The dynamics of negative concord

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August 23, 2018

Abstract

Concord describes a natural language phenomenon in which a single logical meaning is expressed syntactically on multiple lexical items. The canonical example is negative concord, in which multiple negative expressions are used, but a single negation is interpreted. Formally similar phenomena have been observed for the redundant marking of distributivity and definiteness. Inspired by recent dynamic analyses of these latter two phenomena, we extend a similar dynamic analysis to negative concord. We propose that negative concord items introduce a discourse referent (like an existential), but then test that no discourse referent has been introduced in any assignment. These apparently contradictory requirements are licensed with split scope around negation: introduction occurs below negation; the test appears above it. The analysis successfully predicts that negative concord items must be licensed by a sufficiently local negative operator. We further show that modulation of what is at-issue can account for cases in which NC items themselves carry negative force.

1 Introduction

Concord describes a natural language phenomenon in which a single logical meaning is expressed syntactically on multiple lexical items. The canonical example is negative concord, in which multiple negative expressions are used, but a single negation is interpreted. In some dialects of English, (1) negates the proposition that Mary saw something (Labov, 1972). Similarly, in Russian and Italian, the negative quantifier 'nothing' (*nichego*/*niente*) is only grammatical in object position in the presence of the negation 'not' (*ne*/*non*).

(1) Mary didn't see nothing. (some English dialects)

(2) Marija ne videla nichego. (Russian)

(3) Maria non ha visto niente. (Italian)
'Mary didn't see anything.'

NC items are distinguished by apparently context-dependent semantic properties; in some contexts, as in the ones above, NC items seem to be subsidiary to the presence of a negative operator (*n't*/*ne*/*non*) that contributes negation. In such environments, it is compositionally simplest to assign NC items a non-negative denotation; either as a low scoping existential (Ladusaw, 1992; Zeijlstra, 2004) or a wide scoping universal (Szabolcsi, 1981; Giannakidou, 2000). In other contexts, however, the NC item is the only marker of negation, such as in fragment answers to questions, as in (4) and (5). These uses of NC items are parallel to the behavior of *nothing* in Standard English, which contributes negative force itself.

(4) Chto Marija videla? Nichego. (Russian)

(5) Cosa ha visto Maria? Niente. (Italian)
'What did Mary see? Nothing.'

NCIs are also characterized by distributional properties. In their 'redundant' use (as in (1)–(3)), NC items are restricted to negative environments; precisely, they must be licensed by a sufficiently local negative operator. Sentences (6) and (7) are ungrammatical without pre-verbal negation.

(6) * Marija videla nichego. (Russian)

(7) * Maria ha visto niente. (Italian)

Analytically, a successful theory of negative concord is a compositional analysis that explains these properties. I) Why do NC items sometimes appear to carry negative force themselves and at other times appear innocently redundant? II) What can serve as a licensor of NC, and why do (many instances of) NC items require such a licensor?

In this article, we provide a fully compositional analysis of negative concord in which interpretation and licensing is is explained via the semantics. The analysis is inspired by recent work on distributivity and definiteness, in which similar concord behavior has been observed. For both distributivity and definiteness, recent analyses have converged on a semantic theory in which a postponed presupposition checks properties about the discourse referents introduced by the construction. We extend an analogous semantic analysis to negative concord. We hypothesize that concord (in all guises) is a split-scope phenomenon, consisting of the dynamic introduction of a discourse referent and a cardinality test on that referent. Scope-taking plus dynamic semantics allows us to consider properties of objects that emerge via interaction with other logical operators.

2 Concord

Beyond negative concord, a variety of other patterns in spoken language also display concord-like behavior. For example, in what might be called 'distributive concord,' multiple words with distributive marking may appear innocently in the same sentence, with a single distributive meaning, as in examples (8)-(10), from three unrelated languages.

(8) Chikijujunal ri tijoxela' xkiq'etej ju-jun tz'i'.
each(dist) the students hugged one-Dist dog
'Each of the students hugged a dog.' (Kaqchikel, Henderson 2014)

(9) BOY EACH(dist) CHOOSE-Dist ONE-Dist GIRL.
'The boys each chose one girl.' (American Sign Language, Kuhn 2017)

(10) Namca twu-myeng-ssik-i sangca sey-kay-ssik-ul wunpanhayssta
man two-Cl-Dist-Nom box three-Cl-Dist-Acc carried
'Two men carried three boxes on each occasion.' (Korean, Oh 2006)

A related pattern could be called 'definite concord.' When one definite description is embedded underneath a second, the uniqueness of each definite description is determined with respect to the other (Haddock, 1987). For example, the expression in (11a) can be used to describe the image in (11b); there are multiple hats and multiple rabbits, but there is a unique rabbit-hat pair.

(11) a. the rabbit in the hat (Haddock, 1987)

b. 

Like for negative concord, there several possible perspectives on the semantics of these redundant forms. For example, do distributive-marked verbs and numerals themselves have a distributive semantics, or are they a morphological exponent of a (covert or overt) distributivity operator elsewhere in the sentence (Oh, 2006; Kimmelman, 2015)? For distributive concord, Henderson (2014) and Kuhn and Aristodemo (2017) argue that each distributive marker *is* semantically interpreted. They advance an analysis that based on scope taking and dynamic semantics. On this view, distributive marking on verbs and numerals is a wide-scoping predicate that checks that a plurality of events has been introduced. Notably, this hypothesis converges with Bumford (2017)'s analysis of definite concord, which also involves scope-taking of a dynamic predicate.

The core of these analyses can in fact be explained quite easily by paraphrase. In the case of distributive concord, the meaning of the distributive numeral is equivalent to a plain numeral, but there is an added condition, equivalent to a follow-up sentence, that the DP refers to a plurality of individuals. In the case of definite concord, the meaning of the definite article is equivalent to an indefinite article, but there is an added condition, equivalent to a follow-up sentence, that the DP refers to a unique individual. Thus, a pseudo-LF is provided in (12) for the Kaqchikel sentence in (8); a pseudo-LF is provided in (13) for an English sentence including the expression in (11).

(12) Each of the students hugged a dog. There are several such dogs.

(13) A rabbit in a hat (there is one such rabbit and one such hat) ate a carrot.

In both cases, the follow-up sentence (underlined) is a presupposition: that is, the sentence yields infelicity if the condition is not met. This may have consequences on the acceptability of a sentence or the range of meanings that are available to it. For example, note that the underlined condition in (12) guarantees a $\forall > \exists$ interpretation for the target sentence, since the $\exists > \forall$ interpretation only involves a single dog. More generally, distributive numerals require the presence of a plural licensor, since the underlined condition can never be met if all arguments are singular (cf. (14)).

(14) (Yesterday at 2:05,) John hugged a dog. #There are several such dogs.

Here, we propose an exactly analogous analysis for negative concord. The meaning of an NC item is equivalent to an existential, but there is an added condition, equivalent to a follow-up sentence, that the extension of the DP is empty. Thus, a pseudo-LF is provided in (15) for the sentences in (1)–(3).

(15) Mary didn't see a thing. There are no such things.

Like for distributive concord, the presupposed condition of NC items will necessitate a licensor. In particular, observe that the same sentence, without negation, yields a contradiction: if Mary saw something, then it is not true that the set of things that Mary saw is empty. The presupposition is not satisfied, and the sentences in (6) and (7) are correctly predicted not to be grammatical.

(16) Mary saw something. #There are no such things.

This analysis-by-paraphrase is precise enough to make predictions—in particular, about what can serve as a licensor for NC items. In particular, cross-linguistically, it turns out that the quantifier *few* is generally not able to license NC items, despite the fact that it is downward entailing, and is potentially decomposable into *not* + *many* (e.g. Solt, 2006).

(17) * Poche persone hanno visto nessuno. (Italian)
'Few people saw nothing.'

Why is this the case? We run the same analysis-by-paraphrase, as in (18). Here, the situation is slightly different from the one in (16), since there is no contradiction: the two sentences are perfectly compatible. Nevertheless, the algorithm still predicts ungrammaticality, since the underlined sentence is *presupposed*; presuppositions require their content to be part of the common ground—that is, true in *every* world in the local context (Stalnaker, 1973; Heim, 1983). Because *few* is compatible with scenarios in which the predicate holds of a small but non-zero number of people, the underlined sentence in (18) yields a presupposition failure.

