Outer Negation of Universal Quantifier Phrases

Chris Collins, New York University

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Abstract: This paper discusses two ways of negating DP quantifier phrases. In one way, NEG modifies the quantifier D directly with the structure [[NEG D] NP] (inner negation). In the other way, NEG modifies the whole DP with the structure [NEG DP] (outer negation). I give evidence based on negative polarity items that negated universal quantifier phrases like *not every student* involve outer negation.

Keywords: negation, quantifiers, weak NPIs, exceptive phrases.

1. Introduction

Negation can be combined with quantificational DPs as in the examples below:

(1)
a. Not many people are there.
b. Not a lot of people are there.
c. Not so/too/that many people are there.
d. Not every student is there.
e. Not all the students are there.
f. Not a single student is there.
g. Not enough students are there.

Following Collins and Postal 2014 (See also Collins 2016, 2017), I assume that negation is part of the constituent in subject position. However, a question remains as to whether the structure of these examples is as in (2a) or (2b):

(2)
a. [[NEG D] NP] (inner negation)
b. [NEG DP] (outer negation)

Both of these options are allowed by the semantics of negation of Collins and Postal 2014 (presented in section 2). The linear order of the morphemes in (1) is consistent with either structure. This paper narrowly focuses on the universal quantifier in (1d) and asks whether the structure is (3a) or (3b):

(3)
a. [not [every student]] is there.
b. [[not every] student] is there.

I give evidence based on negative polarity items that the structure is (3a). I then address some evidence (based on exceptives) adduced by Hoeksema (1987) in favor of the structure in (3b).

The structure of the paper is as follows. Section 2 introduces the basic assumptions about the syntax and semantics of negation from Collins and Postal 2014. Section 3 discusses the distribution of negative polarity items in the restriction of negated quantifier phrases. Section 4 gives an account of the generalizations presented in section 3. Section 5 discusses Hoeksema's work on exceptive phrases, in which he argues against an outer negation structure of negated universal quantifier phrases. Section 6 gives an analysis of exceptive phrases based on Gajewski 2008. Section 7 accounts for Hoeksema's generalization. Section 8 is the conclusion.

2. Collins and Postal 2014

I follow Collins and Postal 2014 in assuming the following about the semantic value of negation:

(4) If X has a semantic type ending in <t>, then
NEG takes X with semantic value: $\lambda P_1 \ldots \lambda P_n$ […]
And returns Y with semantic value: $\lambda P_1 \ldots \lambda P_n \neg$[…]

For propositional variables p (no predicate abstraction), the negation is simply ¬p. On this view, negation can combine with constituents of various different types, parallel to the analysis of conjunction given in Partee and Rooth (1983). One way to think of it is that the function negation denotes depends on the type of its argument (where the different types partition the domain of the negation function).

Collins and Postal 2014 analyze negative existential quantifiers in terms of inner negation of an existential quantifier phrase. In the following example, NEG is realized as *no*, and SOME is not pronounced, as indicated by the <…> notation.

(5) no person = [[NEG <SOME>] person]

In terms of (4), the semantic value of (5) is calculated as follows:

(6) $[\![\text{SOME}]\!] = \lambda P \lambda Q\, [\exists x\, (P(x) \wedge Q(x))]$

(7) $[\![\text{person}]\!] = (\lambda x.\ x \text{ is a person})$

(8) $[\![\text{NEG}]\!] = \lambda X \lambda P \lambda Q\, \neg[X(P)(Q)]$

(9) $[\![\text{NEG SOME}]\!] = [\![\text{NEG}]\!]([\![\text{SOME}]\!])$
$= (\lambda X \lambda P \lambda Q\, \neg[X(P)(Q)])\ (\lambda P \lambda Q\, [\exists x\, (P(x) \wedge Q(x)])$
$= \lambda P \lambda Q\, \neg[\exists x\, (P(x) \wedge Q(x)]$

(10) $[\![[\text{NEG SOME}]\ \text{person}]\!] = [\![\ [[\text{NEG SOME}]\ \text{person}\ ]\ ]\!]$
$= (\lambda P \lambda Q\, \neg[\exists x\, (P(x) \wedge Q(x))])\ (\lambda x.\ x \text{ is a person})$
$= \lambda Q\, \neg[\exists x\, ((x \text{ is a person}) \wedge Q(x))]$

It is not the purpose of this paper to justify the structure of phrases like (5) or the semantic calculation in (6-10), for that see Collins and Postal 2014. The above discussion is just meant to indicate how inner negation works.

