

# Generalized Scope Economy – Not too strong !\*

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Note also that if the relevant Quantifier Phrases occur in object position rather than in subject position, we get a reversed pattern. In the case of (2a), the inverse-scope reading (equivalent to ‘John met no student of mine on time’) is not available, while the inverse-scope reading is accessible in the case of (2b) (‘There are more than three students of mine who John did not meet on time’).<sup>2</sup>

- (2) a. John didn’t meet every student of mine on time       $(\neg > \forall) *(\forall > \neg)$   
 b. John didn’t meet more than three students on time       $(\neg > \exists) (\exists > \neg)$

As far as we know, the only attempt to account for these types of restrictions in a general way is due to [Beghelli & Stowell \(1997\)](#). These authors propose to account for all the observed restrictions in terms of a *cartographic* analysis. They assume that CSSOs such as QR or reconstruction target different landing sites depending on the surface position and the nature of the item that undergoes the operation. The goal of such an analysis, then, is to find a clause structure where, for instance, universal quantifiers and indefinites in subject position end up in different locations at the level of Logical Form. Depending on how these locations are positioned relative to negation, some of the observed scope restrictions follow. Although this proposal has broad empirical coverage, it is not really explanatory, since it does not provide any principled account of why the hierarchy of landing sites is the way it is. Such a cartographic approach is at most descriptively adequate (see also [Liu 1990, 1997](#)).

Before going on, we should mention another interesting approach which does provide a principled account of some restrictions on the application of CSSOs but only covers a very limited number of examples. [Büring \(1997\)](#) shows how considerations of information structure can explain why certain expected scope ambiguities are sometimes missing. [Büring \(1997\)](#) points out that (1a) becomes unambiguous when negation is focused and the subject is interpreted as a contrastive topic, due to the fact that it bears the so-called B-accent ([Jackendoff 1972](#)), as in (3). That is, (1a), with an intonation as in (3) becomes unambiguous in the same way as (2a) (/ indicates a rising and \ a falling contour).

- (3) /EVERY student of mine DIDN’t\ show up on time       $*(\forall > \neg) (\neg > \forall)$

<sup>2</sup> One could in principle object to the significance of this fact based on the following consideration: as we will discuss in section 6, some indefinites are known to be able to get a wide-scope interpretation even when they occur in a scope island, and for this reason it has been proposed that such wide-scope readings do not result from the application of a CSSO but rather from some special interpretative mechanism that does not involve any covert syntactic operation. However, it appears that modified numerals such as ‘more than three’, contrary to plain indefinites, cannot escape scope-islands, and thus are not subject to this non-syntactic interpretative mechanism (cf. [Liu 1990, 1997, Reinhart 1997](#)).

Büring gives a principled account of why (3) only has the inverse-scope reading. In a nutshell, he argues that because of the semantics associated with the B-accent, the surface-scope interpretation of (3) is expected to give rise to a contradictory implicature, whereas under the inverse-scope reading, (3) has an implicature that can easily be satisfied. But it must be noticed that Büring’s account does not provide a parallel explanation for why (2a) is unambiguous, irrespective of prosody.<sup>3</sup> And it does not shed light either on the contrast between the ambiguous (1b) and the unambiguous (2b).

We submit that we are facing a genuine puzzle. To account for the observed restrictions, we propose a new licensing constraint on CSSOs, which is itself a generalization of Fox’s 2000 *Scope Economy*. In short, we argue that a CSSO can only apply if the resulting interpretation is not logically stronger than or equivalent to the surface-scope interpretation. In other words, a CSSO can only apply if the surface and inverse-scope interpretations stand in a certain logical relationship to each other. This generalization has far-reaching consequences, as we will show.

The paper is structured as follows: in section 2 we introduce our principle and show how it accounts for various restrictions on CSSOs. Section 3 discusses whether our licensing principle should be applied locally or globally – in a sense to be made precise – and refutes a potential counter-argument to our approach. Section 4 provides a specific discussion of the scopal behavior of downward-entailing indefinites, on the basis of the previous sections. In sections 5, 6 and 7, we turn to apparent exceptions to our generalization and show how they can be accounted for. Section 8 concludes the paper with a brief discussion of the modularity assumptions that underly our proposal.

## 2 Our proposal

In this section, we introduce a generalized version of Fox’s economy condition (Fox 1995, 2000) and show that it correctly predicts the patterns described in (1) and (2), as well as other surprising restrictions on the availability of inverse-scope interpretations.

