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PRAGMATIC AND COGNITIVE ASPECTS OF NEGATIVE POLARITY*

This paper will consider the problems posed by NEGATIVE POLARITY ITEMS (NPIs) like *any* and *ever*. Such forms have a restricted distribution: they occur in sentences like (1) with explicit negatives—whence the name 'negative polarity items'—and also in a variety of non-negative constructions like those involving *before* and and *if* in (2) and (3).

(1) Chrysler dealers don't *ever* sell *any* cars *anymore*. (Ladusaw 1980:1)

(2) Jack will replace the money before *anyone ever* misses it.

(3) If he *ever* drinks *any* water from that well, he will get dysentery.

Analyses of the distribution of NPIs have come from syntax (Klima 1964), from formal semantics (Ladusaw 1979) and from a fusion of syntax and pragmatics (Baker 1970, Linebarger 1980). Though these previous approaches have various merits, none gives a fully adequate treatment of NPIs. This paper will take the position that many of the shortcomings of these analyses may be overcome by taking into consideration cognitive issues, which greatly affect the appropriateness of NPIs. One of the reasons that NPI studies have neglected cognitive factors is the lack of a well-established framework of pragmatics and cognitive linguistics applicable to the mechanisms of communication and utterance interpretation. However, RELEVANCE THEORY, proposed by Sperber and Wilson (1986), opens a new avenue toward a better understanding of the mechanisms that constrain NPIs. This theory provides an explicit model of the human information processing and storage systems, a model within which we implement our proposals here.

One notion that will figure heavily in our discussion will be the dichotomy between the CONCEPTUAL and PROCEDURAL theories of semantics advanced by Blakemore (1987, 1988, 1989). The conceptual theory deals with the truth-conditional meanings of propositions, while the procedural theory deals with the way propositions should be processed in the mind.

The object of this paper is to show that NPIs like *ever* and *any* are words which have procedural meanings and that they require the utterance containing them to be processed in what we shall call the COGNITIVE STRUCTURE OF NEGATION (CSN). This expression designates a mental state in which a proposition is juxtaposed with contradictory assumptions. Although the name CSN is original to Yoshimura (1992), the underlying notion has cropped up in a variety of studies, such as Givón's (1978) treatment of negation and Blakemore's (1989) analysis of *but*. This last provides a readily accessible example of the concept in question. In an utterance like *He is a guitar virtuoso, but he doesn't play chords well*, the conjunct *but* is a warning to the cognitive processor that the subsequent clause may seem to contradict its predecessor, although both are asserted to be true. This example illustrates the clash between in-coming and previously processed information that typifies CSN, and it also suggests the essentially procedural character of the phenomenon of CSN-sensitivity.

Section 1 provides an introduction to data concerning NPIs. We then take up a review of some major studies of NPI phenomena, beginning in section 2 with a brief description of two seminal studies by Klima (1964) and Baker (1970). These set the stage for the two major approaches to analyzing NPIs. The two subsequent sections deal with the most recent refinements of these approaches. Section 3 introduces Ladusaw's (1979, 1980) DOWNWARD-ENTAILMENT theory (DE-theory) of NPI licensers, which will be adopted as a component of the present analysis.

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The other major NPI study currently enjoying popularity is Linebarger's (1980, 1987) NEGATIVE-IMPLICATUM theory (NI-theory), which is taken up in section 4. We shall support Ladusaw's approach over Linebarger's. However, the DE-theory makes only a limited claim about the distribution of NPIs, and it is our purpose in this paper to supplement this approach. We suggest that some cognitive and pragmatic theory is necessary to give an adequate account of the constraints on the occurrence and appropriateness of NPIs. Section 5 offers outlines of relevance theory as proposed by Sperber and Wilson (1986) and of the conceptual/procedural dichotomy envisaged by Blakemore (1987). Section 6 focuses on *before*-clauses containing NPIs like *any* and *ever* and shows that the appropriateness of such NPIs is properly predicted by two conditions. The first of these is based on Ladusaw's DE-theory, and the second involves CSN. Section 7 describes the second condition in more depth. The notion of CSN is defined in terms of relevance theory, and its effects are made visible through a test involving the word *but*. Section 7.3 shows that these two conditions also predict the appropriateness of NPIs in other circumstances. As a conclusion, section 8 summarizes the results of this study and advocates the view that NPIs like *any* and *ever* are words which constrain mental processes and that CSN plays a crucial role in licensing NPIs. An attempt will also be made to situate the proposals of the present paper within the broader spectrum of cognitive linguistics.

1 An Overview of NPIs and Licensing Expressions

The class of NPIs is quite large, stylistically diverse, and prone to expansion. It includes, among other things, the determiner *any*; the adverbials *ever*, *yet*,[1] *in years*, *much*, and *until*; the NPs *a red cent*, *a thin dime*, and *a damn thing*; and the verbs and verb phrase idioms *budge* (*an inch*), *lift a finger*, *have a hope* (*in hell*), *cut* (*any*) *ice*, *bat an eyelash*, and *hold a candle to*.

In order for NPIs to be acceptable, they must occur in conjunction with an NPI-LICENSING expression, often described as the TRIGGER, which is drawn from a class of forms to be briefly reviewed next. First of all, NPIs are acceptable in negative sentences such as the (a) sentences below, but unacceptable in thier positive (b) counterparts. The asterisks assigned below do not reflect the possibility of acceptable literal readings of NPIs such as *lift a finger*.

(4) a. I have**n't** *ever* met Mr. Smith.
b. *I have *ever* met Mr. Smith.

(5) a. Mary did**n't** *lift a finger* to help Bill.
b. *Mary *lifted a finger* to help Bill. (Linebarger 1987:327)

In addition to overt negation like (4a) and (5a), a number of other expressions license NPIs in English. Some of these are exemplified below.

(6) *Before*:
a. Billy the Kid shot him **before** he *ever* got his hand on his gun. (Higashimori 1986:107)
b. *Billy the Kid shot him when he *ever* got his hand on his gun.

(7) Conditional *If*:
a. **If** he has *ever* been there, he can tell us about it. (ibid.:107)
b. *If he has been there, he can *ever* tell us about it.

(8) Universal Quantifiers:
a. **Everyone** who knows *a damn thing* about English knows that it's an SVO language.
b. *Someone who knows *a damn thing* about English knows that it's an SVO language. (Linebarger 1987:329)

(9) Certain Determiners, e.g., *few*:

[1] See Bolinger (1977:35–36 note 4) for an alternative viewpoint on this form.

a. **Few** people have *any* interest in this.

b. *Some people have *any* interest in this. (ibid.:328)

(10) Certain Prepositions, e.g., *against*:

a. John voted **against** *ever* approving *any* of the proposals.

b. *John voted for *ever* approving *any* of the proposals. (Ladusaw 1980:2)

(11) Comparatives:

a. He was taller **than** we *ever* thought he would be.

b. *He was so tall that we *ever* thought he would bump his head. (Linebarger 1987:328)

(12) Superlatives:

a. He is **the** smartest man I *ever* met.

b. *He is a smart man I *ever* met.

(13) Complement *If* and *Whether*:

a. He wondered **whether** they would *ever* be able to find their way back.
(C. Wood, *James Bond and Moonraker* (St. Albans: Panther Books, 1979), 167)

b. *He thought that they would *ever* be able to find their way back.

(14) *Too . . . to*:

a. He is **too** busy **to** *lift a finger* to help *anybody.* (Ota 1980:283)

b. *He is busy enough to *lift a finger* to help *anybody.*

(15) *After*:

a. The mad general kept issuing orders long **after** there was *anyone* to obey them.
(Linebarger 1987:371)

b. *The mad general kept issuing *any* orders long after there was someone to obey them.

(16) Adversative Predicates:

a. He **refused** to *budge an inch.*

b. *He promised to *budge an inch.*

c. She was **surprised** that there was *any* food left.

d. *She was sure that there was *any* food left.

e. I'm **sorry** that I *ever* met him.

f. *I'm glad that I *ever* met him.

g. I **doubt** he *much* likes Louise.

h. *I think he *much* likes Louise. (ibid.:328)

(17) *Only*:

a. **Only** John has *a hope in hell* of passing.

b. *Even John has *a hope in hell* of passing. (ibid.:328)

(18) *Exactly*:

a. **Exactly** four people in the whole world have *ever* read that dissertation: Bill, Mary, Tom, and Ed. (ibid.:373)

b. *Almost four people (in the whole world) have *ever* read that dissertation.

(19) Certain Complement-taking Forms, e.g., *evidence*:

a. If you're going to convict him, you'll need hard **evidence** that there's *anything* illegal in what he did. (ibid.:374)

b. *If you want to indict him, the judge will need assurances that there's *anything* illegal in what he did.

(20) Questions:

a. Have you *ever* met George?

b. *You have *ever* met George. (ibid.:329)

Needless to say, not all NPIs are acceptable in this wide range of environments. It is generally agreed that NPI acceptability varies considerably as a function of the inherent 'strength' of the NPI and that weak NPIs such as *any* are acceptable in a much wider range of environments than are strict NPIs such as *until* or *in weeks*.

Out of this wealth of NPIs and triggers, we have chosen to examine a limited range of data in depth. This paper concentrates on two NPIs, *ever* and *any*, and on two triggers, *before* and *if*, although other forms are also considered to a lesser extent. It is expected that the generalizations developed here will extend to other NPIs and triggers, but this supposition will have to await subsequent studies to be properly tested.

2 Two Seminal Analyses of Negative Polarity Items

In this section we shall review a pair of early generativist studies of the distribution of NPIs which in effect gave rise to the two principal guiding ideas that have set the direction for subsequent research on the topic. This short presentation completed, we shall examine the two most recent and widely discussed adaptations of the respective theories in the sections immediately following this one.

2.1 Klima's Notion of Affectivity

Klima (1964) proposed a suppletion rule deriving NPIs from underlying positive counterparts; *any*, for example, was derived from *some*, *ever* from *sometimes*, and *any more* from *still*. The rule applies to expressions preceded and commanded[2] by an AFFECTIVE element. All expressions licensing NPIs, including those rendered in boldface in (4)–(20) above, are assumed to bear the lexical feature specification [+affective]. The part of this analysis that has enduring importance in the current debate over NPIs is the idea that there is some property—labeled 'affectivity' by Klima—which is shared by all NPI-licensing expressions, but which is distinct from negation. Rather, affectivity properly includes negation. The alternative is to assume that NPI-licensing ability is always related to negation, at least at some abstract level. Unfortunately, Klima did not attempt to define his notion of affectivity in terms of deeper syntactic or semantic primitives. Such an effort would have to await Ladusaw's insightful research (1979).

Klima's implementation of his ideas on NPI licensing by means of a transformational rule resulted in certain difficulties. First, not all NPIs have positive counterparts. Obvious examples of this include *a red cent*, *bat an eye*, and *in years*. This is problematic because such forms would presumably lack a transformational source. Second, some contexts allow both NPIs and their positive counterparts, although with different meanings, as in the following pairs:

(21) a. Do they *ever* ask for more?

b. Do they *sometimes* ask for more?

(22) a. If they *ever* ask for more, don't say no.

b. If they *sometimes* ask for more, don't say no. (Bolinger 1977:28)

[2]Klima (1964) uses the expression 'in construction with' to describe the relation of being 'preceded and commanded by.' As for the notion of 'command,' basically α commands β if and only if neither one dominates the other, and every S node dominating α also dominates β.

This state of affairs is problematic—at least in modern versions of transformational grammar—on two counts: the suppletion rule would be obligatory in some cases and optional in others, according to lexical idiosyncrasies that would no longer be countenanced as conditions on rules in a transformational grammar. Also if the rule were employed to relate the (a) and (b) sentences in (21) and (22), the meaning changes to which it would give rise would be of a kind generally thought not to result from the application of transformations.

The following data bring another sort of problem to light: it is not sufficient merely to identify certain expressions as NPI licensers.

(23) a. If you *ever* drink water here, you'll get dysentery.

b. *If you *ever* drink water here, you'll feel better. (Higashimori 1986:97)

The two instances of *ever* are in the same structural environment (i.e., in the antecedent of a conditional), and yet there is a contrast. Since the affectivity approach addresses only the issue of identifying NPI triggers, it obviously should not be taken as a total explanation of NPI phenomena, because it is powerless to predict contrasts like the one in (23). Here we see the essential problem which this paper is intended to address. Beyond the issue of identifying triggers, there are pragmatic constraints on NPI use which have yet to be properly described and which we feel are best handled through procedural-semantic constraints much like the one imposed by Blakemore (1989) on *but*. This problem will be dealt with in substantial detail in later sections.

2.2 Baker's Proposal

A subsequent proposal by Baker (1970) took an approach different from Klima's by supposing that all NPI licensing was effected by overt or abstract negation. Baker proposed that NPI licensing is a two-stage process: either an NPI must occur in the scope of an overt negation, or else the NPI must be licensed by entailment.[3] The proposition φ asserted by a sentence containing an NPI must entail some other proposition φ' in which the requisite relationship between the NPI and overt negation occurs. Baker formulated this as follows:

(24) a. Negative-polarity expressions are appropriate in structures within the scope of negations, whereas affirmative-polarity items are appropriate elsewhere.

b. Given semantic representations φ_1 and φ_2 satisfying the following conditions:

i. $\varphi_1 = \alpha_1\beta\gamma_1$ and $\varphi_2 = \alpha_2\beta\gamma_2$, where β is itself a well-formed semantic representation;

ii. φ_1 entails φ_2;

then the lexical representation appropriate to β in φ_2 (by [(24a)]) is also appropriate to β in φ_1. (Baker 1970:179)

(Variables have been altered for consistency.)