3. Negative Polarity Items

As is well known since Ladusaw's (1980) influential work, the restriction of a universal quantifier DP is a downward entailing (henceforth: DE) context which licenses weak NPIs.

(11) a. Everybody who has a car is crazy.
b. Everybody who has a Ford is crazy.

(12) a. Everybody who eats vegetables is healthy.
b. Everybody who eats spinach is healthy.

Given that Fords are cars and that spinach is a vegetable, in each case, the (a) example entails the (b) example, and hence the relative clause of a universally quantified NP represents a DE context.

Corresponding to these facts, weak NPIs such as *ever* and *any* are licensed in this context:

(13) a. Everybody who has ever been to France smokes.
b. Everybody who knows any physics is smart.
c. Everybody who has done anything wrong is caught.

Given this background, consider the following sentences from Horn (1996: 28):

(14) a. Not all the guests who ate any of the contaminated squid became ill.
b. Not everyone who has ever been to Groningen works on polarity.

Horn (1986: 28) notes that: "But while the restrictor of *not all*, *not every* is a UE position, it also allows NPIs within a relative clause…" Horn seems to assume that the constituent structure in question is [[not every] one], instead of [not [everyone]], since he talks about 'the restrictor of *not all*, *not every*'. We return to the syntactic structure of negated universal quantifier phrases in section 4 below.

To clarify Horn's remarks, consider the following examples.

(15) a. Not everybody who has a car is crazy.
b. Not everybody who has a Ford is crazy.

Clearly, (15a) does not entail (15b). Example (15a) could be true, while every Ford owner in particular is crazy. In fact, (15b) entails (15a), and the relative clause represents a UE context.

Some other examples that illustrate the distribution of weak NPIs in the restriction of a negated universal quantifier phrase are given below:

(16) Context: At a meeting of high school students and law enforcement officers, the chief of police tells the students:
a. Everyone who has ever stolen anything is now in prison.
b. *Some people who have ever stolen anything are now in prison.
c. Not everyone who has ever stolen anything is now in prison.

(17) Context: We are talking about who passed their GRE tests to get into a graduate program. I say:
a. Every student who knows any physics got a good score.
b. *Some students who know any physics got a good score.

c. Not every student who knows any physics got a good score.

(18) Context: We are discussing which of our professors are smokers. I make following observation:
a. Every professor who has ever been to France smokes.
b. *Some professors who have ever been to France smoke.
c. Not every professor who has ever been to France smokes.

(19) Context: We are talking about second amendment rights, and the issues that come up concerning gun ownership. I express my opinion as follows:
a. Everyone who has ever picked up a gun has gone on to shoot somebody with it.
b. *Some people who have ever picked up a gun have gone on to shoot somebody with it.
c. Not everyone who has ever picked up a gun has gone on to shoot somebody with it.

(20) Context: We are discussing whether drug use affects job performance. I offer the following observation:
a. All mechanics who have ever smoked weed are untrustworthy.
b. *Some mechanics who have ever smoked weed are untrustworthy.
c. Not all mechanics who have ever smoked weed are untrustworthy.

It is fairly easy to find examples parallel to Horn's examples on the internet. Here are some examples using the search phrase "everyone who has ever" or "everybody who has ever":

(21) However, not everyone who has ever picked up a gun has gone on to murder others with it.
(http://www.deseretnews.com/article/765629523/Gun-logical-fallacies.html)

(22) While not everyone who has ever been president will find themselves on a "best-dressed" list, it's safe to say that no one will argue against Franklin Delano Roosevelt making the cut.
(http://www.ties-necktie.com/blog/category/more-posts/page/5/)

(23) Not everybody who has ever had a radio hit has done everything we talk about in this article.
(https://creekdontrise.com/gen_music/musician_or_wannabe.htm)

Hoekseman (1986: 37) gives some evidence contradicting Horn's generalization.

(24) a. All students who know anything about logic should know Modus Ponens.
b. ?Not all students who know anything about logic should know Modus Ponens.

Commenting on these examples, Hoeksema claims that "…the correct structure of *not all students* isn't [not [all students]] but rather [[not all] students], with a complex determiner *not all*. This complex determiner is directly monontone, by virtue of its being the negation of the inversely monotone determiner *all*. Consequently, it does not license negative polarity items within its scope."

