

Universal Quantification and NPI Licensing

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Abstract

In this paper, I try to reduce the NPI licensors *every*, *no*, *only* and conditionals to universal quantification $\forall x(Px \rightarrow Qx)$ that licenses NPIs in the restrictor P , which is downward entailing or more exactly, anti-additive. For the uniform analysis, I also advocate two more constraints to guarantee the licensing: one, the restrictor P and the scope Q should be in an essential relation $\forall x(Px \rightarrow_{\text{essential}} Qx)$, i.e. not only if Px , then Qx , but also Qx in virtue of Px . Second, NPIs should occur in the focus within the restrictor, i.e. $\dots[\dots NPI \dots]_F \dots$ in Px .

1 Introduction

It is claimed in Ladusaw (1980), the most influential work on negative polarity items (NPIs), that the key property of NPI licensing contexts is downward entailing (DE). Along these lines, the restrictor of universal quantifiers licenses NPIs because the position is DE, as illustrated in (1).

- (1) A function f is downward entailing iff for all x, y such that $(x \subseteq y) \Rightarrow (f(y) \subseteq f(x))$
Every [student of mathematics] attended the lecture. \Rightarrow
Every [student of applied mathematics] attended the lecture.

The focus of the paper are NPI licensors, including universal quantifiers, *no*, *only* and conditionals, as shown in the examples extracted from the internet in (2)¹.

- (2) a. **Every** family that had ever lived there had gone broke or died or gone crazy, or all of the above, in multiple orders.
b. **No** man or woman who ever ran for national office, ever acted so inappropriately in any debate, interview or speech.
c. **Only** those who were in the middle of any battle can ever fully understand it.

¹In all examples, NPIs are underlined and NPI licensors are boldfaced.

- d. **If** you lift a finger, we will destroy every last one of you.

I attempt to reduce all these contexts to universal quantification that licenses NPis in the restrictor. This proposal, though attractive, has to face a range of challenges. Out of these licensors, *no* is the most harmless one to handle. If we believe that *every* licenses NPis in the restrictor because the position is DE, *no* does so for the same reason. In addition, *no* licenses NPis in the scope as well, which is also a DE position. *Only* is much trickier, as it licenses NPis both in the restrictor and in the scope while neither position is straightforwardly DE. Conditionals are also problematic for at least two reasons: first, whether / how they can be analyzed as being implicitly prefixed by a universal quantifier; second, either the antecedent licenses NPis not due to the DEness or the DEness is not a sufficient condition, as Heim's (1984) data in (3) illustrate:

- (3) **If** he has told a lie, he must go to confession. $\not\Rightarrow$
If he has told a lie and shot himself right after, he must go to confession.

The uniform analysis of these contexts in terms of NPI licensing that I aim for covers only the positions of these NPI licensors that correspond to the restrictor of universal quantifiers. That is, although the scope of *no* and that of *only* (as generalized quantifiers) will be addressed, they are not relevant for the main proposal of the paper, as is stated below:

- (4) **PROPOSAL:**
Every, no, only and conditionals as NPI licensors can be analyzed uniformly by reducing them all to universal quantification that licenses NPis in the restrictor (an anti-additive position) with two requirements satisfied:
- a. the restrictor stays in an essential (Dayal 1995) relation with the scope, i.e. $\forall x(Px \rightarrow_{\text{essential}} Qx)$;
 - b. within the restrictor, the position where NPis occur must be prominently asserted, that is, the focus of the restrictor, i.e. $\dots[\dots NPI \dots]_F \dots$ in Px .

To keep things simple, I will use frequently discussed NPis throughout such as *any, ever* and *lift a finger* without going into the issue of the strength of NPis. The paper is organized as follows. Section 2 presents the logical resemblance of *no, only* and conditionals to *every*, which is in line with the fact that they all license NPis at structurally similar positions. Section 3 argues that universal quantification (in the uniform analysis for all the NPI licensors addressed here) does not license NPis by its DEness sufficiently, but that the restrictor and the scope need be in an essential (Dayal 1995) relation. Section 4 discusses the other constraint beyond the logical properties of these quantifiers in terms of NPI licensing, as is stated in (4-b). The last section concludes the paper.

2 Logical equivalence

The logic of *no*, *only* and conditionals is closely related to that of *every*. I will discuss first the other three NPI-licensing contexts briefly and then the most intriguing case of *only*.