It would appear that Baker's notion of 'scope' is based on the command relation (1970:180), and, according to Linebarger (1987:330), the relevant syntactic level is surface-structure. To see how the entailment part of the definition works, observe the following examples:

(25) a. He is too busy to *lift a finger* to help *anybody*. [=(14a)]

b. He doesn't *lift a finger* to help *anybody*.

According to Baker, in (25), *too* licenses the NPIs *lift a finger* and *anybody* because (25a) entails (25b). Other non-negative NPI-licensing expressions, such as those enumerated in (6)–(20) above, are assumed to license NPIs by virtue of negative entailments in the same way.

There are certain problems with Baker's account of NPI licensing. First, the scope of negation cannot always be determined at the surface-structure level. Observe the following examples:

(26) a. I don't think that she *can help doing* what she does. (Linebarger 1980:13)

b. *I don't accept that she *can help doing* what she does.

[3] Recall that 'entailment' refers to inference without recourse to factual or contextual knowledge. Hence, *A father woke up* entails *A man woke up*, but *The president woke up* does *not* entail *A man woke up*.

The difference in acceptability between (26a) and (26b) cannot be accounted for by appealing to the command relationship that holds between the negative and the NPI in surface-structure because in both (26a) and (26b) the negatives command the NPIs. Therefore, Baker's part (24a) incorrectly predicts that (26b) would be acceptable.

A second problem stems from the fact that not all sentences with negative entailments admit NPIs. Since φ logically entails $\neg\neg\varphi$, NPIs should be allowed in simple positive sentences like (27a) on the basis of the entailment from (27a) to (27b).

(27) a. *John has *ever* been there.

b. It's not the case that John has not *ever* been there.

The central notion of Baker's early study of NPI licensing would later be adopted and refined by Linebarger (1980, 1987), who attempts to address the problems above. Her proposals will be reviewed in a subsequent section, where we shall argue that she was not altogether successful in overcoming the difficulties that face this sort of analysis of NPI distribution.

3 Ladusaw's Downward-Entailment Theory

As mentioned in the foregoing section, Ladusaw (1979, 1980) could be said to have followed the course originally set by Klima (1964). Recall that Klima showed that the range of lexical items licensing NPIs extends far beyond what could reasonably be called negations. He assumed that some semantic property unified this diverse class and postulated the feature [±affective] to govern the rules he proposed to restrict the distribution of NPIs. However, no attempt was made to define the feature [±affective] in terms of more basic notions. Ladusaw argued that in the absence of a definition of [±affective], there was no alternative but to list arbitrarily the lexical items in question, such as *not*, *before*, *if*, etc., as semantically [+affective] and that such an approach was inadequate. He consequently replaced the feature [±affective] with a definition employing the notion of DOWNWARD-ENTAILMENT and gave a model-theoretical explanation for the distribution of NPIs within the framework of Montague grammar. This section is devoted to an exposition of Ladusaw's proposals and to a certain number of criticisms that were subsequently leveled against them by Linebarger (1987).

3.1 Ladusaw's Proposal

In order to understand Ladusaw's approach, we must set the stage with a certain number of auxiliary notions. The first of these concerns the view which regards linguistic structures as applications of functions to arguments. For instance, within the Montagovian framework, a sentence is assumed to consist of two parts, a function and its argument. The function is the subject NP and the argument is the predicate VP. The same manner of thinking applies inside of the NP and the VP. In NPs determiners are functions and head nouns are their arguments; in VPs verbs are function and object NPs are their arguments. The same analysis is extended to all other kinds of phrases and clauses.

This pervasive reliance on the notions of function and argument leads to another important concept, that of SCOPE. Ladusaw (1980) defines the semantic scope of a constituent as follows:

(28) Semantic Scope of a Constituent

> For any two expressions α and β, constituents of a sentence φ, α is in the scope of β with respect to an interpretation of φ, φ' iff the interpretation of α is used in the formulation of the argument to β's interpretation in φ'. (Ladusaw 1980:12)

According to the definition in (28), a VP is in the scope of its subject NP; inside of an NP, the N is in the scope of the determiner; in the predicate VP, the object NP is in the scope of the V.

With the notion of scope in hand, we are ready to proceed with a definition of the basic constraints on the distribution of NPIs. That is to say, NPIs are found within the scope of certain expressions which Ladusaw identifies as DOWNWARD-ENTAILING (DE).

(29) Downward-Entailment (DE) Condition on NPIs

> A negative-polarity item is acceptable only if it is interpreted in the scope of a downward-entailing expression. (Ladusaw 1980:13)

Basically, a downward-entailing expression is one which licenses implications from supersets to subsets. Ladusaw identifies DE-expressions using the test exemplified in the following data:

(30) *No* is DE:

a. **No** man walks. →

b. **No** father walks.

(31) *Every* is DE:

a. **Every** man walks. →

b. **Every** father walks.

(32) *Some* is *not* DE:

a. **Some** man walks. ↛

b. **Some** father walks. (Ladusaw 1980:6)

Note that the denotation of *father* is a subset of that of *man*. If a sentence containing the word *man* entails a sentence identical to the first except for the substitution of *father* for *man*, then *man/father* is in the scope of a DE-expression. Thus, the valid entailments from the (a) to (b) sentences in (30) and (31) indicate that *no* and *every* are DE, and the corresponding non-entailment in (32) shows *some* to be non-DE.

Units larger than words may also have the property of being downward-entailing. For instance, we may consider whole NPs in this regard. The following examples demonstrate that *no man* is DE, but that *every man* and *some man* are not:

(33) [NP *no*...] is DE:

a. **No man** walks. →

b. **No man** walks slowly.

(34) [NP *every*...] is *not* DE:

a. **Every man** walks. ↛

b. **Every man** walks slowly.

(35) [NP *some*...] is *not* DE:

a. **Some man** walks. ↛

b. **Some man** walks slowly. (Ladusaw 1980:6)

Note that the denotations of *walks* and *walks slowly* are sets of individuals, i.e., the sets of 'walkers' and 'slow walkers,' respectively. Thus, the denotation of *walks slowly* is obviously a subset of that of *walks*. Consequently, since (33a) entails (33b), while the (a) sentences in (34)–(35) do not entail the corresponding (b) propositions, it follows that *no man* is DE and that *every man* and *some man* are not.

Ladusaw's DE-condition does an impressive job of correctly predicting the following aparallelism in the distribution of NPIs:

(36) { a. **No** student / b. **Every** student / c. *__Some__ student } who had *ever* read *anything* about phrenology attended the lecture.

(37) { a. **No** student / b. *__Every__ student / c. *__Some__ student } who attended the lectures had *ever* read *anything* about phrenology. (Ladusaw 1980:3)

Restrictive relatives are assumed, at least in the Montagovian view, to be in the scope of determiners and quantifiers. Thus, the NPIs *ever* and *anything* in (36a,b) are acceptable, since they are interpreted in the scope of the DE-expressions *no* in (36a) and *every* in (36b). However, those in (36c) are infelicitous because *some* is not DE. Similarly, the NPIs in (37a) are acceptable, since they are interpreted in the scope of the DE-expression [$_{NP}$ *no*...], while those in (37b,c) are not, because neither of the two expressions [$_{NP}$ *every*...] or [$_{NP}$ *some*...] is DE.

Here we will return to the data listed in section 1 to see how well Ladusaw's DE-condition fits the basic NPI facts, examining the highlighted items to determine whether or not they are really DE-expressions.

(38) Overt Negation:

a. John does**n't** walk. →

b. John does**n't** walk slowly.

(39) *Before*:

a. They run away **before** men come. →

b. They run away **before** fathers come.

(40) Conditional *If*:

a. **If** a man comes, we will be saved. →

b. **If** a father comes, we will be saved.

(41) Universal Quantifiers:

a. **Every** man who walks enjoys himself. →

b. **Every** man who walks slowly enjoys himself.

(42) Certain Determiners, e.g., *few*:

a. **Few men** walk. →

b. **Few men** walk slowly.

(43) Certain Prepositions, e.g., *against*:

a. John is **against** killing animals. →

b. John is **against** killing dogs.

(44) Comparatives:

a. He is taller **than** we thought he would be. →

b. He is taller **than** I thought he would be.

(45) Superlatives:

a. He is **the** smartest man we ever met. →

b. He is **the** smartest man I ever met.

(46) Complement *If* and *Whether*:

a. He doubts whether John can walk. →

b. He doubts whether John can walk fast.

(47) *Too ... to*:

a. He is **too** tired **to** walk. →

b. He is **too** tired **to** walk fast.

(48) Adversative Predicates:

a. John **refuses** to walk. →

b. John **refuses** to walk slowly.

In all of the cases examined above, the typical DE test showing entailments from supersets to subsets yielded successful results, just as Ladusaw's condition predicts.

It must have been noticed, however, that the above set of data lacks examples employing *after*, *only*, *exactly*, *evidence*, and questions. Doubts have arisen as to how successful Ladusaw's proposals are with respect to these particular NPI triggers. Indeed Linebarger (1980, 1987) argues that most of the constructions in question are simply not DE and that for this reason Ladusaw's approach is incorrect. We shall attempt to show that a more thoughtful examination of the facts reveals that Ladusaw's constraint fares somewhat better than Linebarger would have us believe and that we have reason to hope that a future version of the DE-theory may be revised to a point where it can handle the controversial data. The next section is, therefore, devoted to an examination of Ladusaw's proposals and their shortcomings, both apparent and real.

3.2 Limitations of Ladusaw's Theory

Before plunging into a discussion of problems in Ladusaw's approach, let us take a moment to consider on an abstract level what form counterevidence to his analysis might take. One of Ladusaw's most well-known critics is Linebarger (1987), who offers apparent examples both of NPIs that are acceptable without being inside of the scope of DE expressions and also of DE expressions that do not license NPIs within their scope. However, if one reconsiders the actual statement of Ladusaw's constraint, one will find that it does not require that all DE expressions license NPIs, but rather specifies merely that the felicitous use of NPIs is contingent upon their occurring in the scope of DE expressions. This is due to the fact that the constraint is a simple implication employing the expression 'only if,' and not a bi-implication. Thus, while the data where NPIs occur felicitously without being licensed by a DE-expression are well-and-truly counterevidence to Ladusaw's approach, converse examples, i.e., DE-expressions failing to allow NPIs, are not.

The foregoing is not meant to imply that observations about DE-expressions not licensing NPIs are devoid of interest or importance. While they do not demonstrate any fatal flaw in Ladusaw's thinking, they do underscore the partial nature of his solution. In other words, one must conclude that inclusion in the scope of a DE-expression is not the only constraint on the felicitous use of NPIs. Now, any theory that can more exactly characterize the distribution of NPIs, as Linebarger claims hers can, would naturally be preferable to Ladusaw's approach. However, we intend to show in a later section that Linebarger's proposals are seriously flawed. More discussion on this will be reserved for the section devoted to Linebarger's analysis. For now, we will confine ourselves to a consideration of several points where Linebarger accuses Ladusaw of making incorrect predictions of the crucial sort sketched out above, and we will follow up with a brief comment on questions as licensing expressions.

3.2.1 'After'. One NPI trigger which Linebarger claims is not a DE-expression is *after*. She mentions the following data:

(49) The mad general kept issuing orders long after there was *anyone* to obey them.
(Linebarger 1987:371, emphasis mine)

(50) a. She became ill long after eating a contaminated vegetable. ↛

b. She became ill long after eating contaminated kale. (ibid.:372)

She argues that NPIs appear in the scope of *long after* as shown in (49), but that (50) shows that *long after* is not a DE-expression: hence, this would be an explicit counterexample to Ladusaw's DE-theory.

We claim, however, that Linebarger's argument is fatally flawed, because she indiscriminately uses two different senses of the word *after* in the foregoing demonstration. The *after* found in (49) means something like 'at a time when it had ceased to be the case that φ,' while the instance of *after* in (50) could be paraphrased as 'at a time subsequent to that at which φ.' The first has a connotation to the effect that the state no longer obtains, while the latter does not. It is possible to demonstrate very simply that this semantic difference is reflected both in downward-entailment properties and the ability to license NPIs. Consider the following examples:

(51) a. The mad general kept issuing orders long after there were soldiers to obey them. →

b. The mad general kept issuing orders long after there were infantrymen to obey them.

c. The mad general kept issuing orders long after there was *anyone* to obey them. [=(49)]

(52) a. She became ill long after eating a contaminated vegetable. ↛

b. She became ill long after eating contaminated kale.

c. *She became ill long after eating *any* contaminated vegetables.

