP does not disappear even when the antecedent clause is unambiguous. Relevant examples for this ordering asymmetry are repeated below.

(9) a. Some boy admires every teacher, and Mary does, too. (Unambiguous)
b. Mary admires every teacher, and some boy does, too. (Ambiguous)

What does our focus-base approach say about this problem? First, let us assume that the subject of the second conjunct, *some boy*, is focused, and that it is a generalized quantifier. Then, the focus value of the second conjunct is something like (38ab), depending on the relative scope of the two quantifiers.

(38) a. $\{p\text{: } \exists \mathcal{P}_{<<e,st>,st>}\ [p = \forall y\ (\lambda x.\ admires(y)(x)(\mathcal{P}))]$
b. $\{p\text{: } \exists \mathcal{P}_{<<e,st>,st>}\ [p = \lambda x.\ \forall y\ (admires(y)(x))(\mathcal{P})]$

The ordinary value of the first conjunct is shown in (39).

(39) $\forall y\ (admires(y)(mary))$

(39) does not look like a member of either (38a) or (38b). Then, (9b) should be ruled out, no matter which interpretation the second conjunct has. However, if we assume type flexibility for noun phrases, as argued by Partee and Rooth (1983) and Partee (1987), the subject of the first conjunct, *Mary*, can be shifted to type $<<e,st>,st>$., or more concretly a set of properties Mary has. Then, the ordinary value of the first conjunct is either (40a) or (40b).

(40) a. $\forall y\ (\lambda x.\ admires(y)(x)(\lambda P.\ P(mary)))]$
b. $\lambda x.\ \forall y\ (admires(y)(x))(\lambda P.\ P(mary))]$

Since (40a) and (40b) are a member of (38a) and (38b), respectively, we would correctly predict that (9b) is ambiguous.

While the adoption of type flexibility of names makes it possible to account for the ambiguity of (9b), it also poses a serious question for our analysis of the unambiguous Sag/Williams example. If a name can be type $<<e,st>,st>$, it should be true that a focus on the name in (2) can evoke a set of alternatives of a generalized quantifier type. Then, we would incorrectly expect the sentence to be ambiguous.

(2) Someone loves everyone, and [Chris]$_F$ does, too.

To avoid this complication, we may want to conjecture that a focused name cannot be a generalized quantifier. This conjecture seems inappropriate, however, for examples like (41).

(41) A: Robin complained about every grad student and Professor Smith.
B: No, she complained about every grad student and [Professor Jones]$_F$.

In (41), the names are conjoined with the quantifier, *every grad student*, an environment in which the names should be shifted to $<<e,st>,st>$ (cf. Partee and Rooth 1983). Nonetheless, a focus can fall onto *Professor Jones* in B's utterance. In general, effects of focusing on generalized quantifiers have not been fully investigated in the framework of the Alternative Semantics (cf. Bonomi and Casalegno 1994), I will leave this issue as an open question.

4.2. Two Universal Quantifiers

Recall our discussion on two universal quantifiers in section 2. Although Fox presents some unambiguous example with two universal quantifiers as supporting evidence for his ESG, I expressed my doubt on the generalization. In particular, it seems possible to construct an ellipsis example that has two universal quantifiers but is still ambiguous. Consider (11) again.

(11) a. At most ten boys admire every teacher while every girl does.
b. While at most ten boys admire every teacher, every girl does.

For the interpretation of the first conjunct, the preferred reading is definitely the existential-wide-scope reading, but native speakers I consulted think that it is possible to have the universal-wide-scope reading. In (11b), a focus is on the NP, *every girl*, and it evokes a set of alternatives of type $<<e,st>,st>$. Thus, the focus value of the second conjunct would be either (42a) or (42b).

(42) a. $\{p: \exists \mathcal{P}_{<<e,st>,st>} [p = \forall x\, (teacher(x)) \rightarrow \lambda y(admire(x)(y))(\mathcal{P})]$
b. $\{p: \exists \mathcal{P}_{<<e,st>,st>} [p = \lambda y(\forall x\, (teacher(x)) \rightarrow admire(x)(y))(\mathcal{P})]$

The ordinary value of the first conjunct is either (43a) or (43b) below, depending on the relative scope of the two quantifiers.

(43) a. $\forall x\, (teacher(x)) \rightarrow \exists y(girl(y)\ \&\ admire(x)(y))$
b. $\exists y(girl(y)\ \&\ \forall x\, (teacher(x) \rightarrow admire(x)(y))$

(43a) and (43b) are a member of (42a) and (42b), respectively, and our focus-based approach predicts that the first conjunct of (11b) has the universal-wide-scope reading. Although the judgement is not crystal clear, the prediction seems to be borne out.

In this section, I have shown what the focus-based theory of quantifier scope in VP ellipsis can handle cases more intricate than the original Sag/Williams/ Hirschbühler examples.

5. *Closing Remarks*

To sum up the discussion, despite some loose-ends, I have tried to show that the scope constraint in VP ellipsis and phonological reduction is derivable from focus structure. The analysis presented here preserves the conservative view on the division of labor between syntax and semantics, which contrasts with the alternative proposal by Fox. Although we have limited our attention to VP ellipsis and phonological reduction contexts, I hope that this paper is the beginning of a fruitful investigation.

Endnotes

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2. It should be noted that the two conjuncts in (4) must share the same scope possibility. In other words, (4) is two-ways ambiguous but not four-way ambiguous.

3. Other proposals include Diesing (1992) and Fiengo and May (1994). See Fox (1994, 1995) for insightful criticisms.

4. Fox (1995) is not committal to any specific formulation of this parallelism constraint.

5. Fox offers an account based on LF cyclicity and binary branching of coordination (Fox 1995 pp.34-36), which I will not review in this paper. Fox informed me (via personal communication) that he himself is not satisfied with his account and is likely to change it in the near future.

6. This does not mean that QR to VP adjunction is impossible. See Heim and Kratzer (1993) for discussion.

7. Here is how (21') qualifies as a possible antecedent. Under the new semantics in which a sentence denotes a function from assignment functions to propositions, the ordinary value of (21') is indeed (i)

(i) $\lambda g.loves(g(4))(g(1))$

The ordinary value and focus value of the second conjunct are shown below.

(ii) a. $\lambda g.\ loves(g(4))(chris)$
b. $\{p: \exists f\ [p = \lambda g.loves(4)(f(g)): f$ is a function from assignments to individuals$]\}$

Then:

(iii) Let f_1 be $\lambda g.g(1)$.

Then, for all g, $f_1(g) = g(1)$.
Therefore, $\lambda g.loves(g(4))(g(1)) = \lambda g.loves(g(4)(f_1(g))$
$\lambda g.loves(g(4)(f_1(g))$ is a member of $\{p: \exists f\,[p = \lambda g.loves(4)(f(g))\}$.

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