### 2.1 Generalizing Fox’s Scope Economy

Fox (1995, 2000) argues that CSSOs such as QR and reconstruction (or quantifier lowering) are constrained by economy considerations. More specifically, according to Fox’s Economy Condition, a CSSO can take place only if it is not semantically vacuous:

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<sup>3</sup> As we will discuss in section 5, removing ‘on time’ in (2a) might make the inverse-scope reading marginally available if the object QP bears a particular intonation.

- (4) *Economy condition on scope shifting (Scope Economy)*  
*OP* can apply only if it affects semantic interpretation (i.e., only if inverse-scope and surface-scope are semantically distinct) (*where OP stands for CSSO; M&S*)  
 (Fox 2000: 21)

Since Fox’s Economy Condition only blocks semantically *vacuous* scope-shifting operations, its effects cannot usually be detected by direct inspection of the truth-conditions of the relevant sentences. Rather, Fox argues for this constraint on the basis of its more indirect detectable consequences, which follow from its interactions with some other constraints (such as the parallelism condition on VP-ellipsis). It is thus obvious that Scope Economy, as it stands, is not able to predict that both (5) (identical to (2a)) and (6) below fail to have an inverse-scope interpretation, precisely because the inverse-scope interpretation is not equivalent to the surface-scope interpretation.

- (5) John didn’t meet every student of mine on time  $(\neg > \forall) *(\forall > \neg)$   
 (6) A student of mine didn’t show up on time  $(\exists > \neg) *(\neg > \exists)$

In order to account for data like (5) and (6), we propose a generalized version of the principle of Scope Economy in (4). Our Generalized Scope Economy Condition (GSEC) is stated in (7).

- (7) *Generalized Scope Economy condition (to be revised)*  
 A CSSO cannot apply if the meaning of the resulting reading is equivalent to or stronger than (i.e. entails) the meaning that would have resulted without it.

GSEC incorporates the cases subsumed under Fox’s Scope Economy condition, but moreover disallows CSSOs whose output structures have a reading which asymmetrically entails that of the input structure. In other words, we claim that a CSSO is ruled out not only when it is semantically vacuous, but also when it corresponds to semantic *strengthening*. The GSEC accounts for (5) and (6) if we make the auxiliary assumption that quantifiers are *Aristotelian* – that is, they presuppose their restrictors to be non-empty (we briefly discuss this assumption in section 8). Let us first consider the case of universal quantifiers and negation. Observe that the following general fact holds:

- (8) If the extension of a predicate *A* is presupposed not to be empty, then, for any contingent predicate *B*, the formula  $\forall x(A(x) \rightarrow \neg B(x))$  asymmetrically entails (‘a-entails’ for short) the formula  $\neg \forall x(A(x) \rightarrow B(x))$ .

In the case of (5) the inverse-scope interpretation ( $\forall > \neg$ ) a-entails the surface-scope interpretation ( $\neg > \forall$ ), and therefore it is ruled out by the GSEC – a correct result. This also predicts that if the surface order of the universal quantifier and the negation is switched as in (1a), repeated in (9), the inverse-scope reading should become available. The reason is that now the surface-scope interpretation a-entails the inverse-scope interpretation. Again, this is the correct result.<sup>4</sup>

(9) Every student of mine didn't show up on time ( $\forall > \neg$ ) ( $\neg > \forall$ )

Turning now to (6), consider the following fact:<sup>5</sup>

(10) If the extension of a predicate  $A$  is presupposed not to be empty, then, for any contingent predicate  $B$ , the formula  $\neg\exists x(A(x) \wedge B(x))$  a-entails the formula  $\exists x(A(x) \wedge \neg B(x))$ .

For (6) this means that the inverse-scope interpretation ( $\neg > \exists$ ) is strictly stronger than the surface-scope interpretation ( $\exists > \neg$ ). Therefore the inverse-scope interpretation is blocked by the GSEC.<sup>6</sup>

Finally, consider a standard illustration of inverse-scope readings, involving an indefinite in subject position and a universal quantifier in object position.

(11) A boy danced with every girl ( $\exists > \forall$ ) ( $\forall > \exists$ )

The inverse-scope reading ( $\forall > \exists$ ) does not entail the surface-scope reading (in fact the reverse is true), and is thus correctly predicted to be licensed.

These initial observations suggest that a generalization of Scope Economy might be called for. In the following subsections we will further strengthen the support for the GSEC by pointing out that the pattern discussed so far is quite general.<sup>7</sup>

<sup>4</sup> We will turn in section 5 to the issue of quantifiers at the right edge of a clause. It will be seen that these constitute a systematic exception to the generalization proposed. But, as will also be seen, there is a good reason for this exception. The adverbial following the quantifier in (9) is there to somewhat counter the effects of the exception to be discussed.