When *long after* asserts that the state described by its complement no longer obtains, then *long after* is DE and can license NPIs, as in (51). But (52) shows that *long after* neither is DE nor licenses NPIs when it expresses a relationship of pure temporal ulteriority. Probably the most noteworthy point which the examination of these examples suggests is that the property of DE-ness is not attributed to lexical items per se, but rather arises in connection with elements of independent semantic representations onto which lexical items may be mapped, depending on the context of use in which such items find themselves. In other words, in order to determine whether or not a certain word is DE, we should take into consideration the whole meaning of the sentence or the context. If we avoid the pitfall of conflating different senses of *after*, it is possible to see that in this case the presence of the property of DE-ness corresponds to the ability to license NPIs. Thus, rather than proving to be a stumbling block for Ladusaw's theory, as Linebarger would have us believe, *after* turns out to demonstrate the DE-theory's capacity for making subtle and correct predictions about the distribution of NPIs.

3.2.2 ADVERSATIVES. With respect to adversatives, Linebarger takes the case of *surprised* form among several predicates, and argues that it is not 'logically DE' but 'psychologically DE.' She concludes that adversatives in general are not DE-expressions. Her refutation centers on the following non-entailment:

(53) a. Mary was surprised that John bought a car. ↛

b. Mary was surprised that John bought a Mercedes. (Linebarger 1987:364)

Linebarger has the following to say about (53):

> Under the most straightforward notion of entailment, [(53a)] plainly does not entail [(53b)], since it is possible for there to be a world in which [(53a)] is true and [(53b)] is not: one, for example, in which John surprises Mary by purchasing a Pinto, but does not purchase a Mercedes (and hence does not surprise Mary by doing so). In this case [(53a)] is true and [(53b)] is not. (Under some analyses it is false; in others it is neither-true-nor-false due to presupposition failure.) In any event, the truth of [(53b)] does not follow from the truth of [(53a)]. (1987:364–365)

Linebarger (1987:365) reports that in a personal communication Ladusaw responded to the foregoing observation, saying that the relevant entailment of (53a) "would be 'Mary was surprised that John bought a Mercedes' minus the commitment to the truth of 'John bought a Mercedes.'" Admittedly, it is somewhat hard to appreciate the intuition that Ladusaw is attempting to convey. However, it is possible to alter the form of (53) in a manner that makes Ladusaw's intended explanation somewhat more evident. Note that in (54) and (55) there is no implication that John bought anything.

(54) a. Mary would be surprised at John's buying a car. →

b. Mary would be surprised at John's buying a Mercedes.

(55) a. John's buying a car would surprise Mary. →

b. John's buying a Mercedes would surprise Mary.

Examples (54) and (55) lack a specifically anchored tense. Indeed the *buying* construct has only aspectual marking and no tense at all. The lack of a specifically anchored tense removes any implication that there was ever an occasion when John bought something and thereby allows

the downward-entailing character of *surprised* to emerge. Pursuant to this line of thought, the apparent failure of (53a) to imply (53b) would be induced by the factive character of *surprised* plus the specifically anchored tenses, which commit one to the truth of the the subordinate clauses, which in turn do not fall into the proper relation of entailment. In other words, there may be good reason to go along with Ladusaw in claiming that *surprised* is really DE but that the relevant entailments are obscured in (53) by peripheral considerations. However, we should also examine possible objections to the above defense of Ladusaw's position.

The examples in (54) and (55) make use of the conditional form *would be* in order to avoid any implication that an actual purchase ever took place. It could be objected, however, that the semantic effects of the conditional are rather mysterious and that the use of *would be* may have had more of an effect on (54) and (55) than the above explanation spells out. For instance, if the use of *would be* turned (54) and (55) into covert conditional sentences comparable to *if*-constructions, there might be an entirely different explanation of the success of the entailments in (54) and (55). At present it is difficult to draw any definite conclusions one way or the other about the DE-ness of *surprised* or other adversatives.

3.2.3 'ONLY' AND 'EXACTLY'. We now come to a matter which appears to be a genuine problem for Ladusaw's DE-theory: both *only* and *exactly* license NPIs in their scope, yet neither appears to allow the sort of entailments that we depend on to demonstrate DE-ness. While we accept that facts concerning *only* and *exactly* are an outstanding problem for the DE theory, we nonetheless hesitate to conclude that this irremediably debilitates the approach. This section will be devoted to setting out the problematic data and to pointing out directions which future research might take to devise a slight modification of the theory capable of accommodating *only* and *exactly*.

Linebarger (1987:372) offers the following argument employing *only* to argue against Ladusaw's DE approach: "[C]onsider the relationship between [(56a)] and [(56b)]: surely the former does not entail the latter. Nevertheless, the NPI is acceptable in [(57)]."

(56) a. Only people who have had a debilitating illness themselves can appreciate what an ordeal this was. $\not\rightarrow$

b. Only people who have had polio can appreciate what an ordeal this was.

(57) Only people who have *ever* had a debilitating illness themselves can appreciate what an ordeal this was. (emphasis mine)

Linebarger (1987:373) also constructs a similar argument based on *exactly*: "[T]he acceptability of [(58)] requires that *exactly* be DE. But, of course, it isn't, as demonstrated by the failure of [(59a)] to entail [(59b)]."

(58) Exactly four people in the whole world have *ever* read that dissertation: Bill, Mary, Tom, and Ed. (emphasis mine)

(59) a. Exactly four people in the whole world have heard a dolphin recite poetry: Bill, Mary, Tom, and Ed. $\not\rightarrow$

b. Exactly four people in the whole world have heard a dolphin recite Greek poetry: Bill, Mary, Tom, and Ed.

Linebarger is perfectly correct that the (b) examples above can hardly be said to follow from the corresponding (a) forms. Consequently, the success of the NPIs in the accompanying data is a blow to Ladusaw's approach. However, if we examine these phenomena with the aid of some insights due to Horn (1969), we will gain a more precise idea of what exactly is preventing the desired entailments from obtaining, and, from that vantage point, paths for future modification to the theory will become apparent.

Imagine any group of four sentences that begin as follows but that have identical continuations in place of '...'

(60) a. Exactly 13...

b. Only 13...

c. At least 13...

d. At most 13... (Horn 1969:104)

Horn observes with respect to (60) that "(a) asserts both (c) and (d), whereas (b) presupposes (c) and asserts (d)" (1969:104). Horn's comment raises the possibility of viewing the meaning of *only* and *exactly* decompositionally and thereby isolating some component of their meaning to which their NPI-licensing capacity may be attributed. Note that both *only 13...* and *exactly 13...* imply *at most 13...* We suspect that this is the factor which enables NPIs to occur within the scopes of the former two forms.

Notice that *only*, *exactly*, and *at most* all license NPIs in a parallel way.

(61) { Only / Exactly / At most } 13 people who had *ever* had *any* experience with the system could be found.

(62) { Only / Exactly / At most } 13 people have *ever* had *any* experience with the system.

We've already seen that neither *only* nor *exactly* pass the usual tests for demonstrating DE-ness; however, *at most* is uncontroversially DE.

(63) a. At most three men walk. →
b. At most three fathers walk.

(64) a. At most three men walk. →
b. At most three men walk slowly.

Though we shall not attempt to refine Ladusaw's definition here, we nonetheless feel that the NPI licensing capacity of *only* and *exactly* somehow stems from the following two-step implications or else from some underlying and as yet unarticulated characteristic of the forms in question which gives rise to these implications.

(65) a. { Only / Exactly } three men walk. →
b. At most three men walk. →
c. At most three fathers walk.

(66) a. { Only / Exactly } three men walk. →
b. At most three men walk. →
c. At most three men walk slowly.

Of course, Horn's observations also make it plain why expressions with *only* and *exactly* do not themselves pass the tests for DE-ness. Though the *at most* component of their meaning does give rise to the proper entailments, as shown in (65) and (66), *only* and *exactly* assert or presuppose another form with *at least*, and the latter spoils the DE tests.

(67) a. { Only / Exactly } three men walk. →
b. At least three men walk. ↛
c. At least three fathers walk.

(68) a. { Only / Exactly } three men walk. →
b. At least three men walk. ↛
c. At least three men walk slowly.

From the above observations it would appear that Horn's insight into the meanings of *only* and *exactly* isolates the reason that the two forms fail the DE tests and also adumbrates a course for future improvements in the theory. However, until the required refinements are implemented, the facts surrounding *only* and *exactly* will remain a liability for the approach.

3.2.4 COMPLEMENT-TAKING FORMS LIKE 'EVIDENCE'. The last of Linebarger's examples of NPI-licensing contexts that don't appear to be DE is summarized as follows: "In [(69)], for example, the acceptability of the NPI cannot be accounted for by the DE-theory, since, as demonstrated by [(70)], no DE operator appears to be available" (Linebarger 1987:374).

(69) If you're going to convict him, you'll need hard evidence that there's *anything* illegal in what he did. (emphasis mine)

(70) a. If you're going to convict him, you'll need evidence that he stole a car. $\not\rightarrow$

b. If you're going to convict him, you'll need evidence that he stole a 1968 Saab.

Actually the above data represent a family of related collocations, each featuring an expression of deontic necessity along with a description of a demonstration. These forms improve in acceptability when primed with a conditional or purpose clause.

(71) a. To convict him, you must first prove that *anything* illegal *ever* took place.

b. For this marsh to be declared a wildlife refuge, it is incumbent upon you to demonstrate that *any* of the species currently inhabiting the area are, in fact, endangered.

c. To get a new product approved by management, you first have to prove that there are *any* consumers out there who *give enough of a damn* to buy it.

(72) a. *We provided hard evidence that there was *anything* illegal in what he did.

b. *We proved that *anything* illegal had *ever* taken place.

c. *We demonstrated that *any* of the species currently inhabiting the marsh are, in fact, endangered.

d. *We proved that there are *any* consumers out there who *give enough of a damn* to buy the product.

Indeed, these structures resist the usual DE-tests, so this counts as a strike against Ladusaw's approach. Intuitively it appears that the key to the problem is somehow related to the hypothetical nature of the described demonstrations. We may only hope that a fuller understanding of the range of data that fall into this group will lead to insights about an eventual solution.

3.2.5 QUESTIONS. Ladusaw's theory faces a final obstacle which, one must admit, poses a challenge to any semantic theory. He must find some way of predicting that NPIs are licensed in questions, despite the fact that such utterances are not assumed to make any assertions—seemingly a prerequisite for an approach based on entailment.

As a solution, Ladusaw (1979) assumes that the occurrence of NPIs in interrogative sentences is quite a different phenomenon and suggests a unidirectional way of dealing with direct and indirect questions. He proposes the following pragmatic principle with respect to the occurrence of NPIs in questions:

(73) POLARITY-SENSITIVE ITEMS IN QUESTIONS

S should pose the question *q* only when he believes it to be possible for *H* to express its denotation set without major revision of the form of the question. (Ladusaw 1979:151)

In (73), *S* stands for a speaker and *H* for a hearer. If we adopt this principle, this problem about questions is avoided, though perhaps not truly solved, in our opinion. The problem of questions remains a thorny issue for semantic analysis in general, and, understandably, no analysis of NPIs with which we are familiar gives a totally satisfactory account of questions as NPI triggers. Consequently, the phenomenon of NPIs in questions also remains an outstanding problem.

3.3 NON-NPI-LICENSING DE-CONTEXTS

Let us now return to the matter of DE expressions which, under some circumstances, do not license NPIs. Consider the following examples:

(74) a. **If** you *ever* drink water here, you'll get dysentery.

b. ***If** you *ever* drink water here, you'll feel better. [=(23)]

(75) a. **At most 1 out of 100 linguists** has *anything* coherent to say about Cantonese reversible verbs.

b. *__At most 99 out of 100 linguists__ have *anything* coherent to say about Cantonese reversible verbs. (Linebarger 1987:375–376)

It has already been shown in the foregoing discussion that *if* and *at most* are DE-expressions. Therefore, Ladusaw predicts that NPIs *should not be banned* from their scope. However, a truly adequate description of English must find some means of predicting the contrast between the (a) and (b) examples above. The issue that we must now face is how to achieve this goal.

The first question concerns whether or not Ladusaw's approach should be abandoned. By making a cautious prediction, he has avoided criticisms that would have arisen for the failure to predict the contrasts in (74) and (75). However, one might argue that the project he undertook should be started anew with a more ambitious goal of empirical coverage. We think, though, that this is unwise. When one considers the elegance with which Ladusaw's theory handles such curious arrays of data as the following, repeated from above, one cannot help but feel that the approach is headed in the right direction:

(76) { a. **No** student / b. **Every** student / c. *__Some__ student } who had *ever* read *anything* about phrenology attended the lecture. [=(36)]

(77) { a. **No** student / b. *__Every__ student / c. *__Some__ student } who attended the lectures had *ever* read *anything* about phrenology. [=(37)]

This and other predictions strike us as being too good to give up.

We must next turn to the question of how to augment Ladusaw's analysis. Considering the fact that the contrasts in (74) and (75) stem from changing *get dysentery* into *feel better* and *1* into *99*, it is hard to imagine any relevant restriction predicting these data stated in terms of syntax or formal semantics. We think, therefore, that the proper way to supplement Ladusaw's approach is to pair it with a pragmatic constraint. The idea is that NPIs may occur precisely when they *(a)* satisfy Ladusaw's constraint *and (b)* satisfy the pragmatic constraint to be proposed here. This strikes us as the optimal partnership between formal semantics and pragmatics, as far as the study of negative polarity is concerned.