2.1 *Every*

Note that semantically, *every* is actually anti-additive (AA), that is, stronger than DE functions in its negativity.

- (5) A function f is anti-additive iff for all x, y such that $f(x \cup y) = f(x) \cap f(y)$
Every [student of mathematics or linguistics] attended the lecture. \Leftrightarrow
Every [student of mathematics] and **every** [student of linguistics] attended the lecture.

2.2 *No*

$No(P, Q)$ is the right internal negation (de Mey 1991) of *every*, i.e. $\forall x(Px \rightarrow \neg Qx)$. Both its restrictor and its scope license NPIs.

- (6) a. **Nobody**_{*i,j*} who ever_{*i*} ran for national office ever_{*j*} acted inappropriately.
 b. **Everyone**_{*i*} who ever_{*i*} ran for national office didn't_{*j*} ever_{*j*} act inappropriately.

(6-a) and (6-b) are semantically equivalent, except that the second occurrence of the NPI *ever* is licensed by *no* in (6-a) while it is licensed by the sentence negation *not* in (6-b), as the indices indicate².

2.3 Conditionals

In first-order predicate logic, while existential quantification contains a logical conjunction, universal quantification contains a logical conditional. Conditionals are universal quantifiers if we take their semantics to be $\forall w(Pw \rightarrow Qw)$. Attributing the observation to Partee, von Stechow (1993: 135) notes that “If the *if*-clauses restricts a non-universal quantifier, where it is uncontroversial that there is no downward monotonicity, NPIs are not allowed”, as the example shows:

- (7) ‡ Sometimes, if a man feeds a dog any bones, it bites him.

²I will use such kinds of indices to mark an NPI and its corresponding licenser when it is not clear in an example.

A more detailed discussion on the domain constancy concerning the antecedent of conditionals and downward inference is also contained in von Stechow (1999). I will leave this issue for others or another occasion, but concentrate on the case of *only* here.

2.4 *Only*

Only P Q is logically more complex to define. One of the greatest puzzles in the theories of NPI licensing is why it can license NPIs in its scope *Q* - taking *only PN/CN* (proper name / common noun) as a generalized quantifier, while it is not, at least not straightforwardly, a DE position. The restrictor, also an NPI licensing position, receives much less attention in comparison. In this section, I will discuss both the restrictor and the scope to give a general picture of *only* as an NPI licensor.

2.4.1 The scope

As de Mey (1991) indicates, *only P Q* is the left and right internal negation of *every*, i.e. $\forall x(\neg Px \rightarrow \neg Qx)$, therefore the converse of *every* i.e. $\forall x(Qx \rightarrow Px)$. The data in (8) seem to favor $\forall x(\neg Px \rightarrow \neg Qx)$ (see Linebarger 1987), although it is logically equivalent to $\forall x(Qx \rightarrow Px)$, as the latter cannot explain why *only* licenses NPIs in the *P* position while the former can³.

- (8) a. **Only** Peter lifted a finger to help.
 b. **Only** the students who have ever read anything about phrenology attended the lectures. (Ladusaw 1980)

That is, *only* resembles *no* rather than *every*, as both *only* and *no* license NPIs at the restrictor and at the scope, while *every* does so only at the restrictor. However, *no* is plausibly AA at the scope while *only* is not even DE at that position. As (9-b) shows: Broccoli makes a subset of vegetables but the reserved inference (DEness) does not hold between the sentences.

- (9) a. **Nobody** smokes and **nobody** drinks. \Leftrightarrow **Nobody** smokes or drinks.
 b. **Only** John [ate vegetables]. $\not\Leftrightarrow$ **Only** John [ate broccoli].

³For example, although $\neg\exists xQx$ and $\forall x\neg Qx$ are logically equivalent, the contrast between the following sentences confirms that NPIs should be in the syntactic and semantic scope of negation in order to be licensed. In other words, the logical property of a potential NPI licensor only counts when it stays in the right scope relation with the NPI to be licensed, i.e. when it c-commands the NPI (Baker 1970).

- (i) a. John didn't eat any vegetable.
 b. *Any vegetable, John didn't eat.