(18) Few people saw something. #There are no such things.

On the other hand, there exist other operators besides negation that will have the necessary semantic effect. For example, in Italian, like many other languages, one licensor of negative concord is *senza*, '*without*,' as in (19). This is predicted from the analysis-by-paraphrase in (20): if Mary left without eating a thing, then the set of things that Mary ate is necessarily empty, and the presupposition is satisfied.

(19) Maria è partita senza mangiare niente. (Italian)
'Maria left without eating anything.'

(20) Maria left without eating a thing. There are no such things.

I will show in §4.3 that the operators that guarantee an empty extension of the DP coincide closely, though not exactly, with those that are *anti-additive*; i.e., those functions f that satisfy $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$. Previous work has observed that, in general, this is the class of operators that licenses negative concord (Ladusaw, 1992; van der Wouden and Zwarts, 1993). The present analysis explains *why* this is the relevant class.

In the rest of the paper, we will spell out this analysis using split scope and dynamic semantics, but it is possible already, in the analysis sketch here, to see where each technology will be valuable. In the paraphrases above, observe that it is one and the same item that introduces the existential and the underlined condition, but these two components of meaning are structurally separated from each other. This is where split-scope comes in handy; split-scope provides a way for a single lexical object to be evaluated in two distinct hierarchical positions. Second, note the use of anaphoric language in the paraphrases above, instantiated in the word *such*. This anaphoric language allows us to refer back to the specific discourse referent associated with the DP; in (15), we do not want to presuppose that no things exist in the world, just that there are no things that were seen by Mary. Dynamic semantics is used to capture anaphoric behavior.

In §3, I spell out this analysis formally. In §4, I show that the analysis immediately and correctly predicts that NC items should be licensed by a sufficiently local negative operator. In §5, I discuss uses of NC items in which they contribute negative force themselves, and show that these cases can be cleanly captured by manipulating what is *at-issue* in the denotation of the NC item. I discuss the typology of concord items and potential parameters of variation from the novel perspective, and compare it competing accounts.

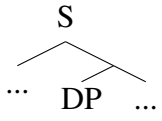
3 Negative concord

I propose that negative concord items introduce a discourse referent (like an existential), but then test that no discourse referent has been introduced in any assignment. These apparently contradictory requirements are licensed with split scope around negation. Introduction occurs below negation; the test appears above it.

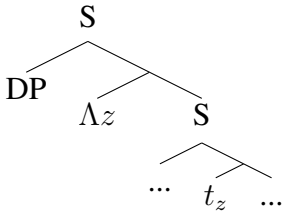
3.1 Split scope

We adopt an analysis of split scope following Cresti (1995) and Charlow (to appear). Notationally, e is the type of individuals; t is the propositional type, whether static or dynamic. Note that we will ultimately be using dynamic semantics, so t is not a primitive type, but this changes nothing in the syntactic analysis. We assume a rule for Quantifier Raising (QR), as in (21).

(21) a.



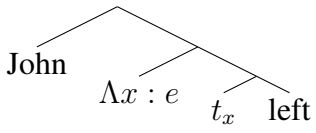
$\Rightarrow$ b.



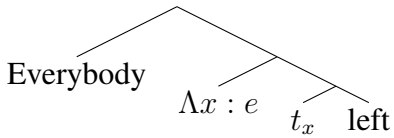
The node Λz lambda abstracts over the variable z, so if the DP leaves a trace of type e, then the constituent [Λz S] is of type $\langle e, t\rangle$. If a proper name is QRed, it can be left as type e, or can be lifted to type $\langle et, t\rangle$, as in (22a). Note that lifting does not add new meanings; it just 'flip-flops' the function and the argument (Partee and Rooth, 1983). On the other hand, lexical items 'born' with type $\langle et, t\rangle$ can be more complex, as in the case of generalized quantifiers like *everybody*, in (22b).

(22) a. $\textsc{lift}(\text{john}') = \lambda P.P(\text{john}')$
b. $\text{everybody}' = \lambda P.\forall x[P(x)]$

(23) a.



b.

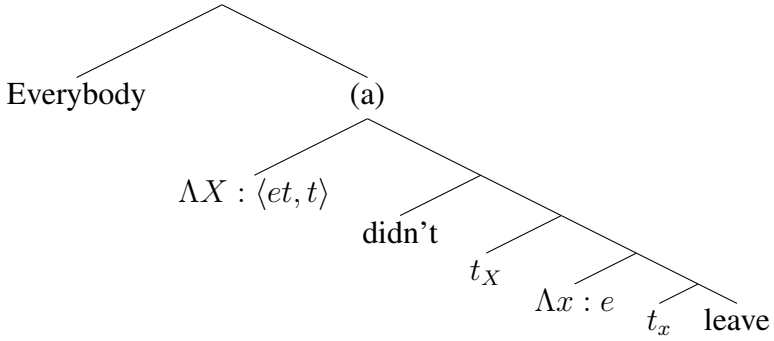


Now, consider that we lift the higher-order generalized quantifier, leaving behind a trace of type $\langle et, t\rangle$. To draw a clear analogy, let us define the type Q to be $\langle et, t\rangle$. By the schema in (21), this transformation is perfectly well-defined. If the DP leaves a trace of type Q (i.e., $\langle et, t\rangle$), then the constituent [ΛX S] is of type $\langle Q, t\rangle$ (i.e., $\langle\langle et, t\rangle, t\rangle$). (Note that this assumes that objects of type $\langle et, t\rangle$ must exist in the range of an assignment function.)

Cresti (1995) proposes such an analysis for syntactic reconstruction effects. For example, the sentence in (24) can naturally be uttered in response to the question 'Did everyone leave?' to communicate the fact that people still remain. This scopal order, $\neg > \forall$, can be derived with the tree in (25), in which the universal quantifier leaves behind a trace of type Q below the negation.

(24) Everybody didn't leave.

(25)



(26) $[\![(25a)]\!] = \lambda Q.\neg Q(\text{leave}') \quad :: \quad \langle Q, t\rangle$

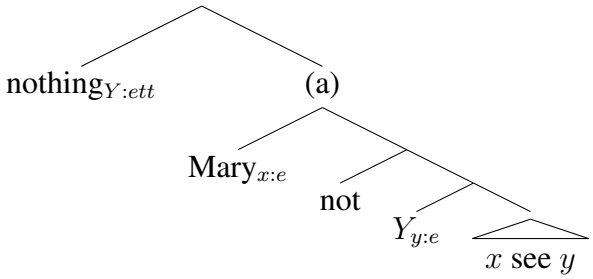
If a generalized quantifier is QRed in this way, it can be left as type Q, or can be lifted to type $\langle Qt, t\rangle$ Once again, lifting does not add new meanings; just 'flip-flops' the function and the argument.

(27) $\textsc{lift}(\text{every}') = \lambda c.c(\text{every}') = \lambda c.c(\lambda P.\forall x[P(x)])$

But, once again lexical items 'born' with type $\langle Qt, t\rangle$ can be more complex. Following Charlow (to appear)'s analysis for distributive numerals and Bumford (2017)'s analysis of definites, I propose that this will be the case for negative concord items. The structure of (28) is thus provided in (29). NC items, of type $\langle Qt, t\rangle$, take arguments of type $\langle Q, t\rangle$, as in (30).

(28) Mary didn't see nothing.

(29)



(30) $[\![(29a)]\!] = [\![8_{\langle et,t\rangle}\ [\text{Mary}\ [6_e\ [\text{not}\ [t_8\ [7_e\ [t_6\ \text{see}\ t_7]]]]]]]\!] = \lambda Q_{\langle et,t\rangle}[\neg Q(\lambda x[\text{see}(x)(\text{mary})])]$

3.2 Dynamics

In dynamic semantics, sentential meaning is conceived of not as a static set of truth conditions but as a way of updating the discourse context. At a given point in discourse, speakers have a representation of shared information (often spelled out as a set of possible worlds), as well as the set of discourse referents that have been introduced (often represented as the values of an assignment function). Uttering a sentence has the potential to both introduce information (i.e., eliminate possible worlds), and to introduce discourse referents (i.e., change values of the assignment function).