Finally, a word is in order about the conjunction of constraints called for above. Being literally a logical conjunction of constraints, it obviously will not allow any *more* NPI occurrences than were predicted under Ladusaw's theory as described above. Consequently, all of the counterevidence brought up by Linebarger must still be addressed. In the semantic/pragmatic approach advocated here, there is clearly only one path to take: Ladusaw's formal semantic approach must be somewhat relaxed, so that it is able to predict that a small number of additional triggers are [+affective] in the sense of Klima (1964). Such a project we will, however, leave for future research. Our proposals for a pragmatic constraint to add restrictiveness to Ladusaw's proposals shall be spelled out in subsequent sections of this paper. Before proceeding with that task, we shall provide a review of an alternative view of the problem proposed by Linebarger (1987).

4 Linebarger's Negative Implicatum Theory

In this section we will consider Linebarger's (1980, 1987) analysis of the distribution of NPIs. Just as Ladusaw's work could be regarded as an amplification and refinement of Klima's proposals, Linebarger could be viewed as carrying on the line of research initiated by Baker (1970), re-implementing it with the tools provided by government-binding theory and pragmatics. We shall first provide a description of Linebarger's proposals and then proceed to a critical evaluation of their application.

4.1 Linebarger's Proposal

Linebarger (1987) proposes a disjunction of two conditions to predict the distribution of NPIs: the first is the immediate scope constraint (ISC), which deals with the paradigmatic cases that have overt negatives; the second is the negative implicatum theory (NI-theory) which deals with the derivative cases that cannot be explained by the ISC. The conditions are defined as follows:

(78) a. The Immediate Scope Constraint (ISC)

A negative polarity item is acceptable in a sentence S if in the LF of S the subformula representing the NPI is in the immediate scope of the negation operator. An element is in the immediate scope of $\neg$ only if (1) it occurs in a proposition that is the entire scope of $\neg$, and (2) within this proposition there are no logical elements[4] intervening between it and $\neg$. (Linebarger 1987:338)

b. Negative Implicatum (NI) Theory

i. Expectation of negative implicatum is itself a conventional implicature.

A negative polarity item contributes to sentence S expressing a proposition φ the conventional implicature that the following two conditions are satisfied.

ii. Availability of negative implicatum.

[Let us call this the Availability Condition.] There is some proposition NI (which may be identical to φ) which is implicated or entailed by S and which is part of what the speaker is attempting to convey in uttering S. In the LF of some sentence S′ expressing NI, the lexical representation of the NPI occurs in the immediate scope of negation. In the event that S is distinct from S′, we may say that in uttering S the speaker is making an allusion to S′.

iii. NI strengthens φ.

[Let us call this the Strengthening Condition.] The truth of NI, in the context of the utterance, virtually guarantees the truth of φ. (ibid.:346)

(Logical notation has been altered for consistency.)

We shall illustrate the basic application of the above definitions on some simple examples. Toward this end, however, we begin by explaining a basic ambiguity that will figure in our examples, along with the logical forms that Linebarger would assign to the alternate readings.

Example (79) features a well-known case of negative scope ambiguity: (80) displays the key points of two government-binding-theoretic logical forms (LFs) that Linebarger proposes in order to capture the two available readings of (79).

(79) George doesn't starve his cat because he loves her.

(80) a. $\neg$**Cause**(he loves her, George starves his cat)

'George's love of his cat is not the cause of his starvation of the cat.'

b. **Cause**(he loves her, $\neg$[George starves his cat])

'There is a causal link between George's love for his cat and his not starving the cat.'

(Linebarger 1987:333)

Usually, a sentence such as (79), which contains a *because*-clause and a negative operator in the matrix clause, is ambiguous, presenting one reading in which the negative affects the whole sentence as shown in (80a) and a second one in which it negates only the matrix verb phrase as in (80b). In (80), **Cause** is a logical operator that takes two propositional arguments. The first argument describes the instigating situation, and the second expresses the result.

With the above background, we are now ready to turn to an examination of Linebarger's conditions. Example (81) features the same combination of a *before*-clause and a negative that usually leads to an ambiguity, as in (79); however, this time an NPI, *budge an inch*, has been introduced.

(81) He didn't *budge an inch* because he was pushed.

[4] Linebarger (1980:30) defines logical elements as "elements capable of entering into scope ambiguities."

(82) a. *¬**Cause**(he was pushed, he *budged an inch*)

b. **Cause**(he was pushed, ¬[he *budged an inch*]) (Linebarger 1987:337–338)

The effect of the NPI is to remove the previously described ambiguity, favoring the reading where the negative operator has narrow scope as reflected in (82). According to Linebarger's ISC, this is because in the LF in (82a) there is a logical element **Cause** that intervenes between ¬ and the NPI *budge an inch*. That is, the NPI is not in the immediate scope of ¬. Therefore, the NPI is not licensed by the ISC. On the other hand, in (82b), which has the narrow scope reading of ¬, the NPI is in the immediate scope of the negative operator, satisfying the ISC. Consequently the NPI is licensed.

Linebarger's ISC admits (82b) without any further consideration of the second part of her analysis, i.e., the NI-theory. However, since (82a) did not pass the ISC, we must reconsider that reading to see if the NI-theory will admit it. It then becomes a matter of determining whether (82a) has any negative implicatum (NI) in whose LF the representation of *budge an inch* occurs in the immediate scope of ¬, as required by the availability condition. Furthermore, the strengthening condition requires that any such NI virtually guarantee the truth of (82a). If Linebarger's approach is correct, then the unacceptability of (82a) should be the result of there being no such suitable NI.

Now let us consider a further example to elucidate the positive application of the NI-theory. Consider (83) and the two readings in (84).

(83) He didn't move because *anyone* pushed him. (Linebarger 1987:337)

(84) a. ¬**Cause**($\exists x$[x pushed him], he moved)

b. **Cause**($\exists x$[x pushed him], ¬[he moved])

The representation of *anyone* in (83) is, of course, the existential quantifier $\exists$. Note that neither (84a) nor (84b) satisfies the ISC, since in neither case is the existential in the immediate scope of ¬. Thus, we must consider both readings from the perspective of NI-theory. The unavailability of the reading corresponding to (84b) is claimed to stem from the lack of any suitable NI. In contrast, following the spirit of Linebarger's analysis, we might claim that there is an NI for the (84a) reading. This NI is shown in (85), along with its LF.

(85) a. No one pushed him.

b. ¬$\exists x$[x pushed him]

The NI in (85) satisfies the availability condition, since it has the existential quantifier in the immediate scope of ¬, so let us consider the strengthening condition. Obviously, if no one pushed 'him,' then 'he' didn't move as a result of being pushed. Indeed, the NI in (85) would strengthen the claim made in the (84a) reading, the result being that the strengthening condition is satisfied.

Let us briefly note that Linebarger overcomes the problems entailed by Baker's surface-structure dependence by couching her definitions in terms of LF. This is, of course, the level of representation in government-binding theory where scope relations are resolved. Consequently, the contrast that was difficult for Baker (1970) in (26) is readily handled.

The discussion above sums up the basic points of Linebarger's analysis, which advances the definite claim that NPIs should be licensed by negative operators and requires that an acceptable NPI-bearing sentence should convey a negative implicatum that contains the NPI. We shall now proceed to a criticism of Linebarger's approach.

4.2 Counterarguments to Linebarger's Approach

In this section we will review several points in which Linebarger's theory seems to be lacking. First there is a matter concerning the empirical accuracy of Linebarger's predictions. Recall example (81), which, indeed, appears to be unambiguous on a context-free reading. The following examples are parallel in structure to (81), yet they admit the sort of reading which Linebarger seeks to ban.

(86) a. Believe me, he would *never budge an inch* because he was pushed: he's not that kind of guy.

b. ¬**Cause**(he was pushed, he *ever budged an inch*)

(87) a. He is not likely to divulge *any* damaging information just because he has been granted immunity from prosecution.

b. $\neg$**Cause**(he has been granted immunity from prosecution,
$\exists x[x$ is damaging information $\wedge$ he is likely to divulge $x]$)

The (a) examples in (86) and (87) readily take on the readings shown in the (b) entries, wherein $\neg$ takes wide scope. Thus, neither sentence satisfies Linebarger's ISC, since the **Cause** operator intervenes between $\neg$ and the various NPIs. That means that we must turn to the NI-theory. However, it is not clear that there are any suitable NIs available for the two examples above. For instance, (86a) in no way implies that 'he would not ever budge an inch.' Indeed, this brings up the tricky problem of deciding whether the *apparent* lack of relevant implicata means that none exists or simply that the right candidates have not yet come to mind. In the case of (86), however, we may profitably make a comparison with (81). In the latter example the negative operator does appear unambiguously to take narrow scope. Consequently, we may ask why it is that, assuming Linebarger's NI-theory, there is apparently some appropriate NI to license the reading in (86b), but none to save that in (82a). Although Linebarger's approach forces us to assume such a distinction, there seems to be little motivation for it. We feel that observations such as these seriously call into question the adequacy of Linebarger's analysis.

The second problem is more foundational. It afflicted Baker's (1970) analysis, and Linebarger has not managed to eradicate it. The problem becomes visible when we examine Linebarger's approach from the perspective of proof theory, which provides the principles for actually deriving entailments, one source of suitable NIs. In this manner, we focus our thoughts on the breadth of entailments that are possible, and we discover thereby that only a fraction of all derivable NIs actually license NPIs. This casts NI-theory in quite a strange light, since it appears that the availability of NIs corresponds at best only sporadically to the felicity of NPIs.

Below we offer a list of basic entailments drawn from first order logic—we assume that these will carry over into whatever logical idiom Linebarger realizes in her level of LF.

(88) a. $\varphi \vdash \neg\neg\varphi$

b. $\varphi \vdash \varphi \vee \neg\varphi$

c. $\varphi \wedge \psi \vdash \neg[\neg\varphi \vee \neg\psi]$

d. $\varphi \wedge \psi \vdash \neg[\varphi \rightarrow \neg\psi],\ \neg[\psi \rightarrow \neg\varphi]$

e. $\varphi \vee \psi \vdash \neg[\neg\varphi \wedge \neg\psi]$

f. $\varphi \vee \psi \vdash \neg\varphi \rightarrow \psi,\ \neg\psi \rightarrow \varphi$

g. $\varphi \rightarrow \psi \vdash \neg\varphi \vee \psi$

h. $\varphi \rightarrow \psi \vdash \neg[\varphi \wedge \neg\psi]$

i. $\varphi \rightarrow \psi \vdash \neg\psi \rightarrow \neg\varphi$

j. $\forall x[\varphi \rightarrow \psi] \vdash \neg\exists x[\varphi \wedge \neg\psi]$

k. $\exists x[\varphi \wedge \psi] \vdash \neg\forall x[\varphi \rightarrow \neg\psi],\ \neg\forall x[\psi \rightarrow \neg\varphi]$

This is merely a collection of a few of the best known and most obvious entailments, put together simply by puzzling over an introductory logic text for a few minutes. The common characteristic is obviously that each entailment introduces one or more negations to the resultant implicatum. Many more such entailments could be concocted. However, although we have a wealth of NIs represented in the above list, surprisingly few correspond to actual contexts where NPIs are allowed.

Consider first (88a). It suggests that NIs are available for *any* clause, no matter what its form and no matter what sort of embedding structure it occurs in. The subsequent entailment (88b) would suggest that NI's are available for any matrix clause.[5] If such NIs as these count for licensing NPIs, even such monstrosities as (89a–d) will be counterfactually predicted to be acceptable.

(89) a. *John has *ever* had *any* money.

b. *If John can, he will bring *any* money.

[5]Since (88b) is not an equivalence, we must guard against making generalizations about NIs it might produce in embedded structures. Note, for instance, $\neg\varphi \not\models \neg[\varphi \vee \neg\varphi]$.

c. *Some people have *any* money.

d. *All people have *any* money.

Even if one somehow rules out (88a) and (88b) as unusable entailments, there are more pitfalls in the remainder of the list. The entailments in (88c–f) suggest that conjunctions and disjunctions should suffice to license NPIs. This is of course incorrect.

(90) *John has *any* money and he likes to buy things.

(91) *Either John has *any* money or Bill does.

The entailments involving conditionals in (88h) and (88i) lead to the false conclusion that NPIs ought to be licensed in the consequent clauses of *if*-constructions—recall (89b). Of course, (88g) and (88i) do predict that NPIs may occur in the antecedent clauses of *if*-constructions, a correct result. Finally, we come to the entailments involving quantifiers in (88j) and (88k). A little reflection on the usual translations for sentences with *all* and *some* will reveal that these entailments lead to at least three erroneous predictions, as exemplified below:

(92) *All people have *ever* been to Japan.

(93) *Some people have *ever* been to Japan.

(94) *Some people who have *ever* been to Japan liked it.

In sum, (88g) makes correct predictions, (88i) leads to both correct and incorrect conclusions, and all of the remaining entailments in (88) yield only erroneous results, as far as we have been able to determine. We therefore think it not at all mean-spirited to call the rate of success exhibited here disappointing. Obviously, for Linebarger's approach to be viable, some way must be found to constrain rather severely the set of entailments usable in the application of her NI-theory.

The above problem has not gone unnoticed by Linebarger, although she gives little sign of being aware of its extent. She discusses such cases as the following:

(95) 'Double Negative' Entailments which do not Serve as NIs

$\varphi \vdash \neg\neg\varphi$

$\varphi \vee \psi \vdash \neg[\neg\varphi \wedge \neg\psi]$

$\varphi \wedge \psi \vdash \neg[\neg\varphi \vee \neg\psi]$ (1987:347)

(Logical notation has been altered for consistency.)