<sup>5</sup> In subsection 2.3 we will return to sentences like (1b) and (2b). At first sight, the problem they pose is that when the plurality of the NP in the quantifier *more than n NPs* is taken into account, entailment does not necessarily hold in the way assumed in the present discussion. We will however see that there is a natural extension of the present reasoning to such cases, once the interactions of plural semantics and distributivity are carefully examined.

<sup>6</sup> In some languages, e.g. Korean and Hindi (Lahiri 1998), certain NPIs are licensed in subject position, preceding a negation, which might provide an argument that in these languages, an indefinite can reconstruct below negation. However, various analyses have been proposed, some of which suggest either that negation c-commands the subject in surface-syntax, or that the NPI is not really a NPI but a universal quantifier (e.g. Vasishth 1999, Sells 2006, Sells & Kim 2006, Shimoyama 2011).

<sup>7</sup> Note that the GSEC does not say that inverse-scope readings are licensed only if they are asymmetrically entailed by the surface-scope reading, but only that they should not entail the surface-

## 2.2 Existential vs. universal quantifiers and *likely* vs. *unlikely*

Lasnik (1998) notes a contrast between examples parallel to the following two:

- (12) One of my friends is (quite) likely to attend  $(\exists > \text{likely}) (\text{likely} > \exists)$   
 (13) Every friend of mine is (quite) likely to attend  $(\forall > \text{likely}) *(\text{likely} > \forall)$

The inverse-scope interpretation, on the one hand, is easily possible for (12), as it can have the interpretation that it is likely that one of my friends will attend. (13), on the other hand, does not have an inverse-scope interpretation, or at least it is quite hard to get. It cannot mean that it is likely that every friend of mine will attend. To see this contrast more clearly, consider the following example (14). It is important to notice that the sentence can only be true under the surface-scope interpretation paraphrased in (14a). It fails to be true under the inverse-scope interpretation in (14b), as it would say that there is a high chance of every child dying old, which is incompatible with common knowledge (even in developed countries, some healthy children unfortunately do not die old). We furthermore note that (14) cannot be judged as false when it is uttered in the context of a developed country. That is, it cannot be used in a situation where only the inverse-scope interpretation would be satisfied. This suggests that the inverse-scope interpretation is absent.<sup>8</sup>

- (14) Every healthy child in this country is likely to die old  
 $(\forall > \text{likely}) *(\text{likely} > \forall)$   
 a. ‘Every healthy child in this country has a high probability of dying old.’  
 b. \*‘It is likely that every healthy child in this country will die old.’

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scope reading. A stronger version of the GSEC that we could consider is the following. We will return to discussion of this in section 8.

- (i) *Strong GSEC*  
 A CSSO can apply only if the meaning of the resulting reading is a-symmetrically entailed by the meaning that would have resulted without it.

<sup>8</sup> Against this reasoning, one might object that a sentence is always judged true when its most accessible reading – that is, the surface-scope interpretation – is true, as argued in Meyer & Sauerland (2009). This would mean that we could not draw any conclusions as to whether the LF reflecting the inverse-scope interpretation is generated or not, and therefore (14) would not count as evidence for the GSEC (and similarly for our other examples). Indeed Meyer & Sauerland (2009) propose an account in terms of ‘preference for truth’ for related data. In section 3.2, we will show that this approach is insufficient to explain all the data that are relevant to the present proposal.

The absence of the inverse-scope interpretation follows from the GSEC. Assume that the probability that every healthy child will die old is high, which corresponds to the inverse-scope interpretation (14b). Then every single child has a high probability of dying old,<sup>9</sup> and therefore the surface-scope interpretation is true as well. The reverse, of course, does not hold. It can be the case that every child has a high probability of dying old without it being likely that every child dies old. In fact, this would be a correct description of the health situation in developed countries. This means that the inverse-scope interpretation a-entails the surface-scope interpretation. As a result, the GSEC predicts that the inverse-scope interpretations for (13) and (14) should not be available. This then also explains why (14) cannot be judged as false: it only has the surface-scope interpretation, which is true according to our world knowledge.

Turning now to (12), we find that the logical relationship between the surface-scope and the inverse-scope readings is the reverse of the one just discussed for (13) and (14). In this case it is the surface-scope reading which a-entails the inverse-scope reading.<sup>10</sup> Therefore according to the GSEC, the inverse-scope interpretation should not be blocked, which conforms to our intuitions about (12).