Atlas (1996) suggests that *only* plus proper names is non-monotonic but pseudo-antiadditive⁴. An operator is ‘pseudo-antiadditive’ if it meets the De Morgan conditions of “closure under finite unions, without being downwards monotonic” (Atlas 1996: 283), illustrated below:

- (10) A function f is pseudo-AA iff for all x, y such that $f(x) \cap f(y) \Rightarrow f(x \cup y)$, while $f(x \cup y) \not\Rightarrow f(x) \cap f(y)$
- a. **Only** John smokes and **only** John drinks. \Rightarrow **Only** John smokes or drinks.
 - b. **Only** John smokes or drinks. $\not\Rightarrow$ **Only** John smokes and **only** John drinks.

This proposal is problematic, as pseudo-anti-additive NPIs such as *some students*, *every student* or *at least three students* do not license NPIs in the scope (von Stechow 1999). With this as one of the arguments against the symmetricalist view on *only*, von Stechow (1999) advances an asymmetric semantics for *only*, i.e. *only* licenses NPIs in its scope due to the Strawson-DEness of the position, as is defined and illustrated below.

- (11) Strawson-DE: A function f of type $\langle \sigma, \tau \rangle$ is Strawson-DE iff for all x, y , of type σ such that $x \Rightarrow y$ and $f(x)$ is defined: $f(y) \Rightarrow f(x)$.
- a. **Only** John ate vegetables for breakfast.
John ate broccoli for breakfast. (Presupposition of the conclusion)
 \models **Only** John ate broccoli for breakfast.

What is true about this proposal is that *only* licenses NPs and *only* is Strawson-DE, but I am not convinced that *only* licenses NPIs due to its Strawson-DEness. In fact, I would rather drop the affix ‘Strawson’ (although it is an important point by itself) and stay with the DEness, as it seems unnecessary to make the “presupposition” DE, as von Stechow does (by putting the presupposition of the conclusion into the premises so that both contents, i.e. the presupposition and the assertion, turn DE). The fact that *only* licenses NPIs in its scope has nothing to do with the “presupposition”, but only with the content labeled as “assertion”. Strawson-DEness is therefore not an account but a consequence of the fact that *only* is actually conjunctive semantically and it licenses NPIs in the negative proposition.

These accounts fail due to the general assumption of a one-propositional semantics for *only* and forced attempts at accounting for its NPI licensing behaviour in its entire meaning. Horn (2002) correctly treats *only* as semantically conjunctive. But he distinguishes the two entailments (pragmatically) by their assertoric prominence and proposes that it is not the DEness, but downward assertion that is the key word for NPI licensing. Following him, the sentence in (8-a) is semantically an exponible but only (12-a) is asserted whereas (12-b) is ‘inertly’ asserted⁵.

⁴Atlas takes *only* plus common nouns (CN) as DE/AA, as his examples below show:

- (i) **Only** women smoke or drink. \Leftrightarrow **Only** women smoke and **only** women drink.

⁵“Semantically entailed material that is outside the scope of the asserted, and hence potentially controversial, aspect of utterance meaning counts as **ASSERTORICALLY INERT** and hence as

- (12) **Only** Peter lifted a finger to help. (= (8-a))
- a. Among the relevant people, nobody other than Peter lifted a finger to help.
(antiadditive)
 - b. Peter helped. (non-DE)

In a similar spirit, I propose in Liu (2009) that *only*, unlike other quantifiers at issue here, is double-propositional, that is, it expresses two propositions that contrast with each other in polarity, as illustrated in (12). I called (12-b) the explicature⁶ and (12-a) the (negative) implicature (negative in the sense that it has reversed polarity at the restrictor and the scope positions in relation to the explicature). However, both are part of the conventional meaning, that is, truth-conditional contents of the sentence. The difference of logical properties between the two propositions is the cause of all the complications that arise with *only* in terms of NPI licensing.

Based on this reasoning, I would rather advocate a decompositional analysis for *only*. My proposal, though, does not have to turn to (but is not incompatible with) Horn's (2002) assertion/assertion inert distinction, but a more straightforward trick, namely, to the composition of the entire sentence. It is plausible that whatever the contribution by the NPI *lifted a finger* is, this contribution is not made to the proposition in (12-b). The domain widening function (Kadmon and Landman 1993) of minimizer NPIs⁷ such as *any*, *ever*, *lift a finger* that occur with *only* only apply to updating the truth conditions of the negative proposition e.g. (12-a) in (12)⁸. Correspondingly, it is at this proposition

effectively transparent to NPI-licensing and related diagnostics of scalar orientation" (Horn 2002: 62).

⁶The explicature (NOT in the relevance-theoretic sense) of *Only S* is usually *S*, but I will argue in a minute that if NPIs are present in *S*, the explicature of the sentence needs some slight revision for both grammatical and truth-conditional reasons.