Having failed in her attempt at finding a principled way to reject these items from the pool of implications and entailments usable for determining NIs, Linebarger says, "Since I do not have a satisfactory account of this, I prefer to exclude these cases by pure stipulation at this point: the entailments specified in [(95)] may not serve as NIs" (1987:348). This is at best an ad hoc solution, if, indeed, it can be called a solution at all.

In (95) Linebarger attempts to stipulate the set of unusable NIs by a finite roster or list. Indeed, it is not only finite but *small*: it would at the very least have to be expanded to include all the entailments in (88) except for (88g). However, even that is insufficient, since the set of unusable NIs is clearly infinite. Notice, for example, that φ entails an infinite sequence of problematic NIs: $\neg\neg\varphi$, $\neg\neg\neg\neg\varphi$, $\neg\neg\neg\neg\neg\neg\varphi$, etc. Consequently, making a finite roster of logical entailments not to be employed in deriving NIs is demonstrably insufficient for constraining the application of Linebarger's NI-theory. Hence, if Linebarger's approach is to be saved, one must seek some more abstract characterization of non-NPI-licensing NIs that relies on a general principle.

One possible approach is to isolate unusable NIs by identifying problematic structural patterns. For instance, interpreting generously Linebarger's apparent intention in grouping the entailments in (95) under the title of 'double negations,' we may say that the set of affected entailments would probably be those that produce implicata where two new negations have been introduced, one inside of the scope of the other. Let us consider the effect of filtering out all NIs that meet this specification from the set of NIs usable for licensing NPIs. Even though we propose to reject even more entailments than Linebarger literally instructs us to in (95), we still have not managed to remove all of the offending items from (88). More precisely, (a), (c), (d), (e), (h), (j), and (k) drop out of

(88). Recall, however, that the only wholely unproblematic entailment was (88g). Furthermore, a little reflection will reveal that we have not managed to bring about much improvement in empirical predictions; for example, (88b) is still available to license NPIs in any matrix clause.

Of course, the fact that the above attempt at constructing a pattern-based filter on NIs ended in failure doesn't force us to conclude that the pattern-based approach is irretrievably inadequate. Indeed, it would probably be impossible to prove once and for all that no implementation of the approach could be made to work. However, we do feel that certain observations leave the feasibility of finding an adequate pattern-based filter very much in doubt. In discussions of Linebarger's work, and of Baker's (1970) before that, when the topic of NIs that don't license appropriate NPI usages arises, the debate usually centers around a few entailments that have come to be well known in the study of logic for their utility in performing inference. However, the limited range of such discussions must not be allowed to foster the impression that there is only a small, comfortably tractable set of entailments that need to be dealt with. In fact, we have already seen that there are an infinity of entailments to consider, and some of these are so unusual from the perspective of the customary practices of logical inference as to be not immediately apparent. Consider in this regard $\varphi \vdash \neg\varphi \rightarrow \varphi$, for instance. This entailment is even more pernicious for the purpose of Linebarger's NI-theory than was (88b); it licenses NPIs in any clause,[6] and the prohibition against double negatives is powerless to exclude it, even in the more liberal form presented in the previous paragraph. One should attempt to imagine an infinite set of possible entailments strewn with undesirable NIs like $\varphi \vdash \neg\varphi \rightarrow \varphi$, $\varphi \vdash [\psi \rightarrow \neg\varphi] \rightarrow \neg\psi$, $\varphi \wedge \psi \vdash \neg\varphi \vee \psi$, etc., which would not even come to mind unless one steps out of the realm of traditionally discussed tautological implications. Then one can appreciate just how difficult a task it is to constrain the NI-theory in a manner that will allow it to achieve empirical adequacy. Viewed in this way, the task of finding some general pattern that characterizes the infinite and seemingly quite diverse set of undesirable NIs comes to seem quite unreasonable, in our opinion.

Having argued against the feasibility of implementing a workable filtering approach that would segregate NIs not usable for licensing NPIs on the basis of structural patterns, we should consider whether or not other sorts of criteria might restrict the set of NIs in the appropriate way. Indeed, one might look to the strengthening condition from (78) for such a principled restriction. However, a little reflection reveals that this is not a very profitable course to pursue. Many of the problematic entailments in (88) are not merely tautological implications but tautological equivalences. In other words, the following reversals of implicans and implicatum yield logical entailments:

(96) a. $\neg\neg\varphi \vdash \varphi$ [cf. (88a)]

b. $\neg[\neg\varphi \vee \neg\psi] \vdash \varphi \wedge \psi$ [cf. (88c)]

c. $\neg[\varphi \rightarrow \neg\psi] \vdash \varphi \wedge \psi$ [cf. (88d)]

d. $\neg[\psi \rightarrow \neg\varphi] \vdash \varphi \wedge \psi$ [cf. (88d)]

e. $\neg[\neg\varphi \wedge \neg\psi] \vdash \varphi \vee \psi$ [cf. (88e)]

f. $\neg\varphi \rightarrow \psi \vdash \varphi \vee \psi$ [cf. (88f)]

g. $\neg\psi \rightarrow \varphi \vdash \varphi \vee \psi$ [cf. (88f)]

h. $\neg\varphi \vee \psi \vdash \varphi \rightarrow \psi$ [cf. (88g)]

i. $\neg[\varphi \wedge \neg\psi] \vdash \varphi \rightarrow \psi$ [cf. (88h)]

j. $\neg\psi \rightarrow \neg\varphi \vdash \varphi \rightarrow \psi$ [cf. (88i)]

k. $\neg\exists x[\varphi \wedge \neg\psi] \vdash \forall x[\varphi \rightarrow \psi]$ [cf. (88j)]

l. $\neg\forall x[\varphi \rightarrow \neg\psi] \vdash \exists x[\varphi \wedge \psi],\ \exists x[\psi \wedge \varphi]$ [cf. (88k)]

The NIs derived by most of the entailments in (88) actually would logically entail the sentences for which they are NIs. Surely, entailment ought to satisfy the strengthening condition. Hence, this condition doesn't seem to be a reasonable place to look for the required filter to rule out unwanted NIs.

Finally, there is another concept discussed in Linebarger's work which one might look to for help in the NI filtering problem, but which ultimately seems rather unattractive. This is what

[6] Note that φ and $\neg\varphi \rightarrow \varphi$ are, in fact, equivalent.

Linebarger calls HIGHLIGHTING. This term appears to refer to the phenomenon of being 'on the speaker's mind' at a given time. For instance, Linebarger claims that in uttering (97) and (98) the speaker highlights entailment (88g), i.e., $\varphi \rightarrow \psi \vdash \neg\varphi \vee \psi$.

(97) If you contribute *a red cent* to those crackpots, I'll never speak to you again.

(98) If you drink *any* water, you'll get dysentery.

This is supposedly because (97) and (98) are threats, which, in turn, are sometimes expressible with disjunctions that resemble the implicatum of (88g), e.g., 'either you don't contribute *a red cent* to those crackpots or I never speak to you again' (Linebarger 1987:379–380, emphasis mine). However, the particular disjunctive paraphrase that Linebarger chose to illustrate her claim is perceived as rather awkward by native speakers, so one might be justifiably reluctant to assume that it is highlighted or 'on the speaker's mind' when (97) is used. Moreover, Linebarger's comments about highlighting with non-threat *if*-sentences is even more suspect. Consider (99).

(99) If he *gives a damn* about his cat, he'll take it to the vet. (Linebarger 1987:380)

In this case, Linebarger asserts that the law of contraposition (88i), i.e., $\varphi \rightarrow \psi \vdash \neg\psi \rightarrow \neg\varphi$, is highlighted and that the speaker should consequently contemplate the NI 'if he doesn't take his cat to the vet, then he doesn't *give a damn* about it' (Linebarger 1987:380, emphasis mine). This state of affairs supposedly licenses the use of *give a damn* in (99). However, according to the definition of the NI-theory, the availability of an NI based on the law of contraposition should also license NPIs in the consequent clause, since the consequent of (99) would also be negated in the NI. As a concrete example, consider (100).

(100) *If he *gives a damn* about his cat, he'll *ever* take it to the vet.

The law of contraposition would provide (100) with the NI 'if he doesn't *ever* take his cat to the vet, then he doesn't *give a damn* about it.' Surprisingly, Linebarger makes no mention of this problem, although it stands as a serious counterexample to her approach. Since Linebarger claims that highlighting may place focus on the law of contraposition, it is mysterious indeed that the resultant NI licenses NPIs only in the antecedent clause and not in the consequent. In sum, there is little reason to hope that the not altogether coherent notion of highlighting can provide a basis for an explanation of how the total set of derivable NIs may be paired down so as to contain only those that would license felicitous NPI occurrences.

In sum, Linebarger's theory presents a rather strange picture. The leading idea of her research is that the distribution of NPIs is predictable on the basis of the availability of NIs, yet, if one stops to examine what sorts of NIs are in fact available, it becomes apparent that the set of possible NIs must be radically restricted in order to achieve anything approaching empirical adequacy. In such a case we feel compelled to conclude that Linebarger has simply chosen the wrong path to follow.

Despite the above objections we would not be doing justice to Linebarger's research if we did not acknowledge that she has managed to predict a significant body of correct results. Even if we reject her approach, it is incumbent upon us to consider what insight allowed Linebarger to pursue her course of study as far as she did. The crux of her claim is that NPI-bearing clauses may be related to sentences with overt negation. The basic intuition is then that NPI licensing is linked to negation. We would agree with her in this, although we maintain—and shall argue below—that the relationship is somewhat less direct than Linebarger supposes. We shall attempt to show that felicitous use of NPIs is connected to a certain characteristic state of the cognitive processing system which is intimately associated with negation and which we have elected to call the COGNITIVE STRUCTURE OF NEGATION. Though the details will be spelled out later, let us say for now that this is a cognitive state in which one finds oneself when processing a sentence which contradicts prior assumptions held in one's knowledge base. In other words, this is precisely the state that Givón (1978) predicts must obtain in order for negation to be used felicitously. If one accepts this line of thought and the motivation for it to be described below, then it will come as little surprise that Linebarger's analysis succeeded to the extent that it did. By relating NPIs to negated sentences, she hit upon an indirect way of getting at the mental state of maintaining contrastive prior assumptions, and we claim that this mental state is crucial in licensing both negation and the use of NPIs. The remainder of the paper will be devoted to an exposition of

the pragmatic constraint on NPIs that we propose to be used in conjunction with some eventually modified version of Ladusaw's DE-theory. We begin with a description of background assumptions about the cognitive processing system which are drawn from relevance theory, as set down by Sperber and Wilson (1986).

5 Theoretical Background

This section outlines RELEVANCE THEORY, as developed by Sperber and Wilson (1986), on which our proposal is based. This section also presents an elaboration of relevance theory due to Blakemore (1987), who provides a conceptual distinction which is significant for our analysis.

5.1 The Essence of Relevance Theory

Relevance theory could be viewed as a synthesis of two competing models of communication. One general theory of communication is the CODE MODEL, in which communication is achieved by encoding and decoding messages. Another is the INFERENCE MODEL, proposed by Grice (1975), in which communication involves the production and interpretation of evidence. Sperber and Wilson (1986) claim that verbal communication contains both systems, and they propose RELEVANCE THEORY as a modified inference theory.

As Sperber and Wilson claim, hearers process utterances to achieve optimal relevance. In communication, the intention of speakers is to modify the COGNITIVE ENVIRONMENT of hearers, i.e., their representation of the world. The cognitive environment consists of a set of logical forms representing ASSUMPTIONS, each of which is associated with a confidence rating. By assumptions, Sperber and Wilson mean THOUGHTS treated by the individual as representations of the actual world (as opposed to fictions, desires, or representations of representations). By thoughts, they refer to conceptual representations (as opposed to sensory representations or emotional states). Modifications of the cognitive environment in the form of deletions or additions of logical forms or alterations of confidence ratings are called CONTEXTUAL EFFECTS and result from the interaction of old and new information. This interaction is mediated by the CENTRAL SYSTEM, comparable to the processor of a computer. The central system's job is to compare new logical forms delivered to it from the aural, visual, tactile, and other input systems with the logical forms already contained in the cognitive environment. The goal is to fill the cognitive environment with logical forms representing the most trustworthy assumptions available, while maintaining consistency, in the sense of preventing the cognitive environment from ever containing two logical forms that contradict each other.

RELEVANCE is a function of contextual effects and the PROCESSING EFFORT which is needed to produce them. Other things being equal, the more contextual effects the information has, the more relevant it is; and the more processing effort it requires, the less relevant it becomes.

An assumption may be more or less accessible or prone to figure in the computations of the central system, depending on a variety of factors. For instance, assumptions recently entered into the cognitive environment are more accessible than those inserted long before. Assumptions which have often been processed are more accessible than those rarely processed.

Sperber and Wilson argue that there are three ways to modify cognitive environments.

1. CONTEXTUAL IMPLICATION

   The first way to modify the hearer's cognitive environment is to add to it consequents of inferences whose premises are combinations of new and old information (or assumptions). Suppose that you already have the assumption (101a) in mind, when you discover (101b). You will then modify your cognitive environment by adding the CONTEXTUAL IMPLICATION (101c) to it.