We have just seen that existential quantifiers can reconstruct below *likely*, whereas universal quantifiers cannot. Observe now that the pattern switches when *likely* is replaced with *unlikely*. That is, (15) can be interpreted as meaning that it is unlikely that every friend of mine attends.

(15) Every friend of mine is unlikely to attend  $(\forall > \text{unlikely}) (\text{unlikely} > \forall)$

Again, in order to see more clearly that the inverse-scope interpretation is available, consider sentence (16). The surface-scope interpretation given in (16a), on the one hand, is clearly false when speaking about a developed country. The inverse-scope interpretation in (16b), on the other hand, must be judged true. Since (16) can be judged as true, it follows that the inverse-scope interpretation must be available.

(16) Every healthy child in this country is unlikely to die old

$(\forall > \text{unlikely}) (\text{unlikely} > \forall)$

<sup>9</sup> This follows from the fact that the probability of a proposition S is always smaller than or equal to the probability of a proposition T when S entails T. Hence for any individual  $x$ , the probability that every individual will die old is smaller than or equal to the probability that  $x$  will die old.

<sup>10</sup> If there is a certain friend who is likely to attend (i.e. if the surface-scope reading is true), call her Mary, then the proposition that Mary will attend has a high probability. Since this proposition, call it  $\phi$  entails the proposition that a friend of mine will attend (call it  $\psi$ ), the probability of  $\psi$  is at least as high as that of  $\phi$ , and therefore it is likely that at least one friend will attend, i.e. the inverse-scope reading is true. The reverse does not hold. It is possible that the proposition that a friend of mine will attend has a high probability even if there is no particular individual  $x$  such that  $x$  is likely to attend.

- a. ‘Every healthy child in this country has a low probability of dying old.’
- b. ‘It is unlikely that every healthy child in this country will die old.’

The GSEC again predicts this. Indeed, the inverse-scope reading does not entail the surface-scope reading. This is clear from the fact that the inverse-scope reading appears to be true in the actual world in developed countries – that is, it is virtually certain that at least one healthy child will unfortunately not die old – while the surface-scope reading is clearly false. In fact, no healthy child is not likely to die old.

Finally, consider (17). Here the inverse-scope interpretation is impossible or difficult to get. Namely, (17) cannot have the reading according to which it is unlikely that at least one of my friends will attend. The pattern associated with (17) is again predicted by the GSEC, since in this case the inverse-scope interpretation a-entails the surface-scope interpretation. If it is unlikely that any friend of mine will attend, then it follows that every friend of mine has a low probability of attending, hence (on the assumptions that I have friends) that there is at least one friend of mine who has a low probability of attending. Thus the GSEC will not license the inverse-scope interpretation in this case.

(17) One of my friends is unlikely to attend  $(\exists > \text{unlikely}) *(\text{unlikely} > \exists)$

To sum up, we have seen that the GSEC accounts for a quite surprising pattern: an indefinite subject can reconstruct below *likely* but not below *unlikely*, while the reverse is true for universally quantified subjects. As far as we can see, approaches (such as Lasnik’s, for instance) which try to explain observed restrictions on reconstructions by positing that certain elements can reconstruct but others cannot, or that certain modals block reconstruction, are ill equipped to account for this type of paradigm, in which we find an interaction between the identity of the modal and that of the quantifier.

### 2.3 Plural indefinites and distributivity

As we have seen in connection with sentence (6), the GSEC correctly predicts that a singular indefinite DP in subject position cannot be interpreted under the scope of negation.<sup>11</sup> Clearly, we would like to make a more general prediction: namely, we would like to predict that all existentially quantified subjects, including plural indefinites such as *several NPs* and modified numerals (*more than n NPs*) also fail to reconstruct below negation, a fact that we illustrated in the very beginning of this paper with sentence (1b), repeated below as (18).

<sup>11</sup> Unless the relevant structure is itself embedded under a downward-entailing operator, as we will discuss in subsection 3.3.

(18) More than three students of mine didn't show up on time ( $\exists > \neg$ ) \*( $\neg > \exists$ )

However, a superficial examination of the surface-scope and inverse-scope interpretations in the case of (18) might lead us to conclude that these types of examples are in fact not covered by the GSEC. We will first explain the sense in which (18) *appears* to be a counterexample to the GSEC, and then point out that, on closer inspection, this is in fact not so. The key to our account will be that by being explicit about the way in which plural semantics and distributivity interact, we can show that the GSEC in fact correctly rules out the inverse-scope reading for (18) and similar examples.