⁷The assumption is that a sentence with minimizer NPIs is truth-conditionally not equivalent to one without. As the examples below show, the presence of *any* and *ever* widens the domain of what counts as breakfast and that of the interval of reference time respectively.

- (i)
 - a. George didn't have breakfast today, but drank a glass of orange juice.
 - b. George didn't have any breakfast today, but *drank a glass of orange juice.
- (ii)
 - a. Kim hasn't had soup for breakfast, but only once in Korea ages ago.
 - b. Kim hasn't ever had soup for breakfast, but *only once in Korea ages ago.

⁸Such mechanism is similar to that of denials (or metalinguistic negation): in (i-b), the predicate *be bald* does not perform function application to *The king of France*, which only contributes its truth-conditional meaning compositionally to a presupposed or preceding utterance such as (i-a).

- (i)
 - a. The king of France is bald.
 - b. The king of France is NOT bald, as there is no king in France.

I discuss in Liu (2009) also the cases of the AA operator *no N* failing to anti-license positive polarity items (PPIs) due to the positive implicature (pragmatically licensing PPIs), which differs from the case of *only* in that this positive implicature is conversational rather than conventional, as it can be cancelled. Take the PPI *would rather* as an example, the implicature that $\exists x(\neg P(x) \wedge Q(x))$ is positive at the Q position where the PPI is licensed. Correspondingly, *would rather* actually takes *Boys* rather than *girl* in e.g. (ii-b) as its semantic argument.

- (ii)
 - a. **No** [girl]_F would rather stay at home.

that these NPIs are licensed⁹. Let me elaborate the idea a little bit further:

- (13) **Only** John ate any vegetables.
- * <John ate any vegetables; Nobody other than John ate vegetables.>
 - * <John ate any vegetables; Nobody other than John ate any vegetables.>
 - ? <John ate vegetables; Nobody other than John ate vegetables.>
 - ✓ <John ate vegetables; Nobody other than John ate any vegetables.>

(13-a) or (13-b) simply cannot be the truth conditions of (13). (13-c) is not entirely wrong but is rather the truth conditions of *Only John ate vegetables*. (13-d) are the right truth conditions of the sentence. The negativity of the implicature gets lost if negation intervenes, as shown below: the NPI *any* is licensed at the explicature and correspondingly contributes its meaning, i.e. the domain widening function to the set of vegetables, to this proposition.

- (14) **Only** John didn't_{*i*} eat any_{*i*} vegetables.
- * <John didn't eat vegetables; Everybody other than John ate any vegetables.>
 - * <John didn't eat any vegetables; Everybody other than John ate any vegetables.>
 - ? <John didn't eat vegetables; Everybody other than John ate vegetables.>
 - ✓ <John didn't eat any vegetables; Everybody other than John ate vegetables.>

To turn an *only* sentence straightforwardly DE, we need two negations to succeed so that both propositions the sentence expresses are DE per se. However, then, the NPI is not licensed by *only* but by the sentential negation, as is in (15-a). Correspondingly, *Not only John ate vegetables* does not license NPIs, as both propositions it expresses are positive in the scope, as shown in (16)¹⁰.

- (15) a. Not only John didn't_{*i*} eat (any)_{*i*} vegetables.
 <John didn't eat (any) vegetables; Someone other than John didn't eat (any) vegetables. >
- b. (15-a) ⇒ Not only John didn't eat broccoli.

b. **No** [girl]_{*F*} would rather stay at home. [Boys]_{*F*} do.

⁹Some people might criticize that my arguments here are circular, but such a criticism would be due to a certain assumption about the nature of licensing between NPIs and their licensors, which is not yet entirely clear to me. But if we admit the truth-conditional contribution of minimizer NPIs that I have been talking about, we can know - logically - where an NPI is licensed by checking at which proposition its domain-widening function applies.

¹⁰In fact, *not only* is an additive operator, i.e. it does not make a negative context.

(i) A function f is additive iff for all x, y such that $f(x \cap y) = f(x) \cap f(y)$.