   (101) a. If Bill came, the party was a success. — OLD INFORMATION
   b. Bill came. — NEW INFORMATION
   ---
   c. The party was a success. — CONTEXTUAL IMPLICATION

2. STRENGTHENING

   Assumptions about the world may vary in strength; one may have more or less evidence for, or more or less confidence in, an existing assumption. New information may affect

an assumption's strength. The second way to modify cognitive environments is to provide further evidence or confirmation for existing assumptions. For instance, you wake up, hearing a pattering on the roof and make the following supposition:

(102) It's raining.

You open your eyes, look out of the window, and see the following sensory input:

(103) It's raining.

Here, the new visual information (103) strengthens existing assumption (102). New information is relevant in any context in which it strengthens an existing assumption.

3. CONTRADICTION LEADING TO THE ABANDONMENT OF EXISTING ASSUMPTIONS

When new and old assumptions contradict each other, theoretically the weaker of the two is abandoned.[7] If the weaker assumption is the older one, its abandonment results in a modification of the cognitive environment. For instance, seeing *A* take some Russian books out of the library, you form the following assumption:

(104) *A* knows Russian.

Several days later at a party, you hear *A* say "I wish I knew Russian," and you come to the following realization:

(105) *A* does not know Russian.

Here, the new assumption (105), being derived from *A*'s own words, is stronger than and supplants the previous, contradictory assumption (104), and modifies your context.

These cases illustrate the three ways in which new information can interact with, and be relevant in, a context of existing assumptions: by combining with the context to yield contextual implications, by strengthening existing assumptions, and by contradicting and eliminating existing assumptions. Sperber and Wilson group these three types of interactions together and call them contextual effects. New information is relevant in any context in which it has contextual effects, and the greater its contextual effects, the more relevant it will be.[8]

Sperber and Wilson assume that a stimulus (e.g., an utterance) is assigned a logical form, which is regarded as a structured string of CONCEPTS in the input system of our mind. In the central system the stimulus goes through computations so as to optimize its relevance. An individual

[7] As we have already noted, the degree of strength (or relevance) is also affected by both contextual effects and processing effort.

[8] This comparative definition of relevance is inadequate in one respect, as may have been noticed, because it doesn't take processing effort into consideration. Observe the following example. You wake up, thinking the following:

(i) If it rains, I'll stay at home.

Then you look out of the window and make one of the following two observations:

(ii) It's raining.

(iii) It's raining and there's grass on the lawn.

Intuitively, (ii) would be more relevant to you than (iii) in the context (i). Yet (ii) and (iii) have exactly the same contextual effects in this context: they both have the contextual implication (iv), and no other contextual effect at all.

(iv) I'll stay at home.

If comparisons of relevance are based solely on contextual effects, then the difference in relevance between (ii) and (iii) is inexplicable. Example (iii) will require all the effort needed to process (ii), and more besides. This extra processing effort detracts from the relevance of the information in (iii). So we need two comparative definitions of relevance, as follows:

(v) Relevance:

a. Other things being equal, the greater the contextual effects, the greater the relevance.

b. Other things being equal, the smaller the processing effort, the greater the relevance.

(Wilson and Sperber 1991:588)

possessing finite processing resources and aiming to optimize relevance, should pay attention to the phenomena which, when represented in the best possible way and processed in the best possible context, seem likely to yield the greatest possible contextual effects in return for the available processing effort. Relevance, and the aim of optimizing relevance, is, according to Sperber and Wilson, the key to cognition.

5.2 Conceptual Theory and Procedural Theory

Using relevance theory, Blakemore (1987) argues that the existence of expressions like *after all* and *you see* suggests a non-unitary theory of linguistic semantics, because the expressions don't represent concepts—i.e., they don't contribute to the truth-conditional meaning.[9] On the one hand, there is the essentially CONCEPTUAL THEORY that deals with the way in which elements of linguistic structure map onto traditional truth-conditional meanings; on the other, there is the PROCEDURAL THEORY that deals with the way in which elements of linguistic structure constrain the computations that determine utterance interpretation. The former theory deals with the mental representation of information, while the latter is concerned with the mental processing of information.

The conceptual/procedural dichotomy can be readily appreciated through an examination of the distinction between *and* and *but*. It is a commonplace of formal logic studies to note that the two English words map onto the same logical connective. For example, *he is poor but he is honest* has the same truth conditions as *he is poor and he is honest*. Blakemore would attribute this similarity to a shared conceptual semantic meaning. However, there is a well-known difference between *and* and *but*.[10] Blakemore would analyze it as arising from an additional procedural semantic component in the meaning of *but*: "the hearer is instructed to process the proposition *but* introduces in a context in which she can derive a proposition logically inconsistent with one assumed to have been derived from the proposition expressed by the utterance of the first clause" (Blakemore 1987:130). For example:

(106) [*A* and *B* are discussing the economic situation and decide that they should consult a specialist in economics.]

A: John is not an economist. (→ 'We shouldn't consult him.')

B: But he is a businessman. (→ 'We should consult him.')

Since the implication of *B*'s utterance contradicts that of *A*'s utterance, it is proper to introduce *B*'s utterance with a warning that it is to be processed as an alternative viewpoint, whence the appropriateness of *but*.

Our claim is that NPIs like *ever* and *any* resemble *but* in that they have not only conceptual but procedural meanings: specifically they require the utterance containing them to be processed in what we shall call the COGNITIVE STRUCTURE OF NEGATION (alternatively CSN). This expression designates a mental state in which a proposition is juxtaposed with contradictory assumptions. In other words, the cognitive structure of negation is essentially the same cognitive context to which we alluded in the foregoing discussion of *but*. This claim will be explained and motivated in the subsequent sections.

6 Toward a Further Constraint on NPIs

In this section we shall examine the semantics of a representative NPI, *ever*, and to a lesser extent *any*, to isolate any characteristic that might clarify the problem of constraining NPI use. We will limit this examination to a single NPI trigger, *before*. As stated in the previous section, we follow Blakemore (1987) in assuming that there are two components of semantics: one conceptual, dealing with traditional truth functional issues, and the other procedural, taking up the problem of how propositions are processed in context. Ultimately we shall propose that the further constraint on NPI pertains to procedural semantics. However, we shall proceed by examining both semantic components. But first we will examine Linebarger's treatment of NPIs in *before*-clauses.

[9] Expressions like *so*, *after all*, and *you see* are dealt with and given explicit stipulations in the procedural theory. See Blakemore (1987, 1988, 1989) for their exact analyses.

[10] Reichenbach (1947:329) claims that "*but* means *and* with the indication 'the following statement seems to contradict the preceding one without doing so.'"

6.1 Linebarger's Treatment of NPIs in 'Before'-Clauses

In the section devoted to a description and evaluation of Linebarger's NI-theory, we concentrated on the open-endedness of the set of entailments and the way in which this situation led to innumerable false positive predictions about the distribution of NPIs. In contrast to that discussion, the investigation of the behavior of *ever* in *before*-clauses provides an interesting opportunity to consider how well Linebarger's theory handles NIs that arise from conversational implicatures. We shall suggest that there are cases when no obvious conventionally implicated NIs are available to license NPIs that are in fact acceptable.

Let us begin by considering the sentence in (6) from Linebarger's point of view.

(107) Billy the Kid shot him before he *ever* got his hand on his gun. [=(6a)]

There is no overt negation in (107), so Linebarger would naturally resort to the NI-theory in order to license the instance of *ever* in the *before*-clause. One must then ask what sort of NI is implied by (107) that could serve as an NPI-licenser. Of course, it was already shown above that various logical entailments could provide an NI, but since most of the applicable entailments wildly over-license NPIs, they should be excluded from consideration—if, indeed, any principled means of doing this can be found. One could also consider entailments drawn from the field of tense logic as possible sources of NIs, since (107) contains the expression *before*. However, this can be ruled out as a viable course to follow by recalling that not all *before*-clauses license NPIs.[11]

(108) *He brushed his teeth before he *ever* went to bed. [cf. (Higashimori 1986:107)]

If the presence of *before* triggered any tense-logical entailments that produced valid NIs, we would expect them to operate in all cases where *before* occurs. Hence, we shall assume that tense logic is not the place to look for an answer to our problem. Let us, then, turn to conventional implicature.

As a start, let us consider what Linebarger herself has to say about conventional implicatures available for *before*-constructions. She gives the following example and explanation:

(109) We had to kick the mule hard before it *budged an inch.* (Linebarger 1987:379, emphasis mine)

She claims (1987:378) that (109) "sounds acceptable because it may be used naturally to convey that 'the mule didn't budge an inch until we kicked it; it took our kicking to get it moving.' That is, a possible account of NPI licensing in this context is that the NI of 'φ *before* ψ' is '$\neg\psi$ *unless* φ,' given the overtones of causality" (Logical notation is modified for consistency).

However attractive it may seem for (109), Linebarger's explanation above does not apply to the example in (107):

(110) a. Billy the Kid shot him before he *ever* got his hand on his gun. $\not\rightarrow$

b. He *never* got his hand on his gun unless Billy the Kid shot him.

(110a) does not imply (110b). Hence, '$\neg\psi$ *unless* φ' is surely not the NPI-licensing NI in this case. However, we cannot say that this constitutes a counterexample to Linebarger's theory either, because she does not assert that '$\neg\psi$ *unless* φ' is the only NI which licenses NPIs in *before*-clauses. What she claims is that a sentence with an NPI must have some uncancelable NI including that NPI: thus, (110a) is presumed to have some other uncancelable NI that includes *ever*.

Then, what is the available NI which licenses *ever* in this case? One possible source of insight might be found in examples like (111), where the basic structure is φ *before* ψ and the situation described in the matrix clause φ precludes any possibility that the event depicted in the *before*-clause ψ ever took place.

(111) a. He died before he (*ever*) wrote a will.

b. He *never* wrote a will.

Example (111a) explicitly implicates (111b), which is uncancelable. So we may regard '$\neg\psi$' as a candidate NI for (111a). Indeed, it seems to be true that *ever* often appears in *before*-clauses with the possibility of a counterfactual reading.[12]

Pursuing this line of reasoning, one might propose that the difference in acceptability between (112) and (113) correlates with the availability of the negation of the *before*-clause, as an NI.

[11] Example (108) is judged unacceptable on a context-free reading: we shall return to this datum later on.

[12] Linebarger claims that the presence of an NPI makes obligatory what is normally a cancelable implicature.

(112) a. Billy the Kid shot him before he *ever* got his hand on his gun. →

b. He *never* got his hand on his gun.

(113) a. *He brushed his teeth before he *ever* went to bed. ↛

b. He *never* went to bed.

According to Linebarger's NI-theory, it might be possible to claim that (112a) is acceptable on the assumption that the situation in the *before*-clause did not actually happen and conversely that (113a) is not acceptable since the event depicted in the *before*-clause did actually occur. As a matter of fact, we are likely to infer that if Billy shot 'him' before 'he' got his hand on his gun, it would be impossible for 'him' to get his hand on his gun.

While it may have seemed that a solution to the problem posed with regard to (107) had been found, (114) shows that the above explanation is not correct.

(114) The dying man limply squeezed off one ineffectual shot before he expired: **Billy had shot and mortally wounded him before he *ever* got his hand on his gun.**

Given the enriched context of (114), it is clear that 'he' did get his hand on his gun, which means that (112b) is not an uncancelable NI of (112a) [=(107)]. Thus, we have seen that neither $\neg\psi$ *unless* φ nor $\neg\psi$ is an NI pattern capable of explaining the acceptability of the NPI *ever* in the *before*-clause in (107).

In order to support Linebarger's theory, we must find some uncancelable NI including $\neg\psi$. The only candidate NI that we can suggest is *At the time when* φ, *not (yet)* ψ because it is explicitly conveyed by φ *before* ψ.[13] But this will not work, either. Let us consider (107), for example, which is repeated for convenience.

(115) a. Billy the Kid shot him before he *ever* got his hand on his gun.

b. ↛At the time when Billy the Kid shot him, he had *never* got his hand on his gun.

c. →At the time when Billy the Kid shot him, he had not yet got his hand on his gun.

Recall that the NPI-licensing NI must include the NPI from the original sentence. Now (115b) does contain the NPI *ever*, but it will not do as an NI, because it isn't implied by (115a); (115b) has only the experience reading, not the order-of-event reading. In contrast, while (115c) is indeed implied by (115a), it does not contain *ever*, and so does not count as an NPI-licensing NI.

Thus, we have examined one pattern of conventional implicature discussed by Linebarger along with two of our own, and we still have not found a usable NI to license *ever* in (112a). This hardly constitutes a proof that no suitable NI exists, but if one does, it is certainly not obvious to us. We are therefore inclined to conclude at least tentatively that Linebarger's NI-theory is unable to predict the acceptability of (112a).[14]

The same points brought out in our discussion of (112a) may be made with regard to the φ *before* ψ sentences at the end of (116a) and in (117a).

(i) I didn't help him because I sympathize with urban guerillas.

(ii) Although I do sympathize with urban guerillas, that wasn't the reason I helped him. I helped him because he's my brother.