Historically, dynamic semantics has proved useful for a number of semantic effects that span sentence boundaries, including the behavior of presuppositions in different environments (Heim, 1983), as well as the anaphoric potential of pronouns (Groenendijk and Stokhof, 1991; Muskens, 1996). Because the present analysis involves both presupposition and anaphoric potential, the system here will essentially be a cross of Heim (1983) and Muskens (1996), incorporating information about both informational content and discourse referents.

In Stalnaker (1973), Heim (1983), and Schlenker (2009), among others, contexts are represented as sets of possible worlds. Letting $\mathcal{W}$ be the set of all possible worlds, $C \subseteq \mathcal{W}$ for all contexts C. In Groenendijk and Stokhof (1991) and Muskens (1996), among others, discourse referents are represented as the values of an assignment function. Contexts are represented as sets of assignment functions. Letting $\mathcal{G}$ be the set of all assignment functions, $C \subseteq \mathcal{G}$ for all contexts C. Putting the two frameworks together, I assume that contexts are sets of tuples containing a possible world and an assignment function: $C \subseteq \mathcal{W} \times \mathcal{G}$ for all contexts C. I will use the term 'state' to refer to a world-function tuple. We let s and t be variables over states: $s = \langle w, g\rangle$. Notationally, s_w retrieves the world variable of s and s_g retrieves the assignment function variable in s.

Indefinites add new individuals to the assignment function in a state. Pronouns retrieve elements from the assignment function. I assume assignment functions start out with only undefined values, represented here with $\#$. As in all the theories above, predicates are tests that filter out states. States are passed through discourse: the output context of one sentence is the input context of the next. A sentence or discourse is true in a context if the output of the update is non-empty.

The discourse in (31) provides an example. We consider a starting context in which nobody has been mentioned, and in which we do not know who left (if anyone), but we know that only Emma is angry. This corresponds to the initial set of states in Figure 1, where the four worlds have the properties provided in (32). Upon the utterance of the sentence '*A girl left*,' we update all states

by introducing a discourse referent at index x, then we remove each state s in which $s_g(x)$ is not a girl who left in s_w. Upon the utterance of the sentence, '*She was angry*,' the pronoun *she* retrieves the individual introduced at x, and we remove each state s in which $s_g(x)$ is not angry in s_w.

(31) (a) A^x girl left. (b) She$_x$ is angry.

(32) w_1: Emma left. Only Emma is angry.
w_2: Mary left. Only Emma is angry.
w_3: Both Emma and Mary left. Only Emma is angry.
w_4: Nobody left. Only Emma is angry.

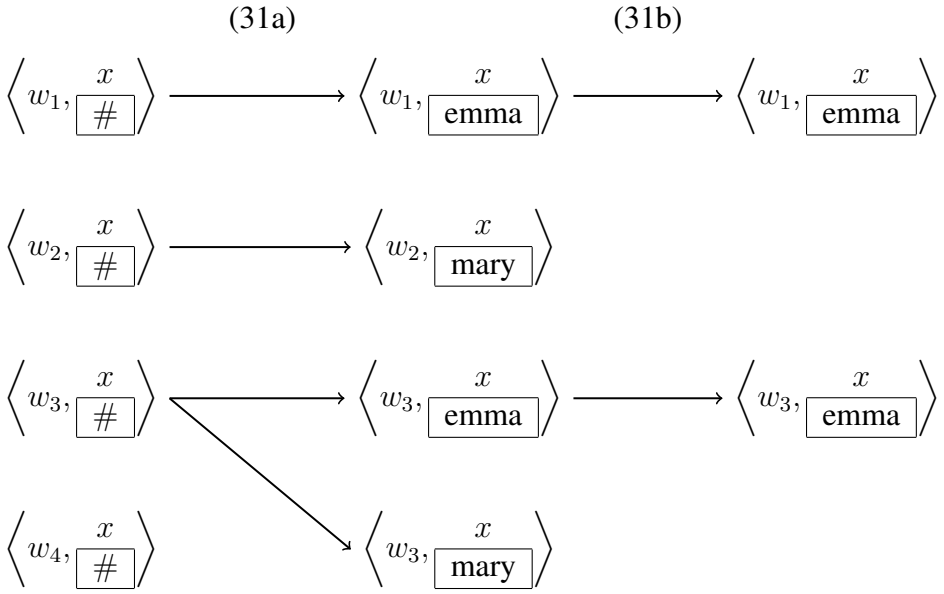


Figure 1: Diagram of updates of the discourse in (31)

We assume that propositions are functions from a set of states to a set of states. Note that this formulation parallels that of Heim (1983), but is slightly different from Groenendijk and Stokhof (1991), where propositions are relations of states; nevertheless, most definitions are inter-translatable. The one exception are presuppositions, which test that a property holds *across* the states in an input context; these will thus be easier to express in the current formulation. A full list of types is provided in Figure 2.

We now define logical operators and lexical items. Dynamic conjunction uses the output of the first proposition as the input of the second, as in (33). Introduction of a discourse referent at index u takes a set of states S and gives the set of states that differ from a member of S only with respect to the value that the assignment function assigns to u, as in (34)[1]. Predicates are filters that return only the states t in which a given property holds in t_w, as in (35). Negation is a filter that returns only those states in which the propositional complement does not hold, as in (36). Note that, as a test, negation does not pass along any discourse referents that may be introduced in its scope.

[1]The expression s$^{u \mapsto d}$ returns the state t that is exactly like s except that $t_g(u) = d$.

Type		Variables	Example
truth value			true, false
worlds		w	w_1, w_2
index		u, v	x, y
entity		d, e	john, mary
predicate	index → proposition	P, Q	LEFT, ZEBRA
assignment function	index → entity	g, h	$\begin{array}{\|c\|c\|}\hline x & y \\ \hline \text{al} & \text{eve} \\ \hline \end{array}$
state	⟨world, assign. fn.⟩	s, t	$\left\langle w_2, \begin{array}{\|c\|c\|}\hline x & y \\ \hline \text{al} & \text{eve} \\ \hline \end{array} \right\rangle$
context	state → truth value	S, T	$\left\{ \left\langle w_2, \begin{array}{\|c\|c\|}\hline x & y \\ \hline \text{al} & \text{eve} \\ \hline \end{array} \right\rangle, \left\langle w_5, \begin{array}{\|c\|c\|}\hline x & y \\ \hline \text{ed} & \text{ann} \\ \hline \end{array} \right\rangle \right\}$
proposition	context → context	φ, ψ	

Figure 2: List of types

(33) $\varphi\,;\,\psi \quad := \quad \lambda S.\psi(\varphi(S))$

(34) $[u] \quad := \quad \lambda S.\{t \mid \exists s \in S[\exists d[t = s^{u \mapsto d}]]\}$

(35) $P_{\text{dyn}}(u_1, ..., u_n) \quad := \quad \lambda S.\{t \mid t \in S \wedge P_{\text{stat}}(t_g(u_1), ..., t_g(u_n))(t_w)\}$

(36) $[\![\text{not}]\!] \quad = \quad \neg \quad := \quad \lambda\varphi\lambda S.\{t \mid t \in S \wedge \varphi(\{t\}) = \emptyset\}$

We are now in a position to build the tools needed to analyze negative concord. Recall that there are two proposed components to the meaning of negative concord: (i) the introduction of a discourse referent, syonymous to an existential, and (ii) a test that the extension of the discourse referent is empty. The first part of the definition is completely straightforward; (37) provides a definition of the existential quantifier *somebody*^{x}. The function takes a predicate, introduces a discourse referent at x, and then returns only those states s in which the predicate holds of $s_g(x)$ in s_w. As discussed in §3.1, the meaning of negative concord *nobody* will be of type $\langle Qt, t\rangle$, so it will in fact be built out of lifted *somebody*, as in (38).