- (16) Not only John ate vegetables.
 <John ate vegetables; someone other than John ate vegetables>

To sum up, I follow Horn's (2002) view that *only* is semantically conjunctive and non-DE. The two conjuncts are both entailments of the sentence. My double-propositional approach and Horn's double-entailment approach differ only in that the latter distinguishes these two contents by their assertoric prominence, i.e. in a pragmatic asymmetry. Although Horn's assertion/inert assertion distinction seems more explanatory for cases such as (17-a) and many others (indeed), where the negative assertoric tone with *only* (of the assertion) licenses NPIs, I would rather adopt only the two-propositional claim without distinguishing the two propositions by assertoric prominence, based on examples such as (17-b), in which I see no reason for such a distinction. Therefore, the inference failure in (17-a) arises not because *Peter helped* is not asserted or only inertly asserted (as it can be asserted, shown in (17-b)) per se, but because the matrix predicate only takes the negative content as its semantic argument. In my decompositional approach to *only*, only the (negative) implicature is in the semantic scope of the adversative predicate.

- (17) a. I was disappointed that **only** Peter lifted a finger to help. \nrightarrow
 I was disappointed that Peter helped and nobody else under consideration lifted a finger to help.
 b. I got to know that **only** Peter lifted a finger to help. \Rightarrow
 I got to know that Peter helped and nobody else under consideration lifted a finger to help.

With the assumption that NPIs contribute truth-conditional meaning by what Kadmon and Landman (1993) call domain widening, it is then natural to claim that in an *only* sentence, NPIs are licensed at the negative implicatum, and it is to this content that they contribute their domain widening function and therefore update the truth conditions of the entire sentence. The next question is whether the same applies to the scope position of *only*.

2.4.2 The restrictor

The restrictor of *only PN/CN* is logically as hard to define as the scope. As *only* is an exclusive operator, sentences like (18-b) and (19-b) are self-contradictory, if we keep the domain of people in contrast constant¹¹, and as (18)-(19) show, this position is not AA.

¹¹If Bill and Kate are among two different domains of people in contrast, the sentence (18-b) turns fine. So does (19-b).

- (i) a. Among the boys, **only** Bill smokes, and among the girls, **only** Kate smokes.
 b. Among the female, **only** (adult) women smoke, and among the male, **only** (adult) men smoke.

- (18) a. **Only** Bill or Kate smokes. \neq / \neq
 b. **Only** Bill smokes and **only** Kate smokes.
- (19) a. **Only** women or men smoke. \neq / \neq
 b. **Only** women smoke and **only** men smoke.

The restrictor of *only PN* is less interesting for us now, as there is no place to plug in an NPI there. Neither *only a CN* nor *only CNs* is even (straightforwardly) DE.

- (20) a. **Only** a woman smokes. \neq **Only** a career woman smokes.
 b. **Only** women smoke. \neq **Only** career women smoke.

To ‘maintain’ the DEness thesis, we could try to test whether *only* is Strawson-DE in its scope. With *only a CN* in (21), the inference seems only to work when the indefinite NP is used specifically, but then this is not about the DEness, as in this case *a career woman* is not a subset of *a woman*, but they denote the same person. In the generic reading, the inference does not work, neither in (21) nor in (22): it could work only if we not only put the presupposition of the conclusion into the premises but also keep the cardinality of all the NPs in the premises and the conclusion constant. But then it is not about the DEness anymore because *a woman* and *a career woman*, or, *women* and *career women* are not in a set-subset relation but denote the same set.

- (21) **Only** a woman smokes.
A career woman smokes. (Presupposition of the conclusion)
 \neq **Only** a career woman smokes.
- (22) **Only** women smokes.
Career women smokes. (Presupposition of the conclusion)
 \neq **Only** career women smokes.

Now that it is certain that Strawson-DEness is not what we can even start with here, we can go back to the explicature/implicature distinction that I’ve advocated above:

- (23) **Only** a career woman smokes.
 a. Explicature: A career woman smokes.
 b. CI: No non-career woman smokes. (All non-career women don’t smoke.)
- (24) **Only** career women smoke.
 a. Explicature: Career women smoke.
 b. CI: No non-career women smoke. (All non-career women don’t smoke.)

Interestingly, if we put the conventional implicature of the conclusion in the premises, the DEness follows. Consider:

- (25) **Only** a woman smokes.
 (All) non-career women don't smoke. (CI of the conclusion)
 \models **Only** a career woman smokes.
- (26) **Only** women smokes.
 (All) non-career women don't smoke. (CI of the conclusion)
 \models **Only** career woman smokes.