One problem with Hoeksema's account is that it would predict the NPI in (24b) to be completely unacceptable, since it is found in the restriction of *not all*, which is upward entailing. I note here that there are speakers who find sentences like Hoeksema's (24b) (and the (b) sentences in (16-20) degraded. I leave the interspeaker variation to future work. Clearly what is needed are experimental studies, looking at various variables: the type of NPI (*ever* versus *any*) the type of quantifier (*every* versus *all*), whether the matrix clause is episodic or generic, context of utterance, etc.

4. Outer Negation and NPIs

Given the theory of negation presented in section 2, a negated quantificational DP with *every* can in principle have either of the following two syntactic structures. Structure (25a) represents a NEG at the DP level, while (25b) locates the NEG modifying the D directly.

(25) a. [not [every professor]] (outer negation)
b. [[not every] professor] (inner negation)

Consider the semantic value of *every*:

(26) $[\![\text{every}]\!] = \lambda P \lambda Q\ [\forall x\ (P(x) \rightarrow Q(x))]$

Negating *every* as in (25b) would yield (27):

(27) $[\![\text{not every}]\!] = \lambda P \lambda Q \neg[\forall x(P(x) \rightarrow Q(x))]$

Unfortunately, this yields the wrong result, since it renders the restriction of *not every* UE. Let us then consider a structure such as (25a). Semantically, this yields:

(28) $[\![\text{not [every professor]}]\!] = \lambda Q \neg[\forall x(P(x) \rightarrow Q(x))]$

The crucial difference between (27) and (28) is that in (28) there is a syntactic constituent *every professor* that has a DE restriction.

Return now the following example with an NPI in the restriction of a negated universal quantifier phrase (repeated from (18c) above):

(29) Not every professor who has ever been to France smokes.

Consider (29) from the point of view of the following condition (from Ladusaw 2002: 467, see also CP2014: 72 who argue for a formulation in terms of non-increasing functions):

(30) A negative-polarity item is acceptable only if it is interpreted in the scope of a downward-entailing expression.

Crucially, nothing in this formulation makes reference to whether the overall sentential context of the NPI is DE or not. This prediction of Ladusaw's system was recognized by

Hoeksema (1986: 37), who states "Now consider what happens when two inversely monotone expressions cancel out each other's monotonicity. According to Ladusaw, this would not have an effect on negative polarity items, because they only require the existence of a trigger."

So Horn's generalization illustrated in (14) is explained. In particular, in (14b), the NPI *ever* is in the scope of the DE expression *every*. What the examples in (14) clarify is that the relevant DE-ness is calculated with respect to some local operator, such as *every*. The calculation of relevant DE-ness is not based on the properties of the whole sentence.

In summary, as far as NPI licensing goes, the structure involving outer negation in (25a) is needed. It remains to be seen whether the structure in (25b) is ever possible. The NPI facts do not preclude the existence of inner negation in (25b). But a weak NPI can only be licensed in the restriction of (25a), not (25b). I propose the following generalization (which generalizes beyond what can be concluded from the data presented):

(31) a. For universal quantifiers, only outer negation is possible: [NEG DP]
b. For existential quantifiers, only inner negation is possible: [[NEG D] NP]

5. Hoeksema on Exceptives

Hoeksema (1987) subsequently offered a different argument for the claim that the NEG associated with a universal quantifier could only be part of a 'complex determiner', what I have been calling inner negation:

(32) Hoeksema (1987: 104, see also Hoeksema 1996)
"Another fact of some interest is the unacceptability of connected exception phrases with *not all*, as in **not all men but Tim*. This follows as a corollary of the present account if *not all* is analyzed as a complex determiner…because the complement of *all* is neither left-downward monotone nor left-additive. If on the other hand, *not* is treated as an NP modifier, as some would have it, it is not clear why it cannot combine with the perfectly acceptable expression *all men but Tim*."

I will call the generalization that negated universal quantifier phrases cannot be modified by *but* exceptive phrases Hoeksema's generalization.

Hoeksema's point is that if the structure is [[NEG D] NP], then one does not expect the quantifier phrase to be modified by a *but* phrase (which is limited to endpoint quantifiers like universal quantifiers and negative existential quantifiers). But Hoeksema's structural claim contradicts our conclusion that outer negation is possible for universal quantifier phrases (see section 4). I will show in the next section that it is possible to account for Hoeksema's exceptive generalization even assuming outer negation.

Some other examples that show the same point as (32) are illustrated in (33-35) below.

(33) Context: I go to a party, and upon my return home, you ask me who was at the party. I respond:
a. Every student but John was there.
b. Not every student was there.
c. *Not every student but John was there.