(37) $[\![\text{somebody}^x]\!] \quad = \quad \lambda P.[x]; P(x)$

(38) $\text{LIFT}([\![\text{somebody}^x]\!]) \quad = \quad \lambda c.c(\lambda P.[x]; P(x))$

We then need to define the presupposition that tests that the extension of the discourse referent is empty. As a presupposition, this test must check that the relevant property holds in all worlds compatible with the common ground (Heim, 1983). In the present framework, a presupposition must hold in all states in the input context. As a presupposition, the test also does not return falsity in the case of failure, but infelicity, notated with #. This is implemented in the definition in (39). The function of '$\mathbf{0}_u$' is a global test (it looks across all states in the input context) that returns undefinedness if any state has an assignment function with a defined value at index u.

(39) $\mathbf{0}_u \quad := \quad \lambda S.\begin{cases} S & \text{iff } |S_g(u)| = 0, \quad \text{where } S_g(u) = \{x \mid \exists s \in S[x = s_g(u)] \wedge x \neq \#\} \\ \# & \text{otherwise} \end{cases}$

This definition is fundamentally modeled after Bumford (2017)'s global test for definites, which also implements a cardinality test across the assignment functions in the context. The principal difference between the two definitions lies in the cardinality tested: Bumford (2017)'s entry for *the* checks that there is one unique defined individual in the context; the above test checks that there are zero.[2]

3.3 The meaning of negative concord items

We can now assign a meaning to negative concord items, as the dynamic conjunction of (38) and (39), shown in (40). In this definition, the effect of split-scope can be seen in the fact that the test $\mathbf{0}_x$ appears *outside* the scope of c. As promised at the end of section §3.1, this is a definition that cannot be derived simply by lifting a generalized quantifier.

(40) $[\![\text{nobody}^x_{\text{NC}}]\!] \quad = \quad \lambda c.c(\lambda P.[x]; P(x)); \mathbf{0}_x$

We can now see how this compositionally derives the desired results. The meaning in (41) is repeated from our derivation in §3.1. Plugging this into NC *nobody* returns the meaning in (42).

(41) $[\![\text{Mary not see}]\!] = \lambda Q_{\langle et,t\rangle}[\neg Q(\lambda x[\text{see}(x)(\text{mary})])]$

(42) $[\![\text{Mary didn't see nobody}^x_{\text{NC}}]\!] \quad = \quad \neg([x]; \text{see}(x)(\text{mary})); \mathbf{0}_x$

To get a handle on the action of this denotation, let us compare NC *nobody* to the ordinary existential *somebody*, and show how we derive the desired pattern of results, exemplified in (43). (For simplicity, we will ignore the fact that *somebody* is itself a PPI.) Observe that the definition of NC *nobody* in (40) and of lifted *somebody* in (38) differ only in the addition of the function '$\mathbf{0}_x$'; thus, the dynamic computation up until this stage is identical.

(43) a. Ed saw somebody.
b. Ed didn't see somebody.
c. * Ed saw nobody.
d. Ed didn't see nobody.

Examples (44) and (45) show the dynamic behavior of the sentences '*Ed saw somebody*' and '*Ed didn't see somebody*,' uttered in a context in which only Ed has been previously mentioned, and where the three worlds under consideration are w_1, in which Ed saw only Sue, w_2, in which Ed saw only Ann, and w_3, in which Ed didn't see anybody. As observed above, negation ($\neg$) is a filter, so cannot return any assignments that were not in the input set.

[2]There a number of more subtle differences in the two analyses, that are encoded into the more general set-up of the system. Of note, Bumford does not want to derive that '*The child left*' presupposes that there is a single child that left. His system thus tracks not only the assignment functions in which the proposition is true, but also those in which it is false; his global test checks for uniqueness across both sets. '*The child left*' thus presupposes that there is a single child, whether or not they left.

(44) $[\![\text{Ed saw somebody}^{y}]\!]\left(\left\{\left\langle w_1, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle, \left\langle w_2, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle, \left\langle w_3, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle\right\}\right)$

$$= \left\{\left\langle w_1, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \text{sue} \\ \hline\end{array}\right\rangle, \left\langle w_2, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \text{ann} \\ \hline\end{array}\right\rangle\right\}$$

(45) $[\![\text{Ed didn't see somebody}^{y}]\!]\left(\left\{\left\langle w_1, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle, \left\langle w_2, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle, \left\langle w_3, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle\right\}\right)$

$$= \left\{\left\langle w_3, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed} & \# \\ \hline\end{array}\right\rangle\right\}$$

The only difference for NC *nobody* is an additional update with $\mathbf{0}_y$, evaluated on the output of the sentence with the existential. $\mathbf{0}_y$ checks that y is undefined in all assignments. The test is satisfied for '*Ed didn't see nobody*,' so it returns the same output as (45). It is not satisfied for '*Ed saw nobody*,' so it returns a presupposition failure.

4 Predictions

4.1 Locality

Cross-linguistically, the licensor of a NC item is known to obey certain locality constraints (see Longobardi 1992 for Italian; Przepiórkowski and Kupść 1997 for Polish). Déprez (1997), Giannakidou (2000), and de Swart and Sag (2002) observe that these locality constraints are closely tied to constraints on quantifier scope: a negative operator cannot license a NC item if the two are separated by a scope island. The sentences in (46) and (47) illustrate this correspondence with Greek stressed KANENAN, which Giannakidou (2000) shows to be a NC item. The same environments that delimit the scope of quantifiers also block the licensing of NC items. (Below, these scope islands are indicated with angled brackets.)

(46) Scope-islands block NC item licensing (Greek, Giannakidou 2000)

a. * Dhen lipame ⟨pu pligosa KANENAN⟩.
Not regret that hurt nobody$_{\text{NC}}$
Desired: 'I don't regret that I hurt anybody.'

b. O Pavlos dhen theli na dhi KANENAN.
the Paul not want SUBJ see nobody$_{\text{NC}}$
'Paul doesn't want to see anybody.'

(47) Scope-islands block inverse scope of universals (Greek, Giannakidou 2000)

a. Kapjos fititis lipithike ⟨pu kathe kathijitis tis sxolis apolithike⟩.
Some student regretted that every professor the department got-fired.
'Some student regrets that every professor in the department got fired.
$*\forall > \exists \quad \checkmark\exists > \forall$

b. Kapjos kathijitis ihele kathe ipopsifios s' afti ti lista na vri dhulja.
Some professor wanted every candidate in this the list SUBJ find job
'Some professor wanted every student on this list to find a job. $\checkmark\forall > \exists \quad \checkmark\exists > \forall$

Giannakidou (2000) uses this as evidence that NC items take scope. Under her analysis, NC items are universal quantifiers that take scope above negation. The present analysis differs in the denotation of NC items, but the analysis makes exactly the same predictions with respect to scope islands. On the present analysis, the structural configuration that licenses NC items is one in which the NC item takes split scope around its licensor. Scope islands block scope-taking, so disallow this logical form.

As it turns out, similar locality effects have been found for distributive concord and definite concord. In the Hungarian sentence in (48), an island intervenes between the distributive-marked numeral and the quantifier *minden*, 'every.' In other circumstances, *minden* can license *két-két*, but the island blocks the process, yielding ungrammaticality. In the English expression in (49), an island intervenes between the two definite DPs; as a result, the phrase cannot be used felicitously in a situation with multiple doctors and multiple patients, but only one doctor-patient pair such that the doctor knows which treatment cured the patient (*cf.* '*the doctor who cured the rabies patient*').

(48) * Minden professzor azt mondta, hogy meglepné, ha ⟨két-két diák diplomát szerezne⟩.
every professor DEM said that surprised if two-two student diploma receive
'Every professor said that he would be surprised if two students graduated.'
(Hungarian, Kuhn 2017)

(49) # the doctor who knows ⟨which treatment cured the rabies patient⟩
[in a context with multiple rabies patients] (English, Bumford 2017)

Each of these effects is predicted on an analysis in which licensing is explained via scope-taking.

4.2 Licensors beyond negation

In §2, I sketched an informal version of the analysis that predicted the set of operators that should act as licensors, beyond negation. We saw that the (downward entailing) quantifier *few* is not predicted to license NC items, but operators like *without* are predicted to license NC items. Here, we spell out the case of generalized quantifiers in more detail.