Based on this, we can conclude that the scope of *only PN/CN* is Strawson-DE, or taking the double-propositional view, it is non-DE at the explicature and DE at the CI content. In the same double-propositional view, the restrictor position of *only* is DE both at the explicature¹² and the CI content, as is shown above. All in all, *only* is not straightforwardly DE, but at the conventional implicature, it is DE/AA both at the restrictor and at the scope.

2.4.3 Summary

For simplicity, I assume that (23) (in the non-specific reading) and (24) have the same meaning and that *only PN is Q* and *Only Ps are Q* have the same semantics and pragmatics, except that *only* induces a set of individuals as the set of the alternatives in the former, and a set of sets (properties) as the alternative set in the latter. I used Karttunen and Peters' (1979) two-dimensional notation (designed for conventional implicatures) to present the entire meaning of an *only* sentence as $\langle \phi_e, \phi_i \rangle$: ϕ_e is the explicature, i.e. the *a* sentences in the above examples and ϕ_i is the conventional implicature, i.e. the *b* sentences above. This is summarized below:

- (27) Meaning of the (contrastive) focus operator *only*:
 $[[\text{Only } P \text{ are } Q]] = \langle \forall x(Px \rightarrow Qx), \forall x(\neg Px \rightarrow \neg Qx) \rangle$

Only P Q expresses two propositions that contrast with each other at both the *P* and the *Q* positions. The extensions of *P* and $\neg P$ form together the entire target domain of foci; the contrast at the *Q* position is one of polarity. *Only* is therefore only and always halfway negative (and halfway positive) - if no extra negation intervenes.

2.5 Summary of the section

Whether it is possible to reduce the NPI-licensing positions of these quantifiers to one with the same or at least similar logical property has the following consequence: if yes, this will be evidence for the logical approach to the phenomenon of negative polarity; if not, we have to rethink the nature of NPI licensing and consider that the (dominant) logical approaches are, probably, problematic. This section proves that *Every P Q*, *No P Q*, *Only P Q* and *If P, Q* with *P* as a NPI licensing position can all be reduced

¹²It is not DE if we have a PN, different from those cases where we have a CN or CNs. As the explicature of *Only Bill smokes*, i.e. *Bill smokes* is obviously non-monotonic at the subject position.

to universal quantification $\forall x(Px \rightarrow Qx)$ that licenses NPIs in the restrictor position P and P is a DE/AA position. The question is whether this is a sufficient condition. In the following sections, I discuss two possible constraints that guarantee the NPI licensing in these contexts, namely, first, we need $\forall x(Px \rightarrow_{\text{essential}} Qx)$ instead of plain universal quantification and second, where NPIs are licensed should be in the focus within the restrictor. The satisfaction of the two constraints should facilitate an uniform analysis for these four NPI licensors.

3 The essentialness

Dayal (1995) makes the distinction between an essential/accidental reading for *every* as in (28). This distinction seems to also capture the fact that it is the essential reading of the universal quantifier that is capable of licensing NPIs, or in other words, when the restrictor and the scope are inherently related (Heim 1984). Sailer (2009) notes that this is an issue of the strength of NPIs: strong NPIs e.g. *so much as* in (29) (Heim 1984) require that the sentence have a law-like, i.e. non-presuppositional¹³ rather than episodic reading, but weak ones like *ever* do not.

- (28) **Every** student who is in Mary's class is working on polarity items.
- a. **Every** student in Mary's class, by virtue of being in her class, is working on polarity items. (essential)
 - b. It happens to be true of *every* student in Mary's class that s/he is working on polarity items. (accidental)
- (29) a. **Every** restaurant that charges so much as a dime for iceberg lettuce ought to be closed down. (law-like/essential)
- b. ??**Every** restaurant that charges so much as a dime for iceberg actually has four stars in the handbook. (episodic/accidental)

Remember that *every* is actually AA in its scope. In the logico-semantic approaches to NPI licensing such as van der Wouden (1997), NPIs are classified by strength according to the negativity of their licensors. Other AA functions are, for example, *never*, *no N*, *nothing*. If *no N* can license the NPI *as much as* in its scope, there is no reason why *every N* should fail in its restrictor due to the strength of the NPI, since both positions are AA.

- (30) **Nobody** there did so much as take notice of him.

Putting the issue of strength aside, with reference to (28)-(30), one can argue that although *every* is semantically DE/AA, this might not be the necessary condition for NPI licensing. At least certain NPIs are licensed in the restrictor only if $\forall x(Px \rightarrow_{\text{essential}}$

¹³Universally quantified NPs are controversially argued to be presuppositional, that is, *every student* presupposes the quantification domain to be a nonempty set, in this case, a set of students. However, universal quantifiers licensing NPIs in the restrictor seem to lack such an existential import.