(34) Context: I ask you which of our friends went to the movies and which of them did something else. You reply:
  a. Everybody but Mary went to the movies.
  b. Not everybody went to the movies.
  c. *Not everybody but Mary went to the movies.

(35) Context: There was an exam, and I ask you how everybody did on it. You reply:
  a. All the students but John did well.
  b. Not all the students did well.
  c. *Not all the student but John did well.

The (c) examples do not really sound ungrammatical, but they are difficult to interpret. I note this status with the * grammaticality marking.

Before giving an explanation of Hoeksema's generalization, there is a tricky empirical issue to clarify. Consider the following exchange (due to Frances Blanchette):

(36) a. Everybody but John was there.
  b. No, not everybody but John was there, Mary wasn't there either.

Apparently, Hoeksema's generalization does not hold for so-called denial negation. Denial negation has properties that distinguish it from non-denial uses of negation. For example, it is well known denial negation is generally accepted with positive polarity elements.

Another example of denial negation is the following:

(37) Context: Somebody has just claimed that I saw all the boys but John, which I am now denying.
  I saw only some of the boys, not all the boys but John

I have no explanation for these exceptions at the present time.

6. Analysis of Exceptive Phrases

In order to account for Hoeksema's generalization, I first present a theory of exceptive phrases. Consider the exceptive phrases in (38):

(38) a. Every student but John was there.
  b. No student but John was there.

Intuitively, an exceptive phrase breaks down into two components (von Fintel 1993:125 takes both parts to be entailments):

(39) a. Every non-John student was there.
  b. John was not there.

(39a) by itself is too weak as a paraphrase of (38a), since (39a) one does not say whether or not John was there. It is necessary to add (39b) to (39a). Another way to state (39) is as in (40):

(40) a. Every non-John student was there.
b. Not every student was there.

(40a) and (40b) together entail (39b). Furthermore, (39) and (40) are logically equivalent. Such paraphrases also capture the truth conditions of (38b):

(41) a. No non-John student was there.
b. John was there.

Just as (39) is equivalent to (40), (41) is equivalent to (42):

(42) a. No non-John student was there.
b. It is not the case that no student was there.
(= Some student was there.)

Once again, (42a) and (42b) together entail (41b). Furthermore, (41) and (42) are logically equivalent.

Given these paraphrases, I propose to analyze exceptives in the following way (based on the analysis given in Gajewski 2008, see von Fintel 1993 for background). First, I propose that *but* represents set complementation (see Gajewski 2008: 70). For example, in (38a), *but* yields a set of students not containing John. Second, I propose that the complement of *but* is a quantificational expression of the form OP(John). OP will have the effect of introducing the entailment in (40b).

Together these assumptions yield the following syntactic structure for (38a). The occurrence of $[\text{OP(John)}]_1$ in the clause initial position is covert.

(43) $[\text{OP(John)}]_1$ [[Every [student but DP_1]] was there]

The semantic value of *but* can be formalized in terms of set complementation as follows. Note in this semantic value, X ranges over sets:

(44) $[\![\text{but}]\!] = \lambda X.\ \lambda P.\ \lambda y.P(y) \wedge y \notin X$

In order to get the additional entailment in (40b), Gajewski (2008: 88) proposes the LEAST operator defined in (45a). I change his formulation slightly to make it consistent with my assumptions about OP in (45b):

(45) a. $\text{LEAST}(<F,X>) = 1 \text{ iff } F(X) = 1 \wedge \forall S[F(S) = 1 \rightarrow X \subseteq S]$
b. $[\![\text{OP}]\!] = \lambda x.\ \lambda P.P(\{x\}) \wedge \forall S[P(S) \rightarrow \{x\} \subseteq S]$

For the cases in (38) (involving expressions like *but John*, where *John* denotes a singular individual), (45b) can be simplified to (46):

(46) $[\![\text{OP}]\!] = \lambda x.\ \lambda P.P(\{x\}) \wedge \neg P(\varnothing)$ ($\varnothing$ is the empty set)

The interpretation of (43) is calculated as follows. In (47), DP_1 is a trace/copy bound by OP(John), which quantifiers over sets.