A relatively recent literature has investigated the dynamic potential of different kinds of generalized quantifiers, including the discourse referents that they themselves introduce, as well as those of indefinites that appear in their scope (van den Berg, 1996; Nouwen, 2003; Brasoveanu, 2008). In descriptive terms, a quantifier in a sentence of the form 'Q A B' systematically introduces a plural discourse referent corresponding to its refset ($[\![\text{A}]\!] \cup [\![\text{B}]\!]$), and admits plural discourse referents collecting the values of any indices introduced in its scope. Thus, the sentences in (50) will collect the set of all children who saw a cat at index x and the set of all cats they saw at index y.

(50) a. Several^{x} children saw a^{y} cat.
b. Few^{x} children saw a^{y} cat.
c. No^{x} children saw a^{y} cat.

We simplify the analyses above by assuming that these discourse referents are sums of individuals. We can illustrate the behavior of quantifiers with an example. We assume the starting context C_0 in (51) with the worlds described in (51a) and the assignment function in (51b).

(51) a. w_1: Ed saw cat_1, Sue saw cat_2, Al saw cat_3. Nobody else saw any cats.
w_2: Ed saw cat_4, Sue saw cat_5, Al saw cat_6. Nobody else saw any cats.
w_3: Sue saw cat_1 and Al saw cat_2. Nobody else saw any cats.
w_4: No children saw any cat.

b. $g = \begin{array}{|c|c|}\hline x & y \\ \hline \# & \# \\ \hline \end{array}$

c. $C_0 = \{\langle w_1, g\rangle, \langle w_2, g\rangle, \langle w_3, g\rangle, \langle w_4, g\rangle\}$

Assuming that *few* means 'two or less' and *several* means 'three or more,' updating with each of the sentences in (50) thus gives us the following output states.

(52) $[\![(50a)]\!](C_0) = \left\{ \left\langle w_1, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed}\oplus\text{sue}\oplus\text{al} & \text{c}_1\oplus\text{c}_2\oplus\text{c}_3 \\ \hline \end{array} \right\rangle, \left\langle w_2, \begin{array}{|c|c|}\hline x & y \\ \hline \text{ed}\oplus\text{sue}\oplus\text{all} & \text{c}_4\oplus\text{c}_5\oplus\text{c}_6 \\ \hline \end{array} \right\rangle \right\}$

$[\![(50b)]\!](C_0) = \left\{ \left\langle w_3, \begin{array}{|c|c|}\hline x & y \\ \hline \text{sue}\oplus\text{al} & \text{c}_1\oplus\text{c}_2 \\ \hline \end{array} \right\rangle, \left\langle w_4, \begin{array}{|c|c|}\hline x & y \\ \hline \# & \# \\ \hline \end{array} \right\rangle \right\}$

$[\![(50c)]\!](C_0) = \left\{ \left\langle w_4, \begin{array}{|c|c|}\hline x & y \\ \hline \# & \# \\ \hline \end{array} \right\rangle \right\}$

This explains the licensing of NC items. Under *several*, the index y is defined in all output states. Under *few*, the index y is defined in some states, and remains undefined in states with no cat seen. Under *no*, the index y remains undefined in all output states. The global test $\mathbf{0}_y$ is only satisfied in the last of these. The analysis thus correctly predicts that *few* does not license NC items. What about *no*? Following the definitions above, we should expect that '*no children*' will license NC items. The situation is complicated, though, by the fact that many of the operators that block introduction of discourse referents in non-concord languages are exactly those words that are translated as NC items in concord languages: *nobody, nothing, never, no N,* and so on. Nevertheless, in §5, I will argue that there are indeed some cases in which these operators can be used with a meaning like that of Standard English, blocking introduction of discourse referents. Namely, in 'non-strict' concord languages, I will propose that NC items in preverbal position may be interpreted as having universal negative force. In these cases, the analysis correctly predicts that the operators can license further NC items in their scope. This being said, evaluation of these predictions will depend on the ultimate analysis of NC items in non-strict concord languages.

There remain a handful operators besides negation that license NC items that do not face the confound above. Most clearly, one operator robustly attested cross-linguistically is *without*. Section 2 provided an example from Italian; sentences (53) and (54) provide further examples from French and Greek. (See Zeijlstra 2004 for examples from Czech, Polish, Romanian, Hungarian, Hebrew, Spanish, and Portuguese.)

(53) Jean est parti sans rien dire à personne.
Jean AUX left without $\text{nothing}_{\text{NC}}$ say to $\text{nobody}_{\text{NC}}$
'Jean left without saying anything to anybody.' (French)

(54) ... xoris na dhi KANENAN.
... without SUBJ see $\text{nothing}_{\text{NC}}$
'...without having seen anybody.' (Greek, Giannakidou 2000)

Informally, the explanation for licensing by *without* is clear: if X happened without Y happening, then Y did not happen, so no discourse referents are introduced that are involved in a Y-ing event. More generally, though, the precise predictions for a given operator will depend on its precise dynamic definition. In well-studied cases, like the case of generalized quantifiers, broad generalizations have been made that derive dynamic meanings from static meanings, but this is not the case across the board. Not only are there many operators for which the dynamics have not been studied, it is additionally possible that fine variation in the lexical semantics will modulate judgments across languages, dialects, and registers. It may further turn out that the ability to license NC items is a gradient property. Chemla et al. (2011), for example, argue that the grammaticality of NPIs like English *any* and *ever* is best predicted not by whether or not a context is downward entailing or not, but by the degree to which people *perceive* a context to be downward entailing. A similar situation could easily hold for NC item licensing.

4.3 The relation to anti-additivity

As we have seen, the set of operators that license NC items is more constrained than simply those that are downward entailing; for example, *few* is downward entailing, but does not license NC items. In previous work, the operators that license NC items have been characterized as those that are *anti-additive* (Zwarts, 1998; Ladusaw, 1992; van der Wouden and Zwarts, 1993). Downward entailing operators are those that preserve the inference in (55). Anti-additive operators additionally preserve the converse inference, in (56).

(55) a. An operator f is *downward entailing* iff $f(X \cup Y) \rightarrow f(X) \cap f(Y)$
b. e.g. 'Few people danced or sang' $\rightarrow$ 'Few people danced and few people sang.'

(56) a. An operator f is *anti-additive* iff $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$
e.g. 'Nobody danced or sang' $\leftrightarrow$ 'Nobody danced and nobody sang.'

In my analysis above, my characterization of the licensors of NC items is intuitively rather different. On my analysis, the set of NC licensors are those that block the introduction of a discourse referent in their scope. Let us call these *dref-blocking* operators. What is the relation between anti-additive operators and dref-blocking operators? For many lexical operators, these two properties coincide. We can go through the list: operators that are both anti-additive and dref-blocking include: *not*, *without*, *nobody*, *nothing*, *never*, *no*. Operators that are downward entailing but neither anti-additive nor dref-blocking include: *few*, *less than N*, *not all*.

Nevertheless, the two properties are not equivalent, and neither is stronger than the other. For simplicity, let us limit ourselves just to quantifiers of type $\langle et, \langle et, t\rangle\rangle$. Based on the generalizations described in §4.2, we will assume that an operator Q is dref-blocking if $Q(A)(B) \rightarrow A \cap B = \emptyset$. First, let us consider the hypothetical quantifier Q_1, defined in (57). By the assumption above, this is is dref-blocking, since $Q_1(N)(P)$ entails that $N \cap P$ is empty. On the other hand, the quantifier is *not* anti-additive: $Q_1(N)(X) \wedge Q_1(N)(Y)$ does not entail $Q_1(N)(X \cup Y)$.

(57) a. $Q_1 = \lambda N \lambda P\,.\,\text{no}'(N)(P) \wedge \text{few}'(N)(\text{want}'(P))$
b. 'Q_1 children left' $\leftrightarrow$ 'No children left, and few of them wanted to leave.'

Of course, this operator seems very 'unnatural,' in that it consists of the conjunction of quantifiers of different quantificational forces which perform different operations on the predicate. Even if such a predicate were to exist in natural language, it is unclear that our simplifying assumption about the definition of dref-blocking would hold.