So why is (18) a potential problem? Consider the following situation: I have exactly four students, and exactly two of them showed up on time, while the other two failed to show up on time. In such a situation, it seems that the inverse-scope reading of (18) ('NOT(more than three students of mine showed up on time)') is *true*, since it is not the case that more than three students of mine showed up on time (indeed, only two of them did). On the other hand, the surface-scope reading ('More than three students of mine failed to show up on time') is *false*, since the number of students of mine who failed to show up on time is two, hence no greater than three. So we found a situation in which the inverse-scope reading is true and the surface-scope reading is false, which is sufficient to show that the inverse-scope reading does not entail the surface-scope reading. Consequently, the GSEC does not seem to rule out the inverse-scope interpretation in this case.

This conclusion, however, is premature. We submit that the way the above-mentioned 'inverse-scope' reading and 'surface-scope' reading could arise in principle does not only depend on the relative scopes of the modified numeral and negation, but also on how quantifiers over pluralities are interpreted when scoping above an inherently distributive predicate such as 'show up'. As we will see shortly, the 'inverse-scope' reading we have just considered cannot be obtained from the relevant surface-scope structure simply by reconstructing the subject below negation. How exactly this reading could in principle be derived depends on very specific assumptions about the relationship between plurals and distributive predicates.

Before substantiating this point, let us first consider a simpler case, involving a collective predicate and no negation. Consider the following sentence:

(19) More than 15 soldiers are surrounding the castle

The standard approach to sentences such as (19) is the following. The predicate 'surrounding the castle' is a collective predicate: it has plural individuals in its extension, and represents a property that a collection of individuals can have while no individual member of the collection can be said to have it. Saying that a certain group of soldiers is surrounding the castle does not entail that any individual soldier

is surrounding the castle. (19) asserts that there exists a plurality made up of more than 15 soldiers, and this plurality is surrounding the castle. Accordingly, the lexical entry we need for numeral determiners of the form *more than n* is as follows:

- (20)  $[[\textit{more than } n]] = \lambda P.\lambda Q.\exists X(\#X > n \wedge P(X) \wedge Q(X))$  (assuming an ontology in which the domain of individuals includes both atomic and plural individuals, and is structured by a part-whole relation, satisfying the axioms of a meet-semilattice.  $\#X$  denotes the cardinality of the set of atomic individuals which are part of  $X$ .)

Given such a lexical entry, let us examine the logical relationships between the inverse-scope and surface-scope interpretations of schematic structures of the form  $[(\textit{more than } 10)P][\neg Q]$ .

- (21) a. Surface-scope:  
 $\exists X(\#X > 10 \wedge P(X) \wedge \neg Q(X))$   
 b. Inverse-scope:  
 $\neg \exists X(\#X > 10 \wedge P(X) \wedge Q(X))$

On the assumption that there exists at least one plurality  $X$  made up of more than 10 atomic individuals such that  $X$  is in the extension of  $P$ , the inverse-scope reading in (21b) entails the surface-scope reading in (21a). This is simply an instance of the general logical fact noted in (10) (one can go from the generalization in (10) to this particular instantiation by positing  $A = \lambda X.(\#X > 10 \wedge P(x))$  and  $B = Q$ ). To see this, let us suppose that (21b) is true. Then there is no plurality made up of more than 10 atomic individuals which has both the properties represented by  $P$  and  $Q$ . So if there is a plurality that has the property  $P$  and is made up of more than 10 atomic individuals, then this plurality necessarily fails to have property  $Q$ , and therefore (21a) is true as well.

Now, recall we assumed that the the GSEC treats quantifiers as Aristotelian, i.e. operates on the assumption that quantified DPs presuppose their restrictor to be non-empty. Instead of referring to the syntactic notion of restrictor, we could as well have used a related semantic notion, that of a ‘smallest live-on set’.<sup>12</sup> That is, we could have said instead that a quantifier presupposes that its smallest live-on set is

<sup>12</sup> See chapter 1 of Szabolcsi (1997), which is based on Barwise & Cooper (1981). The smallest live-on set of a generalized quantifier  $GQ$  relative to a model  $M$  is the smallest set  $X$  such that, for any set of individuals  $E$ ,  $E \in [[GQ]]^M$  if and only if  $(E \cap X) \in [[GQ]]^M$ . Ignoring quantification over pluralities, for most natural language determiners  $DET$ , existential and universal quantifiers in particular, the smallest live-on set of  $DET NP$  in a model  $M$  is  $[[NP]]^M$ . The fact that, given (20), the smallest live-on set of *more than n NPs* is the set of pluralities made up of  $n$  atomic individuals satisfying the property represented by  $NP$  follows from the observation that *more than n NPs* is, given (20), equivalent to *A plurality made up of n NPs*.

not empty. It turns out that the smallest live-on set of a DP of the form *more than n NPs*, given the lexical entry in (20), is the set of all plural individuals  $X$  such that both  $\#X > 10$  and  $X$  belongs to the denotation of  $NP$ . To conclude, then, given the hypothesis that quantifiers are Aristotelian in this sense (i.e. presuppose that their smallest live-on set is not empty), we get an entailment from (21b) to (21a), and therefore the GSEC rules out the inverse-scope reading for sentences of the form  $[(\textit{more than } 10)P][\neg Q]$ .