(iii) *I didn't help him because I have *any* sympathy for urban guerillas, although I do sympathize with urban guerillas. (1987:343–344)

She says that (i), with no NPI in the *because*-clause, can be followed by (ii). Linebarger claims on the basis of this fact that the implicature of 'my not sympathizing with urban guerillas' is cancelable. In contrast, she says (1987:363) with reference to (iii) that "the presence of an NPI in the embedded proposition seems actually to compel this implicature."

[13]Such an implication is suggested by Quirk et al. (1985:1082), who provide the following comment about NPIs in *before*-clauses: "Nonassertive items [NPIs here] can appear in *before*-clauses, perhaps because *before*-clauses, like conditional clauses..., inherently relate to matters unfulfilled in respect of the matrix clause:

I spoke to them *before I ever heard any gossip about them.*
['At the time I spoke to them I had not heard any gossip about them']"

[14]This statement is made on the (in our opinion, counterfactual) assumption that Linebarger can rule out all of the problematic entailments that produce excessive numbers of NIs, as pointed out in the foreging critique of NI-theory. Although such entailments would come in handy for the present problem, maintaining them would prove generally destructive to the theory.

(116) a. Suspect: I met her and decided to accompany her here.
Detective: According to the station master, you had already purchased a ticket the day before! So I submit that **you were coming here before you** *ever* **met her**.

b. $\not\rightarrow$You *never* met her.

c. $\not\rightarrow$You *never* met her unless you were coming here.

d. $\not\rightarrow$At the time when you were coming here, you had *never* met her (*yet).

(117) a. I lost my ticket before I *ever* got to the station.

b. *I lost my ticket before I *ever* got to the station; in fact I didn't get to the station.

c. $\not\rightarrow$I *never* got to the station until I lost my ticket.

d. $\not\rightarrow$At the time when you lost your ticket you had never got to the train station.

Usages such as these (a) examples emphasize the order in which the respective events described by the matrix and *before*-clauses occurred. For instance, the detective in (116a) is contradicting the testimony of the suspect, asserting that the latter reversed the order of the relevant events. Furthermore, (117a) sounds like an utterance that might come up when one attempts to retrace one's steps, situating the loss of the ticket in a sequence of events, in order to pair down the set of locations in which to search for it. In both cases, the events described by the *before*-clauses definitely took place, so if ψ is the *before*-clause, $\neg\psi$ is not available as an NI, as indicated in (116b) and (117b). Furthermore, sentences of the $\neg\varphi$ *unless* φ pattern are not implied either, as in the (c) examples. Finally, the (a) sentences do not imply the *at the time when* φ *not yet* ψ pattern, as shown in the (d) examples, so we are left wondering what possible NI there could be to license the NPI *ever* in these cases.

Consequently, we cannot help wondering if there is really any NI which licenses *ever* in such *before*-clauses. If not, it follows that Linebarger's theory cannot explain this occurrence of *ever* in a *before*-clause. In other words, the NPI is not licensed by a negative operator in the LF of some negative proposition conveyed explicitly by the host sentence. It seems that this problem is caused by ignoring the conceptual and procedural meanings of *ever*. In the next section, we shall go back to the foundation, consider the basic meaning of the word, and propose two conditions on NPIs.

6.2 Two Conditions on 'Ever' in 'Before'-Clauses

In this section we shall use data concerning the felicity of *ever* in *before*-clauses as a test case to explore constraints on NPIs. The approach will be expanded to other NPIs and triggers in later sections.

6.2.1 Scope of Downward-Entailing Expressions. As we have already observed in Section 1.2.3, *ever* appears in the scope of *before*, but not outside of its scope. To capture this fact, we will tentatively adopt Ladusaw's DE analysis.

Recall that Ladusaw (1980) proposes the following necessary condition on the occurrence of NPIs, repeated here for convenience.

(118) The Downward-Entailment (DE) Condition on NPIs

A negative polarity item is acceptable only if it is interpreted in the scope of a downward-entailing expression. [=(29)]

It was argued above that, despite a handful of residual problematic data, the DE condition does an impressive job of constraining the distribution of NPIs. Recall, for example, the following subtle contrast, which the DE condition successfully handles:

(119) a. The mad general kept issuing orders long after there were soldiers to obey them. $\rightarrow$

b. The mad general kept issuing orders long after there were infantrymen to obey them.

c. The mad general kept issuing orders long after there was *anyone* to obey them.
(Linebarger 1987:371)

(120) a. She became ill long after eating a contaminated vegetable. $\not\rightarrow$

b. She became ill long after eating contaminated kale.

c. *She became ill long after eating *any* contaminated vegetables.

Since the criterion of downward-entailment does an excellent job of predicting which expressions can take NPIs in their scope, we shall adopt Ladusaw's DE-condition as the first of our two constraints on NPIs. However, Ladusaw proposes the DE requirement only as a partial, necessary condition on NPI acceptability. He cannot explain cases in which NPIs are unacceptable, even though they occur in the scope of a DE expression.

(121) *He brushed his teeth before he *ever* went to bed. [=(108)]

(122) *John was a respected businessman before he killed *any* homeless people.

(123) *If he *ever* takes *any* medicine, he will feel better.

This theory requires some further condition to filter the set of NPI usages which pass the DE condition down to the set actually allowable as English utterances. We turn to the formulation of this new condition in the next section.

6.2.2 THE NEED FOR A CONTRASTIVE ASSUMPTION. Next let us examine the semantics of the NPI *ever*. To do this, however, we will have to consider to factors, the conceptual and procedural meanings, in keeping with the proposals of Blakemore (1987).

6.2.2.1 CONCEPTUAL SEMANTICS: THE CASE OF 'EVER'. Though the point is rarely stressed, NPIs clearly each possess their own inherent conceptual semantic content. For the most part, they seem to contribute some form of quantification to the sentences in which they occur, though I shall not attempt a survey here. Instead, I will illustrate an example of the inherent conceptual semantic content of NPIs through a close examination of *ever*. Its semantic contribution consists of adding the frame of universal quantification over time to the proposition of the utterance that includes it.

Ever has a clear effect on temporal reference as the following examples demonstrate:

(124) If you *ever* come to Japan, visit me.

(125) Have you *ever* been to Japan?

First imagine (124) without *ever*: the offer of hospitality might be implicitly limited, e.g., 'in the near future.' In contrast, when *ever* is present, there can be no such implicit limit: it must be interpreted as referring to all times from now on. Similar observations hold for (125): without *ever*, the implicit frame of temporal reference might be 'within the last month,' but with *ever* it becomes unmistakably 'in your life.' Thus, *ever* appears to project the understood time frame of the discourse to a universal scale, and is unacceptable in the following examples which include elements which are incompatible with universal quantification over times:

(126) *If I *ever* fail this time, I would not try again.

(127) *If you *ever* touch me in a few minutes, I'll scream.

(126) and (127) are unacceptable, since *this time* in (126) and *in a few minutes* in (127) are incompatible with the conceptual semantics of *ever*.

The above observation shows that the conceptual contribution of *ever* is adding the frame of universal quantification to the proposition of the utterance that includes them. We will see the effect of the item in the scope of DE expressions in the next section.

6.2.2.2 PROCEDURAL SEMANTICS: THE NEED FOR A CONTRASTIVE ASSUMPTION. In this section we turn to the procedural theory of semantics. I shall argue that NPIs encode an instruction to the effect that the sentences that contain them must be processed in a context that has a contrastive assumption. We shall begin with observations about *ever* used in *before*-clauses. In the next section, we shall extend the discussion to *any*.

When we consider sentences including *ever*, one characteristic comes to dominate our attention: its pragmatic function.

(128) I lost my ticket before I (*ever*) got to the station. [=(117a)]

Sentences like (128) have the same truth conditions with or without *ever*. This fact suggests that *ever* in the scope of *before* fulfills some pragmatic function by adding the frame of universal quantification. We claim that it is to intensify order-of-event readings. Recall (116) repeated below and the following detective-story-like exchanges:

(129) Suspect: I met her and decided to accompany her here.

Detective: According to the station master, you had already purchased a ticket the day before! So I submit that **you were coming here before you *ever* met her.** [=(116)]

(130) Suspect: I was only acting under Lord Belthorpe's orders.

Detective: But you arrived with the murder weapon concealed in your coat, so **you must have intended to kill Smith before your employer *ever* gave you that order.**

(129) and (130), which are typical cases of *ever*, are sentences which intensify the temporal sequence of two events. The testimony of informants to the effect that utterances with *ever* are more appropriate than those without it, in contexts where one intends to intensify the temporal sequence of events, suggests that *ever* plays a role as an intensifier of the trigger *before*. As a matter of fact, φ *before* ψ without *ever* only indicates that φ happened before ψ, but φ *before* ψ where ψ includes *ever* makes one conscious of the contrastive situation φ *after* ψ (or ψ *before* φ). The *ever* form implies that 'it is not that φ happened after ψ, but rather that φ happened definitely before ψ.'

The inappropriateness of the following sentences can be explained by the assumption that *ever* in the scope of *before* selects a context that has the most relevant contrastive assumptions to intensify its trigger:

(131) *He brushed his teeth before he *ever* went to bed. [=(108)=(121)]

(132) *He was quite a playboy before he *ever* got married.

(133) *Jane took it down before she *ever* forgot it.

All of the above seem unsuitable, because the contrastive assumptions 'brushing one's teeth after going to bed,' 'becoming a playboy after getting married,' and 'taking it down after forgetting it' are usually hard to access because they run counter to normal experience.

We can test the accuracy of the above explanation, which attributes the anomaly of (131)–(133) to the inaccessibility of contrastive assumptions, by altering the surrounding discourse context. In so doing, we can establish the necessary contrastive assumptions in the discourse, and the utterances should come to seem acceptable.

Reconsider (131) inserted into the following discourse fragment:

(134) The accused's alibi depends on the preposterous claim that he brushed his teeth while in bed; however, the eye-witness testimony of the butler proves that **he brushed his teeth before he *ever* went to bed.**

The contrastive assumption 'brushing one's teeth after going to bed' has been introduced by brute force, and this is enough to render the use of *ever* in (131) natural. Indeed, (134) is deemed better with *ever* than without. Similar observations hold for the next discourse fragment:

(135) *A*: Isn't it funny that he became such a playboy only after getting married?!

B: You've got it all wrong: **he was quite a playboy before he *ever* got married.**

Once the unusual idea of becoming a playboy only after getting married is established in the discourse, (132) comes to be quite acceptable. As for (133), it is probably irreparable, due to the apparent practical impossibility of taking something down that one has forgotten and is therefore not conscious of. Despite this, it seems clear enough that manipulating the discourse to introduce contrastive assumptions can save otherwise illicit-seeming usages of *ever* from being perceived as anomalous. This is just as is expected on our analysis, and it therefore supports the supposition that the occurrence of *ever* is dependent on the availability of a contrastive assumption.

6.3 'ANY' IN 'BEFORE'-CLAUSES

It is well-known that the behavior of *any* is complicated: in some of its uses it is known as FREE-CHOICE *any*, and in others it is called POLARITY *any*.[15] There are several theoretical standpoints on the analysis of *any*, but researchers agree that polarity *any* does not appear in generic sentences. What we need here is a way to distinguish polarity *any* from free-choice *any*. Carlson (1981) proposes three tests for this purpose. We shall adopt one which takes advantage of the fact that free-choice *any* is modifiable with *nearly* and *almost*, but polarity *any* is not. Keeping this in mind, let us proceed to an analysis of polarity *any* in *before*-clauses. Quite the same analysis as the case of *ever* can be applied to the case of *any*, except for the replacement of the universal quantification over time for that over things or humans, which *any* modifies.

Our two conditions correctly predict the appropriateness of (136) and (137) as follows:

(136) John will put the money back before (*almost) *anyone* misses it. (NPI *any*)

(137) He went bankrupt before I could do (*almost) *anything* for him. (NPI *any*)

In both cases, *any* appears in the scope of the DE expression *before*, which satisfies the first condition. The two sentences also satisfy the second condition: the contrastive assumptions 'putting the money back after someone's missing it' in (136) and 'his going bankrupt after my effort to help him' in (137) are accessible. Thus, our conditions correctly predict the felicity of (136) and (137).

We can also show that the availability of a contrastive assumption is crucial for the felicity of *any*, using the same type of discourse manipulation test as was introduced above. The following sentence seems anomalous in isolation:

(138) *John was a respected businessman before he killed *any* homeless people. [=(122)]

Since murder generally brings disgrace upon the killer, it is difficult to imagine a contrastive assumption in which John gains the status of a respected businessman after killing homeless people. However, the following discourse fragment makes such an assumption readily accessible:

(139) *A*: Isn't it amazing that John could become a respected businessman after killing those homeless people?

B: You've got it all wrong: **John was a respected businessman before he killed (*almost) *any* homeless people.**

This demonstration suggests that *any*, like *ever*, requires that the proposition of the utterance that contains it be processed in a context that features a contrastive assumption. Though we shall not attempt a survey here, we propose as a working hypothesis that all NPIs are alike in this respect.

Thus, we may tentatively state our second condition on NPIs as follows:

(140) A negative polarity item is appropriate only if the proposition of the utterance containing it is processed in a context with a contrastive assumption.

Our next task is to provide this work with a theoretical foundation that will allow us to render (140) more precise.