Qx): to understand this, we can take the implication as a two-place predicate such as $R(P, Q)$. The operator $\rightarrow_{essential}$ signals that this relation is essential in the sense not only that if P , then Q , but that Q will be true by virtue of P . This is similar to the case of *but*, which, besides being a logical conjunct, also occasionally indicates a contrast between its conjuncts¹⁴.

Conditionals show similar requirements as *every* in terms of NPI licensing, namely, they can license NPIs in the restrictor only when the restrictor is essential to the scope. Consider: in (31-b), the lack of an essential relation between the antecedent and the consequent makes the presence of the NPI unacceptable, while (31-a) licenses the NPI as $\forall w(Pw \rightarrow_{essential} Qw)$. This shows that the NPI licensing conditionals cannot be the material implication $P \rightarrow Q$ and nor can the plain universal quantification $\forall w(Pw \rightarrow Qw)$ do.

- (31) a. **If** you ever date my daughter, I will kill you. (If you date my daughter, I will kill you for that.)
 b. **If** you *ever come to my office, we can have tea together. (*If you come to my office, we can have tea together because of that.)

This proposal has received the following criticisms from anonymous reviewers.

An anonymous reviewer, referred to (32) as counterexamples to (29). His or her arguments are that in (32-a), the scope is not true in virtue of the restrictor but dependent on other contextual propositions. The sentence (29-b) is odd not due to the presence of the NPI but to the fact that the restrictor and the scope are not inherently related by themselves, as even if the NPI is absent e.g. in (32-b), the sentence is still odd.

- (32) a. **Every** person that so much as glances at this book should take its lessons to heart.
 b. ??**Every** restaurant that charges more than \$.20 for iceberg lettuce actually has four stars in the handbook.

Another anonymous reviewer questions the validity of the essentialness of the conditional relation in the case of *no*, as s/he thinks that the essentialness is not necessary in sentences like (33-a). However, (33-a) is logically equivalent to (33-b) and both of them conversationally strongly implicate (33-c).

¹⁴Bach (1999) takes the semantics of *but* as propositional rather than simply as that of a truth-functional connective. Analogously, we can take the truth-functional connective *if... then* to be propositional, then it would be possible to modify it with the essential operator. In the case of *but*, this would roughly correspond to the following two cases in contrast: in sentence (i-a), with use of *but* the speaker expresses a contrast between the two propositions *Mark is fat* and *Mark is agile*. This does not hold naturally between *Mark is fat* and *Mark is very smart* in sentence (i-b).

- (i) a. Mark is fat but agile. ($P \wedge_{contrast} Q$)
 b. Mark is fat but smart. ($P \wedge Q$)

- (33) a. **No** child with any money left sat in the classroom.
 b. **Every** child with any money left did not sit in the classroom.
 c. Every child, if with any money left, did not sit in the classroom, by virtue of having any money left.

Though, in some cases, s/he is right. Suppose that a child gang who is used to robbing money from other children utters (33-a). The utterance does not have the meaning in (33-c).

The same reviewer also points out the following sentences as counterexamples to the essentialness between the restrictor and the scope as a necessary licensing requirement.

- (34) a. **If** you ever become president, we can turn it into a museum and charge admission.
 b. **If** you had ever come to my office, we could have had tea together.

I don't know how to answer these questions. Maybe the essentialness should not be put in the logical form, but be taken as a generalized conversational implicature that is available in most examples including the two from (2).

- (35) a. **No** man or woman who ever ran for national office, ever acted so inappropriately in any debate, interview or speech. they all acted appropriately because they ran for national office before.
 b. **Only** those who were in the middle of any battle can ever fully understand it - they can fully understand it because they were in the middle of some battle and those who cannot fully understand it cannot because they were not in the middle of any battle.

Anyway, one thing that I want to advocate here with Dayal's notion of essentialness is that these NPI licensors do not license NPIs only due to their logical properties, be it DE or AA. Rather, there are other requirements to be satisfied to guarantee the licensing. If the DENess is only necessary but not sufficient, it is at least important to see that (in many cases) the essentialness is sufficient, although it might not be necessary. In the section below, I will put forward another requirement that needs observing in addition to an NPI licensor with the right logical property.