Moving towards 'real' natural language operators, there nevertheless remain operators for which the two logical properties are dissociated. Of note, on its restrictor argument, the universal quantifier *every* is anti-additive but is not dref-blocking. The equivalence in (58) can be checked to show that *every* is anti-additive on its restrictor argument. On the other hand, $\forall x[N(x) \rightarrow P(x)]$ certainly does not entail that $N \cap P$ is empty. More to the point, discourse referents introduced in the restrictor of a universal are by now well known to project their dynamic potential beyond the clause and even beyond the sentence boundary (van den Berg, 1996; Nouwen, 2003; Brasoveanu, 2008). As seen empirically in (59), the restrictor of a universal is not dref-blocking.

(58) $\forall x[M(x) \rightarrow P(x)] \wedge \forall x[N(x) \rightarrow P(x)] \quad \leftrightarrow \quad \forall x[[M(x) \vee N(x)] \rightarrow P(x)]$

(59) Every friend of mine with a plant takes good care of it. They each water it every day.

With respect to this operator, then, we can evaluate the predictions of the two logical properties. Does the restrictor of *every* license NC items or not? First, we address one potential confound: relative clauses are generally scope islands, so, regardless of theory, NC items are predicted not be grammatical in a relative clause modifying the restrictor of a universal quantifier, since locality is not satisfied ('Every boy who loves nobody$_{\text{NC}}$...'). On the other hand, modification with a prepositional phrase does not create a scope island; the sentence in (60) allows the '$\forall > \exists$' reading.

(60) Un rappresentante di ciascuna regione farà parte del gruppo di redazione.
One representative of each region will-take part of-the group of writing.
'One representative from each region will take part in the drafting team.' (Italian)

As seen in (61), these environments do not license NC items, despite having a local anti-additive operator. In this case, then, looking at the dynamic properties of the operator provides us with better predictions than theories based on anti-additivity.

(61) * Ogni rappresentante di nessuna regione farà parte del gruppo di redazione.
Every representative of no$_{\text{NC}}$ region will-take part of-the group of writing.
Desired: 'Every representative from any region will take part in the drafting team.'

In sum, for many operators, we have seen that the theory outlined above coincides with the property of anti-additivity, previously argued to be the semantic property responsible for licensing NC items. On a few cases, the two theories can be dissociated, however. On at least one clear front, the present theory makes better predictions than theories based on anti-additivity.

5 Negative uses of NC-items

Our point of departure included two desideratum: (i) to explain the distributional properties of NC items, and (ii) to explain the apparent presence of two different meanings of NC items. Up to this

point, I have accomplished the first: providing an analysis that explains why NC items need to be licensed by a sufficiently local anti-additive operator. In this section, I address the second point: how do we explain NC items when they appear to carry negative force themselves?

As a reminder, whereas many uses of NC items need to appear below an anti-additive licensor, there are a number of uses of these words in which they appear without any overt licensor. As mentioned in the introduction, the clearest such example is the case of fragment answers, where an NC item may appear without an overt negation, but nevertheless carries negative force.

(62) Chto Marija videla? Nichego. (Russian)

(63) Cosa ha visto Maria? Niente. (Italian)
'What did Mary see? Nothing.'

Exactly where these 'licensor-free' uses can appear is subject to cross-linguistic variation. Notably, negative concord languages can be roughly divided into two different categories: *strict* concord languages and *non-strict* concord languages (Giannakidou, 2000; Zeijlstra, 2004), though a few languages display both patterns (Catalan: Espinal 2000, Hungarian: Szabolcsi 2018). In strict concord languages, when an NC item appears in preverbal position, it requires negation in order to be grammatical, just like NC items in postverbal position. Example (64) gives an example from Russian, a strict concord language. In non-strict concord languages, there is an asymmetry between perverbal and postverbal position: when an NC item appears before the verb, it does not need an overt licensor, and indeed is not compatible with negation. Example (65) gives an example from Italian, a non-strict concord language.

(64) a. Nikto ne zvonil. (Russian)
b. * Nikto zvonil.

(65) a. * Nessuno non ha telefonato. (Italian)
b. Nessuno ha telefonato.
'Nobody called.'

When Italian *nessuno* is used in preverbal position, no additional negative marker appears in the sentence, and yet the sentence carries a negative meaning. The use of *nessuno* thus appears very similar to Standard English *nobody*, which itself carries negative force.

5.1 How many meanings?

In the descriptive generalizations of the patterns above, I have stated that NC items 'appear' to bear two different meanings, depending on the context, but whether there are actually one or two denotations involved depends on the analysis one adopts.

Two general directions are possible. On the first kind of analysis, NC items always bear the same meaning—one that is fundamentally existential, and which requires an anti-additive licensor. In certain cases, though, a silent negative operator can appear in the structure, licensing NC items that appear below it. This is postulated to be the case for the uses of NC items in fragment answers

and NC subjects in non-strict concord languages. Such an analysis must explain why covert negative operators can appear sometimes in the derivation, but not always (e.g. 'Mary called' can never be used to mean 'Mary didn't call' in any NC language, strict or non-strict). This line of analysis, and the explanation for where silent operators appear, has been pursued by Ladusaw (1992); Zeijlstra (2004); Chierchia (2013), among others.

On the second kind of analysis, NC items are ambiguous between two meanings. Some uses of NC items are existential, and require an anti-additive operator; other uses of NC items carry negative force themselves, like Standard English *nobody*. Notationally, I will distinguish these uses with subscripts: *nobody*$_{\text{NC}}$ refers to the 'concord' use of the NC item, which must be licensed by an anti-additive operator; *nobody*$_{\neg}$ refers to the use on which the NC item itself contributes negative force. Such an analysis has been pursued by van der Wouden and Zwarts (1993); Herburger (2001). This second line of analysis also faces explanatory challenges. First: what is the relation, if any, between these two meanings? Second: what explains the distribution of where the two meanings can appear?

Here, I propose an analysis of the second kind (i.e., two different denotations), but in which the negative use *nobody*$_{\neg}$ is systematically derived from the concord use *nobody*$_{NC}$. Strikingly, I show that this shift in meaning results immediately from a shift from presupposed to at-issue meaning, motivated independently from the behavior of presupposition elsewhere. *Nobody*$_{\neg}$ is the at-issue counterpart of *nobody*$_{NC}$. Distributional facts are explained in part by syntactic and semantic considerations regarding information structure.

5.2 Presupposed vs. at-issue content

At-issue content and presupposed content act differently from each other. In analyses based on context sets (Stalnaker, 1973; Heim, 1983; Schlenker, 2009), a presupposition must be true in all worlds in the input context, and results in undefinedness if not satisfied. An at-issue proposition filters out worlds, and results in falsity when there is no world in which it is satisfied. We can see the two kinds of meaning as different ways to interpret propositions, as seen in the common decomposition of presupposition triggers into their presupposed and at-issue components.

(66) John stopped smoking.
= *Presupposition:* John used to smoke + *At-issue:* John does not now smoke

As it turns out, what is presupposed and at-issue may vary, depending on the information structure of the discourse (Karttunen, 1971; Simons, 2007; Beaver, 2010). For example, although in many contexts the verb *notice* presupposes that its complement is true, there are certain contexts in which all parts of its meaning are at-issue.

(67) If I notice that he's cheating, he will be penalized.
= If he is cheating and I notice it, he will be penalized.

A number of modern analyses have explained the relation between presupposed and at-issue content on the basis of fundamental pragmatic principles (e.g. Schlenker 2009; Beaver et al. 2017). For the our present purposes, though, I will describe the relation between at-issue and presupposed

content using type-shifters. Note that these are *not* intended to be syntactic operators; they are merely a descriptively explicit short-hand for the semantic effect of the relevant pragmatic processes.

Given an at-issue, dynamic proposition φ, the semantic shift in (68) expresses what it means to interpret φ as a presupposition. Presuppositions must be true in every single state in the context set; if not, they result in infelicity (#). Conversely, given a dynamic presupposition ψ, the semantic shift in (68) expresses what it means to interpret ψ as an at-issue proposition. The new meaning filters out only those states that do not generate a presupposition failure.