Why, then, does a sentence like (18) *look like* a counterexample to the GSEC? To understand what is going on in this case, we make some assumptions about the way plural DPs are interpreted when they combine with a non-collective predicate such as *show up*. Following Link (1983) and much subsequent work, we assume that when such a predicate is applied to a plurality (i.e. a non-atomic individual), it needs first to be turned into a distributive plural predicate, thanks to a distributivity operator, *DIST*, whose semantics is given in (22) (we will see shortly that this lexical entry for *DIST* needs to be refined).

$$(22) \quad \llbracket \text{DIST} \rrbracket = \lambda P_{\langle e,t \rangle} . \lambda X_e . \forall x [(x \textit{ is an atom} \wedge x \leq X) \rightarrow P(x)] \text{ (where } \leq \text{ represents the part-whole relation.)}$$

With this in place, we can see that there are in principle two LFs in which the quantified subject takes scope over negation in (18), depending on where *DIST* itself takes scope:

$$(23) \quad \begin{array}{l} \text{a. } [\text{More than three students of mine}].[\text{DIST}(\lambda x. \neg(x \textit{ showed up}))] \\ \text{b. } [\text{More than three students of mine}] [\lambda X. \neg (\text{DIST}(\textit{showed up}))(X)] \end{array}$$

Let us ignore for a moment the specific meanings that these two LFs predict, and focus now on how the ‘inverse-scope’ reading could in principle be generated. The inverse-scope reading must correspond to the following LF, which we assume involves reconstruction of the subject into its VP-internal position:

$$(24) \quad \neg (\text{More than three students of mine})[\text{DIST}(\textit{showed up})] \\ \rightsquigarrow \text{There is no plurality made up of more than three students of mine such that, for each atomic member } x \text{ of this plurality, } x \textit{ showed up.}$$

In order to see what the GSEC predicts for (24), we need to determine whether (24) entails the LF that would have arisen if the subject had not been reconstructed to its VP-internal position. This LF is in fact the one given in (23b), rather than the one in (23a). Indeed, the LF in (24) cannot be obtained from the one in (23a) simply by shifting the relative scopes of the quantified subject and negation. To go from (23a) to (24), it is also necessary to shift the relative scopes of *DIST* and negation. So we can in principle assume that the LF in (23a) does not play any role in the licensing of

(24) – but we will see momentarily that nothing really hinges on this. Now note that, on the assumption that I have more than three students, (24) *does* entail (23b). This is simply an instance of the general schema given in (21), and it is sufficient to show that the reconstruction operation that is needed to go from (23b) to (24) violates the GSEC.

It should be noted, however, that the way we defined *DIST* is too simplistic. It is widely agreed (Fodor 1970, Schwarzschild 1993, Löbner 2000, a.o.) that the distributivity operator triggers a so-called *homogeneity presupposition*: when it applies to a predicate *P* which in turn is applied to an expression *X* denoting a plural individual, the resulting expression, *DIST(P)(X)*, presupposes that either *P* is true of every atomic member of *X*, or is true of no atomic member of the denotation of *X*. Note that (23b), and (24) end up with the same presupposition. Negation does not affect the homogeneity presupposition. Moreover, given reasonable assumptions about how the homogeneity presupposition projects when *DIST* is under the scope of an UE-indefinite, all examples will require that there is that there exists at least one plurality made up of more than three students of mine that satisfies the homogeneity presupposition of the predicate, i.e., a plurality of more than three students who either all showed up or all did not show up. Call this the *existential homogeneity presupposition*.<sup>13</sup> In fact, (23a) also shares this presupposition, since it does not matter for the homogeneity presupposition whether the negation is in the scope of *DIST* or not.