7 THE COGNITIVE STRUCTURE OF NEGATION

In the present section, we will provide a theoretical foundation for the notion of a context with a contrastive assumption employed in the foregoing analysis of the procedural meanings of *ever* and *any*. This process will involve the synthesis of threads of research initiated by Givón (1978), Sperber and Wilson (1986), and Blakemore (1987). It will culminate in a definition of the notion to which I have already alluded under the name of cognitive structure of negation.

[15] The study of *any* has a long history. Some linguists have analyzed it as a universal quantifier (∀ theory); others as an existential quantifier (∃ theory). Recently some have argued that it is an inherently existential quantifier, but that some operators can change it into a universal quantifier (Homma 1990). The analysis of polarity *any* as an existential is gaining ground recently (Carlson 1980, Linebarger 1980). We do not side especially with any of these, for their analyses of *ever* are mostly reduced to that of *any*. We use the expression universal quantification to mean that propositions including *ever* or *any* must have the possibility of universal quantification, but this does not imply full acceptance of the ∀ theory of *any* (or *ever*). For researchers who observe pragmatic and cognitive aspects of natural languages, the value of the existence of *any* (and *ever*) seems to lie in the property of *random selection in a universally-quantified domain*. Therefore, *ever* and *any* are not allowed to appear in sentences which cannot have such a domain. Any semantic theory of *any* (and *ever*) without this notion is unsatisfactory.

7.1 Parallelism with Explicit Negative Utterances

The contrastive assumption required by *any* or *ever* in the scope of *before* is parallel to the one required by explicit negative sentences. Givón (1978) makes the following claim:

> [N]egatives are uttered in a context where corresponding affirmatives have already been discussed, or else where the speaker assumes the hearer's belief in—and thus familiarity with—the corresponding affirmative. (Givón 1978:109)

The accuracy of Givón's observation may be demonstrated with the following argument. Consider (141) and (142), which have literal and metaphorical readings paraphrased in the (a) and (b) entries respectively.

(141) John is a fox.

a. John is an canine fox. (False)

b. John is a cunning person. (True/False)

(142) John is not a fox.

a. John is not an canine fox. (True)

b. John is not a cunning person. (True/False)

The truth values listed opposite the (a) and (b) paraphrases above are relevant for the situation where the referent of *John* is known to be a human being. Briefly, world knowledge tells us that human beings are not canine foxes, so (141a) is certainly false, while (142a) is true. In contrast, human beings either may or may not be cunning, so the truth values of the (b) sentences above could go either way. What is significant here is the fact that, while (142) is definitely true on the literal reading, it is infelicitous from a pragmatic point of view. Givón's foregoing claim readily explains this state of affairs. For a negative proposition like (142a) to be appropriate, the affirmative in (141a) must have been previously stated or assumed. However, we can scarcely expect this requirement to be met, because of the blatant falsehood of (141a). In contrast, (142) is pragmatically felicitous on the metaphorical reading, because the corresponding affirmative, (141b), is plausible as a prior assumption.

In Givón's terminology, the pre-existing assumption of an affirmative constitutes a *ground* on which the corresponding negative may be superimposed as a *figure*. Givón's ground is obviously the same notion as was introduced in the section on the procedural semantics of *ever* and *any*, where it was noted that the propositions bearing these NPIs had to be processed in a context featuring a pre-existing contrastive assumption. While Givón's characterization appears to be touching upon exactly the elements that we need for our analysis, one could object that the terms 'figure' and 'ground' which he uses to express his ideas are little more than useful, intuitive metaphors. In order to establish this line of thought on a firmer theoretical foundation, we turn next to an attempt to define the above mental structure from the relevance theoretic point of view.

7.2 The Definition of the Cognitive Structure of Negation

In this section, I would like to show that the concerned figure/ground mental structure, which we shall call a cognitive structure of negation, is characterized as pursuing its relevance by contradiction which leads to the cancellation of existing assumptions in the context and that the word *but* plays a role as a marker of this negative cognitive construction.

In relevance theory, as we have seen in Section 6, the hearer processes the utterance to get the optimal relevance. Relevance is a function of contextual effect and processing effort. The more contextual effect the utterance gives, the more relevant it becomes. The more processing effort the utterance needs to be processed, the less relevant it becomes. The speaker's intention of communication is to modify the hearer's cognitive environment, that is, the whole representation of the world. This modification is called contextual effect, and is the modification and improvement of the hearer's context as a result of the interaction of new and old information.

New information can interact with, and be relevant in, a context of existing assumptions in three ways: *(a)* by combining with the context to yield contextual implications, *(b)* by strengthening existing assumptions, and *(c)* by contradicting and eliminating existing assumptions. The third, *(c)*, is the mental process which the negative cognitive construction has.

With this brief review in hand, let us attempt to situate Givón's figure and ground within relevance theory. The figure should probably be identified with the logical form being processed in the central system at any given time. The ground would correspondingly be the cognitive environment. Lewin (1942), writing on the cognitive theory of learning, describes knowledge acquisition as the passage from one COGNITIVE STRUCTURE to another. The emphasized term refers generally to the state of the human information processing and storage mechanisms. We shall borrow the term for the purposes of this study to describe the situation that obtains at any given time in the central system and cognitive environment. Formally, a cognitive structure would be a pair consisting of the logical form in the central system and the corresponding set of logical forms in the cognitive environment. The figure and ground discussed by Givón would then be a cognitive structure where the cognitive environment contains a logical form that leads to a contradiction when combined with that of a new assumption in the central system.

(143) THE COGNITIVE STRUCTURE OF NEGATION (CSN)

$\langle \varphi, \{\ldots \psi \ldots\} \rangle$ where the logical forms φ and ψ lead to a contradiction.

The cognitive structure schema displayed above is what we shall call the cognitive structure of negation (CSN). As for the informal terminology used in section 6, what we called the contrastive assumption corresponds to ψ or else some implicatum thereof.

For the case that Givón is discussing, φ in the schema above would be the logical form of a negated sentence, perhaps, though not necessarily, $\neg\psi$. However, we will now see that CSN is useful beyond the analysis of overt negation.

CSN is important for Blakemore's analysis of *but*. Recall example (106), elaborated below as

(144) [*A* and *B* are discussing the economic situation and decide that they should consult a specialist in economics.]

A: John is not an economist.

If John isn't an economist, then we shouldn't consult him (John).	PREMISE
John is not an economist.	PREMISE
We shouldn't consult John.	CONTEXTUAL IMPLICATION

B: But he is a businessman.

If John is a businessman, then we should consult him (John).	PREMISE
John is a businessman.	PREMISE
We should consult John.	CONTEXTUAL IMPLICATION

Let us assume that after *A*'s utterance the logical form corresponding to its contextual implication 'We shouldn't consult him' comes to be in the cognitive environment of both the speaker and hearer. Now consider *A*'s cognitive structure after *B*'s utterance.

(145) THE CHANGE IN *A*'S COGNITIVE STRUCTURE

$\langle$John is a businessman, $\{\ldots,$ We shouldn't consult John, $\ldots\}\rangle$

$\downarrow$

$\langle$We should consult John, $\{\ldots,$ We shouldn't consult John, $\ldots\}\rangle$

Given the contextual implications drawn from *B*'s utterance, we can see that the current contents of the central system, taken together with an entry in the cognitive environment leads to a contradiction, viz., 'we should consult John, and we should not consult John.' Thus, restating Blakemore's generalization in our own terms, *but* is acceptable only if the proposition it introduces is processed in CSN. Having established the connection between *but* and CSN, we may interpret the presence of this word as an indicator of CSN, and thereby construct semantic tests.

The notion of CSN is useful in implementing our second condition on NPIs, which was left in a tentative state. Recall examples (131) and (134), repeated below as (146) and (147).

(146) *He brushed his teeth before he *ever* went to bed. [=(108)=(121)=(131)]

(147) The accused's alibi depends on the preposterous claim that he brushed his teeth while in bed; however, the eye-witness testimony of the butler proves that **he brushed his teeth before he *ever* went to bed.** [=(134)]

In isolation, (146) seems infelicitous because the NPI *ever* is a signal that the clause containing it should be processed in CSN, but one is hard-pressed to imagine any obvious contradictory assumption that could be residing in the cognitive environment. However, this does not mean that none exists. In the extended context of (147), it is made clear that the improbable event of John's brushing his teeth in bed has been asserted as true and therefore inserted into the cognitive environment. Once it is established that the order of events implied by *He brushed his teeth before he ever went to bed* contradicts something in the cognitive environment, one easily comes to realize that the form is acceptable. Let us now restate our second condition in terms of CSN.

(148) THE COGNITIVE STRUCTURE OF NEGATION (CSN) CONDITION

A negative polarity item is acceptable only if the proposition of the utterance containing it is processed in the cognitive structure of negation.

Since *but* and NPIs are assumed to imply that the proposition in question is processed in CSN, we have an opportunity to check a prediction. If a proposition is not processed in CSN, then neither *but* nor NPIs should be acceptable. This is exactly what we find.

(149) John claimed to have finished up his washing before retiring for the night. (*But) He brushed his teeth before he (**ever*) went to bed.

(150) John claimed to have finished up his washing in bed. But he brushed his teeth before he *ever* went to bed.

In this section we have sought a concrete definition for our second condition on NPIs. We found a useful foundation in the notion of CSN and observed that this approach led to convergence with analyses of negation and *but*. We next expand our examination to NPI in the scope of *if*, to confirm our hypothesis.

7.3 APPLICATION TO 'IF'-CLAUSES

This section shows that the above conditions also correctly predict the appropriateness of NPIs in *if*-clauses. We will find that the connective *but* makes it easy for us to detect when a proposition is being processed in CSN.

Recall that it has already been shown in (40) that *if* is a DE expression. Thus we expect NPIs to occur in its scope. Furthermore, the CSN condition explains the following contrasts:

(151) a. *If he *ever* takes *any* medicine, he will get better. [=(123)]

b. We hope for his recovery. (**But*) **If he** (**ever*) **takes** (**any*) **medicine, he will get better.**

c. He is seriously ill and will die sooner or later. We eagerly await his death, because his fortune will then be ours. *But* **if he** *ever* **takes** *any* **medicine, he will get better.** We should prevent that at all costs.

(151a) is usually evaluated as inappropriate because it is hard to access to a contrastive assumption for it, as shown in (151b); we usually hope for someone's recovery when he is sick. However, (151c) shows that (151a) becomes completely appropriate when it is processed in a context where it can be introduced by *but*, that is, in CSN.

We can explain the following examples in the same way:

(152) a. If you *ever* come this way, be sure to visit me.

b. I hear you often come around here. (**But*) **If you** (**ever*) **come this way, be sure to visit me.**

c. Now that you have to move to a town far away, it may be hard for you to make it over this way. *But* **if you** *ever* **come this way, be sure to visit me.**

(152a) is appropriate when it is processed in CSN, in a context like (152c) where (152a) is introduced by *but*. However, it becomes infelicitous when processed in a context like (152b) where it cannot be introduced by *but*; its corresponding contrastive assumption is hardly accessible. Here also, the demand for CSN plays an important role in evaluating the felicity of NPIs.

In this section, we have provided a relevance-theoretic definition of the notion of a context with a contrastive assumption, a state-of-affairs that we called CSN, and we have hopefully provided convincing evidence that the need for CSN plays a crucial role in licensing NPIs.

8 Conclusion

Through limited data, we have tried to show that NPIs like *any* and *ever* are words which constrain mental processes and that CSN plays a crucial role in licensing them. Recall that NPIs appear in the scope of *not*, *before*, *if*, etc. We adopted Ladusaw's (1979) DE condition to capture this characteristic. However, since it is only a partial necessary condition, it could not explain cases where NPIs in the scope of DE expressions are still inappropriate. Therefore, we showed that another cognitive constraint comes into play in licensing NPIs. This is significant, because it provides yet another piece of evidence that the cognitive states of the speaker and hearer are determinants of linguistic form.

Concentrating on the latter constraint, we provided it with a relevance-theoretic definition in terms of CSN. Relevance theory provided a foundation on which a precise description of CSN could be constructed. One of the more interesting points of this paper is, we believe, the observation that the cognitive constraints on negation, the use of *but*, and the distribution of NPIs converge on one basic concept easily statable in relevance-theoretic terms. We think it worthy of note, that while previous pragmatic analyses of these three phenomena have attempted to point out such similarities on a more or less intuitive level, none has been able to attribute the shared properties to a specific, easily describable mechanism of information processing, as has been done here. Without the theory, our cognitive condition would have been only a description of intuitions about contrastive situations.

This is one of the criticisms typically raised against pragmatics, and recently against cognitive linguistics. Among them are the claims that "pragmatics is a wastebasket" (Kempson 1975, Blakemore 1987), that it is theoretically immature or doesn't even have any 'theory,' or that it is only a description of intuition. It is often said that linguistics is (or should be) a science. From this point of view, pragmatics or cognitive linguistics has been regarded as lacking an established framework.

Indeed, cognitive pragmatics is still in its infancy. It is designed to deal with meanings which overflow the scope of truth conditional semantics. For that purpose, it must consider many factors such as human cognition, social relations, and a broad base of knowledge. Therefore, it is natural that cognitive pragmatics should take a long time to be systematized. However, relevance theory, as proposed by Sperber and Wilson (1986), does present one way of developing cognitive pragmatics along carefully thought-out, scientific lines.