(68) $\textsc{presup}(\varphi) = \lambda S. \begin{cases} S & \text{iff } \forall s \in S, \varphi(\{s\}) \neq \emptyset \\ \# & \text{otherwise} \end{cases}$

(69) $\textsc{at-issue}(\psi) = \lambda S.\{t : t \in S \wedge \psi(\{t\}) \neq \#\}$

These type-shift rules allow us to be descriptively explicit about the meanings of the sentences above. The meaning of *stop* can be stated as the dynamic conjunction of a presupposed and a non-presupposed proposition. The semantic shift of *notice* in (67) is equivalent to AT-ISSUE applying to the proposition as a whole.

(70) $[\![\text{John stopped smoking}]\!] = \textsc{presup}([\![\text{John used to smoke}]\!]); [\![\text{John doesn't smoke}]\!]$

(71) $\textsc{at-issue}([\![\text{I notice that he's cheating}]\!]) = [\![\text{he's cheating}]\!]; [\![\text{I notice that he's cheating}]\!]$

5.3 Derivation of *nobody*$_\neg$

I claim that the uses in which NC items bear negative force are derived from concord uses of NC items via a shift of presupposed meaning to at-issue meaning. The proposal is summarized in (72).

(72) $[\![\text{nobody}_\neg]\!](c) = \textsc{at-issue}([\![\text{nobody}_{\text{NC}}]\!](c))$

Let us recall the definition of *nobody*$_{\text{NC}}$ proposed above. In (73), $\mathbf{0}_x$ is a presupposition, so the result is either # (when $\mathbf{0}_x$ is not satisfied) or the output of $c(\text{somebody}^x)$.

(73) $[\![\text{nobody}^x_{\text{NC}}]\!] = \lambda c.c(\lambda P.[x]; P(x)); \mathbf{0}_x = \lambda c.c(\text{somebody}^x); \mathbf{0}_x$

(74) $\mathbf{0}_u := \lambda S. \begin{cases} S & \text{iff } |S_g(u)| = 0 \\ \# & \text{otherwise} \end{cases}$

Applying the AT-ISSUE rule in (69) to the meaning of *nobody*$_{NC}$ in (73), we thus derive the meaning for *nobody*$_\neg$ in (75a), paraphrased in (75b).

(75) a. $[\![\text{nobody}^x_\neg]\!] = \lambda c \lambda S.\{t : t \in S \wedge |(c(\text{somebody}^x)(\{t\}))_g(x)| = 0\}$

b. 'Return the set of states h such that, if I had updated $\{h\}$ with *somebody Xed*, then checked that for individuals witnessing that proposition, I wouldn't have found any.'

5.4 Examples

Here, we show that this definition derives the desired meanings. We start with the Italian example of a NC item in subject position, repeated in (76). Following the definitions in §3, this is assigned the meaning in (77). As we have already observed, if left unmodified, this results in a presupposition failure, since it introduces an individual at index x, then checks that there is no individual at index x.

(76) Nessuno ha telefonato.
'Nobody called.'

(77) $[\![\text{nessuno}^x_{\text{NC}}]\!]([\![\text{ha telefonato}]\!]) = \lambda c[c(\lambda P.[x]; P(x)); \mathbf{0}_x](\lambda Q.Q[\lambda u.\textsc{called}(u)])$
$= [x]; \textsc{called}(x); \mathbf{0}_x$

However, following to the hypothesis above, we assume that when Italian *nessuno* appears in subject position, its meaning is shifted to an at-issue contribution. We thus apply the AT-ISSUE rule to the meaning derived in (77). We assume the context set given in (78), with the four worlds described in (79) and $g(x) = \#$. The meaning of AT-ISSUE instructs us to consider what happens to each singleton set containing one of the elements of S_0 when updated with (77).

(78) $S_0 = \{\langle w_1, g\rangle, \langle w_2, g\rangle, \langle w_3, g\rangle, \langle w_4, g\rangle\}$

(79) w_1: Only John called.
w_2: Only Mary called.
w_3: John and Mary both called.
w_4: Nobody called.

When $\{\langle w_1, g\rangle\}$ is updated with (77), we first introduce an individual in g at x, then check that x called in w_1; the output is $\{\langle w_1, h\rangle\}$, where h which is identical to g except that $h(x) =$ john. We then evaluate $\mathbf{0}_x$; the tests returns $\#$, since the value of x is defined in h. For analogous reasons, updating $\{\langle w_2, g\rangle\}$ and $\{\langle w_3, g\rangle\}$ with (77) also returns $\#$. But consider what happens when $\{\langle w_4, g\rangle\}$ is updated with (77). We first introduce an individual in g at x, then check that x called in w_4. Since nobody called in w_4, the output of the update is the empty context, $\{\}$. But the algorithm is not yet finished; we now evaluate $\mathbf{0}_x$. The test is trivially satisfied, since there are no states in $\{\}$, so there are no states s such that $s_g(x)$ is defined. The test $\mathbf{0}_x$ thus returns its input context, $\{\}$—it does *not* return $\#$. The definition of AT-ISSUE returns the set of states that do not result in $\#$ when updated as singleton contexts. The output of AT-ISSUE$((77))(S_0)$ is thus $\{\langle w_4, g\rangle\}$. The algorithm only returns states containing worlds in which nobody called.

Let us now turn to an ungrammatical Italian example, with a NC item in subject position and sentential negation, shown in (76). Following the definitions in §3, this is assigned the meaning in (77). As we have already observed, if left unmodified, the sentence is predicted to be felicitous, with the meaning that nobody called.

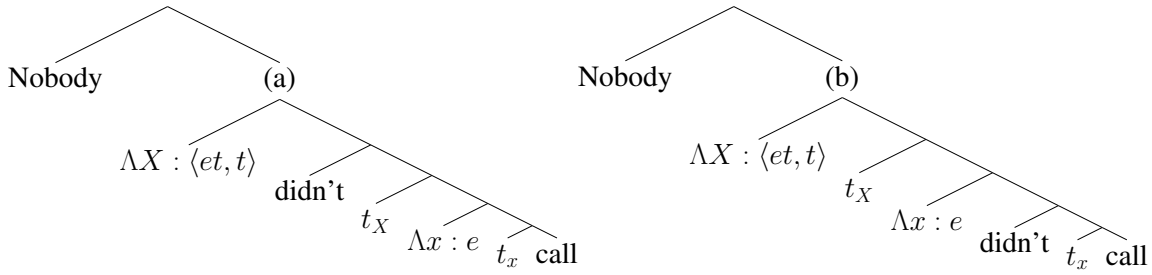
(80) * Nessuno non ha telefonato.

(81) $[\![\text{nessuno}^x_{\text{NC}}]\!]([\![\text{non ha telefonato}]\!]) = \lambda c[c(\lambda P.[x]; P(x)); \mathbf{0}_x](\lambda Q.\neg Q[\lambda u.\textsc{called}(u)])$
$= \neg([x]; \textsc{called}(x)); \mathbf{0}_x$

However, following to the hypothesis above, we assume that when Italian *nessuno* appears in subject position, its meaning is shifted to an at-issue contribution. We thus apply the AT-ISSUE rule to the meaning derived in (77). But now, we run into an unusual situation. Because the presupposition is satisfied in (81), it will also be satisfied for all singleton subsets of the context. This guarantees that AT-ISSUE((81)) will be a tautological assertion that has no effect on the context set. I assume that a pragmatic principle of *non-triviality* rules out this utterance (Schlenker, 2009).

There is another possible derivation for the sentence in (80)—one that does not result in triviality, but instead gives rise to a meaning of double negation, like Standard English '*Nobody didn't call.*' What differs on this derivation is not the interpretation of *nessuno*, but rather the structure of its complement. Whereas previous derivations have assumed that the complement of *nessuno* is of the form in (82a), it is also possible to QR the quantifier in such a way to produce a 'non-reconstructed' subject, as in (82b), with the meaning in (83b). Such a structure would generate a presupposition failure for standard *nobody*$_{\text{NC}}$, which requires split scope around the anti-additive operator, but the derivation proceeds without problem when the negative concord item is made at-issue. The logic proceeds similarly to the example in (76), and the sentence only returns states containing worlds in which there is no person who didn't call. With the relevant supporting context, such readings do seem to be marginally available in non-strict concord languages.