Now, consider again the situation that we mentioned in the beginning of this section, in which it appeared that the inverse-scope reading was true but the surface-scope reading was false. This was a situation where I have exactly four students, two of which showed up and two of which did not show up. Note that in such a situation there is no single plurality made up of more than three students of mine that satisfies the existential homogeneity presupposition. Indeed, there is only one plurality made up of more than three students, and it is not the case that either each member of this plurality showed up or that each of them failed to show up. Such a situation will in fact be a situation where neither (23a) nor (23b) nor (24) has a

13 This assumption is minimal because it is widely agreed that when a presuppositional predicate is embedded under the scope of an indefinite DP, the resulting sentence presupposes *at least* that one witness set of the indefinite DP (if there is such a witness set) meets the presuppositions of the predicate. For instance, sentences such as ‘A student of mine stopped smoking’ and ‘A student of mine didn’t stop smoking’ presuppose *at least* that one student of mine was a smoker at some point (under the assumption that there are students of mine). There are disagreements as to whether such sentences in fact trigger a stronger, universal presupposition (‘Every student of mine was a smoker at some point’), as argued in Heim (1983), but this need not concern us here (see Beaver 1994, Schlenker 2008, Chemla 2009, among others). The point is that this universal presupposition entails the weaker, existential presupposition, as soon as we assume that I have at least one student.

truth-value. Therefore, this type of situation cannot be claimed to be a situation where the inverse-scope interpretation is true but the surface-scope interpretation is false, and thus cannot be used to show that the inverse-scope interpretation fails to entail the surface-scope interpretation.

But it turns out that we can get a more general result: when we consider only worlds where all the examples have a defined truth-value, it turns out that there are no worlds in which what we informally described as the inverse-scope reading (i.e. the meaning of (24) without its presuppositions) is true but (23b) or (23a) is false. The reason is the following. When an expression  $DIST(P)(X)$  is negated ( $\neg DIST(P)(X)$ ), the resulting meaning (including the homogeneity presupposition) is that there is *no* atomic member of  $x$  of the denotation of  $X$  such that  $P(x)$  is true. Therefore (23b) is going to entail that there is a plurality made up of more than three students of mine such that *no* member of this plurality showed up. This is in fact equivalent to what we described as the *attested* surface-scope reading of (18), a reading which, until now, we assumed corresponded to the logical form given in (23a). Moreover, the inverse-scope reading says that one cannot find more than three students of mine who all showed up. But if the inverse-scope reading is true, the only way the existential homogeneity presupposition can be met is if there is a plurality made up of more than three students of mine who all failed to show up, i.e. if the surface-scope reading is true. So it in fact turns out that, once we take into account homogeneity presuppositions, (24) entails (23b) in the strict sense (and also (23a), for that matter): every world where (24) is true is a world where the existential homogeneity presupposition is true as well, and is therefore a world in which (23b) is true, and (23a) is true as well. Hence even if we assumed that (23a) were also relevant for the licensing of (24), the GSEC would still correctly rule out the inverse-scope reading for (18).

To conclude this section, note that our approach to modified numerals in subject position equally applies to all monotone increasing indefinites, e.g. *many NPs*, *several NPs*, etc. All these DPs are correctly predicted not to be able to reconstruct below negation in simple, unembedded sentences.<sup>14</sup>

<sup>14</sup> This discussion is also relevant to the analysis of the following pair of examples:

- (i) a. More than 20% of the students didn't pass
- b. More than 80% of the students didn't pass

In both cases, the inverse-scope reading fails to be available. However, in the case of (ib), what is intuitively the inverse-scope reading does not entail the surface-scope reading (in fact, the reverse is true): if it is not the case that more than 80% of the students passed, it of course does not follow that at least 80% of them failed. But, on the plausible assumption that such proportional quantifiers can be analyzed as expressing existential quantification over pluralities of a certain type, the analysis we provided in this section should be equally applicable to this case.

## 2.4 Scope-shifting between indefinites in subject and object positions

Consider now the following sentence:

(25) A soldier is standing on more than ten government buildings

#(a > many) (many > a)

(25) licenses both the surface-scope interpretation ('There is a certain soldier who is standing on more than ten government buildings') and the inverse-scope interpretation ('More than ten government buildings are such that each of them has a soldier standing on it'). Given that no single soldier can simultaneously stand on several buildings, (25) favors the inverse-scope reading. And the fact that (25) is not pragmatically deviant provides evidence for the availability of the inverse-scope reading. Now, this seems to follow straightforwardly from the GSEC. Indeed, it is clear that the surface-scope reading entails the inverse-scope reading but not the other way around. Clearly, in a situation where more than ten buildings have a different soldier standing on them but no soldier is standing simultaneously on several buildings, the inverse-scope reading is true but the surface-scope reading is false. So it seems that the GSEC very clearly predicts the availability of the inverse-scope reading.