4 NPIs in the restrictor

The examples below are intended to show that if the focus of the restrictor is restricted to the N head (in a-c) or switched to other constituents (in c-d), NPIs that were licensed in (2) turn odd. This is compatible with the fact that universal quantifiers do not take appositive relative clauses, which would make the position not DE anymore.

- (36) a. **Every** [family]_F, which had ?ever lived there, had gone broke or died or gone crazy, or all of the above, in multiple orders.
 b. **No** [man or woman]_F, who ?ever ran for national office, ever acted so inappropriately in any debate, interview or speech.
 c. **Only** [those]_F who were in the middle of ?any battle can ever fully understand it.
 d. If [you]_F ?lift a finger, we will destroy every last one of you.

Coming back to (28)-(29), it is also to note that the content by the relative clause where NPIs are licensed is prominent at the NP node. For example, although (29-a) has the LF, for simplicity, $\forall x((Nx \wedge RCx) \rightarrow_{essential} Qx)$ (N for restaurant, RC for the relative clause, and Q for the scope), it is the RCx content that decisively makes the essential relation of the restrictor to the scope Q hold. To elaborate, if we zoom in the restrictor, Nx is only inertly asserted while RCx is asserted, in Horn's (2002) terms. Correspondingly, it is the RC content that licenses NPIs. Similarly, in (31), the antecedent in (31-a) is asserted whereas it is only 'inertly' asserted in (31-b) or even a conventional implicature in Potts's (2005) sense, as the whole utterance is at issue in the former whereas the consequent in the latter, i.e. *we can have tea together* seems to suffice as the major message from the speaker. Although the theories on NPI licensing in the literature are predominantly semantic, all these data seem to support the insights that the phenomenon of NPIs cannot be a purely semantic one. Look at more googled examples:

- (37) a. **If** you purchase DLC and ever get rid of xbox live, don't plan on having DLC anymore.
 b. 20-something (or even younger) will and do go after your man **if** he is decent looking and has any money/status/power.
 c. **If** a boy fails to re-register at re-chartering time and has any money remaining in his account after the re-charter date, the money in his account will revert back to the troop.
 d. WILLIAMS: An't please your majesty, a rascal that swaggered with me last night; who, **if** alive and ever dare to challenge this glove, I have sworn to take him a box o' th' ear: or if I can see my glove in his cap, which he swore, as he was a soldier, he would wear if alive, I will strike it out soundly. (King Henry V., Shakespeare)

Take (37-a) for example, the replacement of the NPI *ever* would cause confusion or deviation from the original meaning.

- (38) a. **?If** you ever purchase DLC and get rid of xbox live, don't plan on having DLC anymore.
 b. ***If** you ever purchase DLC, don't plan on having DLC anymore.

5 Conclusion

I took efforts above to show that the NPI licensors *every*, *no*, *only* and conditionals are logically closely related to each other, that is, they can all be reduced to universal quantification that licenses NPIs in the restrictor position.

- (39) a. **Every** $P Q : \forall x(Px \rightarrow Qx)$
 b. **No** $P Q : \forall x(Px \rightarrow \neg Qx)$
 c. **If** $P, Q : \forall x(Px \rightarrow Qx)$
 d. **Only** $P Q : \langle \forall x(Px \rightarrow Qx), \forall x(\neg Px \rightarrow \neg Qx) \rangle$

Since the focus of the paper is on the relation between the restrictor of universal quantification and NPI licensing, I will not go into details about the other NPI-licensing positions in their logic as the formulae above exhibit. An important question for future research is why universal quantification matters: for example the NPI licensor *before* seems also to have a semantics of universal quantification over times (the contexts I've discussed above involve a semantics of universal quantification over individuals or worlds). The reductionist view in this paper is therefore probably more general than is presented here.

However nice and desirable the generalisation that *every*, *no*, *only* and conditionals license NPIs due to the universal quantification in their logic is, empirical data pose challenges, that is, the logical property of the restrictor of universal quantification might not be the sufficient condition for it to license NPIs. The two constraints that I elaborated so far, even if being sufficient but sometimes not necessary, are maybe just another starting point to look at this old but still entangling issue.

Acknowledgements

The content of this paper benefits from previous discussions with Andreas Blümel, Janina Rado, Frank Richter and Manfred Sailer. I am also grateful to the audience of *Sinn und Bedeutung* 14 for very helpful comments. All mistakes are my own.

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