(47) $[\![[\text{but } DP_1]]\!]^g \quad = \quad \lambda P.\ \lambda y.P(y) \wedge y \notin [\![DP_1]\!]^g$

(48) $[\![[\text{student but } DP_1]]\!]^g \quad = \quad \lambda y.\text{student}(y) \wedge y \notin [\![DP_1]\!]^g$

(49) $[\![[\text{Every [student but } DP_1]] \text{ was there}]\!]^g$
$= \quad \forall x[\text{student}(x) \wedge x \notin [\![DP_1]\!]^g \rightarrow \text{there}(x)]$

(50) $[\![[\text{OP(John)}]_1]\!] \quad = \quad \lambda P.P(\{\text{John}\}) \wedge \neg P(\varnothing)$

(51) $[\![[\text{OP(John)}]_1 \text{ [[Every [student but } DP_1]] \text{ was there]}]\!]$
$= \quad \forall x[\text{student}(x) \wedge x \notin \{\text{John}\} \rightarrow \text{there}(x)] \quad \wedge$
$\neg\forall x[\text{student}(x) \wedge x \notin \varnothing \rightarrow \text{there}(x)]$
$= \quad \forall x[\text{student}(x) \wedge x \notin \{\text{John}\} \rightarrow \text{there}(x)] \quad \wedge$
$\neg\forall x[\text{student}(x) \wedge \rightarrow \text{there}(x)]$
$= \quad \forall x[\text{student}(x) \wedge x \notin \{\text{John}\} \rightarrow \text{there}(x)] \quad \wedge \neg\text{there(John)}$

These are intuitively the right truth conditions. A similar calculation gives the truth conditions for (38b).

One piece of evidence for this theory is that it makes sense out of the following ambiguity (contra Gajewski 2008: 103):

(52) I said that everybody but John was there.

Example (52) can have the following paraphrases:

(53) This is what I said: everybody but John was there.

(54) X is the set of people not including John. I said that X was there.

(53) and (54) are not equivalent. Suppose that I know nothing about John, and merely tell you that Mary, Bill and Sue were there (not knowing that John was also there, and not knowing of John's existence). In that situation, (53) seems very strange.

My claim is that (53) corresponds to a narrow scope reading of OP(John) and (54) corresponds to a wide scope reading of OP(John). So the syntactic structure of (52) corresponding to (53) is:

(55) I said that $[\text{OP(John)}]_1$ everybody but DP_1 was there.

The syntactic structure of (52) corresponding to (54) is:

(56) $[\text{OP(John)}]_1$ I said that everybody but DP_1 was there.

(56) yields the following interpretation:

(57) I said that every non-John person was there and
I did not say that every person was there.

These are intuitively the right truth conditions.

7. Negated Quantifier Phrases with Exceptive Phrases

Given the syntactic and semantic analysis of exceptive phrases presented in section 6, return now to the issue of negated quantifier phrases with exceptive phrases, which are unacceptable. Consider (58) repeated from (33) above:

(58) a. Every student but John was there.
b. Not every student was there.
c. *Not every student but John was there.

As noted, I am assuming that the subject in (58c) has the structure [not [every student but John]] (outer negation). Therefore, the syntactic structure of (58c) is as follows:

(59) [OP(John)]$_1$ [[not [Every [student but DP$_1$]]] was there]

It is crucial that the scope of OP(John) cannot come between negation and the phrase *every student* (see Collins 2017 for discussion of scope freezing).

Given the semantic value in (45b), (59) has the following entailments:

(60) a. Not every non-John student was there
b. For all S, if not every non-S student was there → John is an element of S.

Since John is not an element of the empty set, (60b) entails:

(61) It is not the case that not every student was there.

But then (60a) and (61) entail:

(62) Not every non-John student was there and every student was there.

But (62) is a contradiction. I propose that (58c) has the unacceptable status that it does because it is an inherent contradiction (see Gajewski 2008: 76 and von Fintel 1993).

It is unclear that von Fintel's 1993 approach predicts the same result. Under von Fintel's approach, a constituent such as [every A but C] denotes a generalized quantifier with the semantic value $\lambda P.\forall x[(A(x) \wedge \neg P(x)) \leftrightarrow C(x)]$. But there is no reason why this semantic value should not fall under the rule for negation in (4).

8. Conclusion

This paper discussed two ways of negating DP quantifier phrases. In one way, NEG modifies the quantifier D directly with the structure [[NEG D] NP] (inner negation). In the other way, NEG modifies the whole DP with the structure [NEG DP] (outer negation). I gave evidence based on the distribution of negative polarity items that negated universal quantifier phrases like *not every student* involve outer negation. I also showed that Hoeksema's generalization about exceptive phrases is not inconsistent with the assumption of outer negation of universal quantifier phrases.

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