(82)



(83) a. $[\![(82a)]\!] = \lambda Q.\neg Q(\text{call}') \quad :: \quad \langle Q, t\rangle$

b. $[\![(82b)]\!] = \lambda Q.Q(\neg\text{call}') \quad :: \quad \langle Q, t\rangle$

Finally, we observe that the the derived meaning of *nobody*$_\neg$ should be able to license further NC items in its scope. Intuitively, this is because '*nobody*$_\neg$ Xed' entails that the set of people who Xed is empty. Technically, we observe that the definition in (75) does not preserve updates to the assignment function that may have been introduced by its complement c. Empirically, the prediction is borne out; in the Italian sentence in (84), the NC item *niente* is grammatical. As promised in §4.2, *nessuno*$_\neg$ is thus another operator that blocks the introduction of discourse referents.

(84) Nessuno ha visto niente. (Italian)
'Nobody saw anything.'

5.5 The role of information structure

As mentioned above, the availability of 'licensor-free' NC items is restricted to certain environments: to fragment answers of questions and, in non-strict NC languages, to syntactic positions before the verb. We note that preverbal positions are not restricted to subjects, nor are subjects

restricted to preverbal position, as material may move via topicalization. In (86a), if the prepositional phrase *con nessuno* is moved before the verb, the negative concord item does not need (and cannot take) overt negation; in (86b), if the subject *nessuno* remains after the verb, the negative concord items requires an overt negation.

(85) Con nessuno ha parlato Maria.
with nobody$_{NC}$ has spoken Maria
'Mary has spoken to anybody'

(86) Non ha telefonato nessuno.
not has telephoned nobody$_{NC}$
'Nobody called.' (Italian, cf. Ladusaw 1992)

A standard analysis of these cases is that the negative operator *non* in non-strict concord languages can only take scope over linguistic objects that it c-commands. Linear order corresponds directly to hierarchical order, so *non* can only license NC items that appear to its right. For Zeijlstra (2004) and Chierchia (2013), when a NC item appears hierarchically too high to be licensed by overt sentential negation, it triggers a 'last-resort' option, in which a covert negative operator scopes over the entire sentence.

I see no reason why a similar 'last-resort' analysis cannot be be transferred directly over to the present analysis. Whenever possible, NC items must be licensed by a (dref-blocking) negative operator. When hierarchical structure prevents such an operator scoping above the NC item, the NC item shifts its presupposed meaning to an at-issue contribution in order to avoid a presupposition failure. In doing so, it becomes itself an operator that can license further NC items, as seen above. Of course, in any of these theories, the mechanics of 'last-resort' need to be spelled out. For example, in order to prevent sentences like (87) from being saved by a covert negation or a meaning-shift, the mechanism will require comparison to competing forms of the sentence in which overt sentential negation is present.

(87) * Maria ha visto niente.
Mary has seen nothing$_{NC}$

All this being said, the analysis presented in §5.3 suggests an alternative explanatory direction, that may replace or supplement the last-resort analysis. Notably, in evoking what is presupposed and at-issue in the meaning of negative concord, the analysis above opens the door to interactions with information structure. For example, because hierarchical order is confounded with linear order, we do not know whether what is important is that these NC items appear *higher* than sentential negation or *before* sentential negation. Critically, information structure is known to interact with the linear order of a sentence (Birner and Ward, 2009). Functionally speaking, in a sentence with a preverbal NC item, sentential negation is no longer necessary, since it presents no new information. (See also Barker and Shan (2014) for a theory of Negative Polarity Item licensing in terms of linear order.)

Appealing to information structure may also be able to provide explanations for interactions with other properties of a sentence, such as the role of intonation. Examples from several different languages make the point. First, in English dialects that have negative concord, Labov (1972)

reports that double negation readings may be made available by stressing the NC items. Zeijlstra (2004) presents analogous results for Italian. The present analysis can explain these examples if focus marking shifts presupposed meaning to at-issue meaning in these languages.

(88) a. I didn't tell John to paint none of these. (NC variants of English, Labov 1972)
'I didn't tell John to paint any of these.'
b. I DIDN'T tell John to paint NONE of these.
'It's not the case that I told John to paint none of these.'

(89) Non ha telefonato NESSUNO. (Italian, cf. Zeijlstra 2004)
'Nobody didn't call.'

Second, in Catalan, negation following a preverbal NC item turns out to be optional, which poses a large challenge for a purely last-resort analysis, since a synonymous and 'better' competing form is available. On the other hand, Espinal et al. (2016) show that the interpretation of the NC item depends significantly on its prosody. Speakers of Catalan are significantly more likely to assign a double negation interpretation to (90b) if the NC item has a 'contradiction contour' (L+H* L!H%).

(90) a. Ningú ha menjat postres.
$\text{nobody}_{\text{NC}}$ has eaten dessert
'Nobody has eaten desert.'
b. Ningú no ha menjat postres.
$\text{nobody}_{\text{NC}}$ not has eaten dessert
i. 'Nobody has eaten desert.'
ii. 'Nobody hasn't eaten dessert.' (Catalan, Espinal et al. 2016)

Finally, Szabolcsi (2018) shows that Hungarian, similarly to Catalan, displays patterns of both strict and non-strict concord. The NC item *senki*, 'nobody,' acts as a strict concord item, requiring sentential negation, but, when paired with focus particle *sem*, 'even,' the combined item acts as a non-strict NC item: *senki sem* can appear in preverbal position without overt sentential negation.

(91) a. Senki nem szólt.
$\text{nobody}_{\text{NC}}$ not spoke.
'Nobody spoke.'
b. Senki sem szólt.
$\text{nobody}_{\text{NC}}$ FOC spoke.
'Nobody spoke.' (Hungarian, Szabolcsi 2018)

These examples pose serious challenges for pure last-resort theories as well as for theories, such as Zeijlstra (2004) that posit that the distinction between strict and non-strict division concord is a language-level parameter. Although we do not here attempt a full analysis of these data, I hope that a way forward is clearer: the environments in which NC items can shift their meaning may depend on a variety of features relevant to information structure, including linear order, prosody, and other markers of topic and focus.

Finally, we turn to fragment answers to questions, in which both strict and non-strict NC items appear to carry a negative meaning. In previous work in which NC items do not inherently bear negative force, these cases have again been typically been analyzed as involving the presence of a covert negation. For Zeijlstra (2004), this is the covert 'last-resort' operator that licenses NC items elsewhere. For Giannakidou (2000), the ability for NC items to appear in fragment answers critically depends on the analysis of fragment answers as ellipsis (Merchant, 2001): the negative operator licensing the NC item is deleted along with the rest of the sentence. As Zeijlstra (2004) observes, though, an ellipsis-centric analysis faces challenges with respect to the cross-linguistic inability for NPIs to appear in fragment answers. If ellided negative operators can license NC items, nothing should be able to prevent them from also licensing NPIs, as in (93b).

(92) Quién vino? Nadie. (Spanish, Herburger 2001)
'Who came? Nobody.'

(93) * Quién vino? Un alma.
'Who came? A single soul.'

Again, the analysis presented here changes the perspective. Recent work on presupposition and information structure has shown that what is at-issue in a sentence is largely determined by the question under discussion (Beaver et al., 2017). For fragment answers, the question under discussion that they are answering is the question that licenses their very existence; we should thus not be surprised that they are fully at-issue. For the denotation we have hypothesized for NC items, we have seen that this shift results in a negative meaning, predicting the attested patterns. Notably, NPIs do not share this denotation, so shifting what is at-issue for a NPI cannot produce a negative meaning.

6 Conclusion

I have presented a novel theory of negative concord items based on their dynamic properties. The intuition is simple: NC items check that the set of discourse referents that they introduce is empty. I have shown that, implemented correctly, this condition correctly predicts the range of operators that license NC items. A new explanation has also been provided for the negative uses of NC items. I show that these uses are exactly the meaning that is derived by shifting what is at-issue in the denotation of the NC item. On a larger scale, the dynamic analysis provided here builds a unified, semantic perspective of concord phenomena more generally, mirroring theories built independently for distributivity and definiteness.

Acknowledgments

Thank you to Adrian Brasoveanu, Dylan Bumford, Simon Charlow, Milica Denic, Salvador Mascarenhas, and Benjamin Spector.

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