However, having in mind the observations made in the previous subsection, we should have a closer look. Indeed, we should note that two existential quantifiers can commute with each other without any change in meaning, so that if 'more than ten government buildings' simply expresses existential quantification over pluralities of a certain type, the GSEC should ban the inverse-scope reading. On closer inspection, though, this turns out to be a case where (unlike the previous case we considered) the very presence of a distributivity operator in fact allows a CSSO to shift the relative scope of the subject and the object. Let us see this in details. The intended inverse-scope reading corresponds to the following schematic representation:

(26) [More than ten government buildings] [*DIST* [ $\lambda X$ .(a soldier stands on  $X$ )]]  
 $\rightsquigarrow$  There is a plurality  $G$  made up of more than ten government buildings such that each atomic part  $g$  of  $G$  is such that there is a soldier standing on  $g$ .

Following standard assumptions, we assume that such a structure is derived by a) obligatory adjunction of the object QP to the VP (for type-theoretic reasons), b) insertion of *DIST* just above the lambda-abstract created by this movement, and c) reconstruction of the subject into its VP-internal position. Consider now the minimally different structure that we get if reconstruction of the subject does not take place - i.e. where the overt movement of the subject from its VP-internal position to the specifier of TP is interpreted and therefore creates its own lambda-abstract:

- (27) [a soldier][ $\lambda y$ .(more than ten government buildings) [*DIST* [ $\lambda X$ .(y stands on X)]]]  
 $\leadsto$  There is a soldier  $s$  such that there is a plural individual  $G$  made up of ten government buildings such that  $s$  is standing on every atomic part of  $G$ .

This representation corresponds to what we informally described above as the ‘surface-scope’ interpretation. And, from the point of view of the GSEC, it is also the relevant ‘competitor’ for (26). Since (26) does not entail (27), the GSEC correctly licenses (26). Parallel considerations show that replacing ‘more than ten government buildings’ with ‘many government buildings’ or ‘several government buildings’ gives also rise to sentences for which the inverse-scope reading is licensed by the GSEC, a welcome result.

## 2.5 Interactions between quantified subjects and temporal adverbs

Similarly to what we observed in the preceding subsection, the GSEC predicts the following patterns:

- (28) a. An indefinite in subject position can reconstruct below *always* and *often*.  
 b. An indefinite in subject position cannot reconstruct below a negative temporal adverb that it c-commands in surface syntax (*never*, *rarely*).  
 c. A universally quantified subject can reconstruct below a negative temporal adverb that it c-commands in surface syntax.

First, consider the following contrast:

- (29) a. More than two windows are always open in this building  
 $\leadsto$  inverse-scope available: ‘it is often the case that many windows are open in this building (not necessarily the same ones)’  
 b. More than two windows are never open in this building  
 $\leadsto$  inverse-scope unavailable: \*‘it is never the case that many widows are open’

This contrast is predicted by the GSEC. In the case of (29a), the inverse-scope reading does not entail the surface-scope reading (‘There are more than two windows which are always open in this building’), since it does not entail that any window is permanently open. The inverse-scope reading is thus correctly predicted to be available. In the case of (29b), the relevant inverse-scope reading corresponds, schematically, to the following structure.

- (30) never [more than two windows *DIST*(open)]

Now, similarly to what was discussed in subsection 2.3, what we need to check is whether (30) entails (31), on the assumption that both sentences presuppose that there exist more than two windows in the building.

(31) [More than two windows]<sub>i</sub> [never (DIST(open))(X<sub>i</sub>)]

In fact, (30) does entail (31), because the following generally holds, for any relation  $P$  between (possibly plural) objects and instants (on the assumption that in all the relevant models there exist more than two windows).<sup>15</sup>

(32)  $\neg\exists t\exists X[X \text{ is a plurality made up of more than two windows} \wedge P(X, t)]$   
 entails  
 $\exists X[X \text{ is a plurality made up of more than two windows} \wedge \neg\exists tP(X, t)]$

Therefore, the GSEC correctly rules out the inverse scope reading for (29b), and also for variants of (29b) where the subject is replaced by any upward-entailing indefinite (e.g. ‘many windows’).<sup>16</sup>

Completely similar considerations also account for the following contrast, given reasonable assumptions about the meanings of *often* and *rarely*.

(33) a. More than two windows are often open in this building  
 $\rightsquigarrow$  inverse-scope available: ‘it is often the case that more than two windows are open in this building’  
 b. More than two windows are rarely open in this building  
 $\rightsquigarrow$  inverse-scope unavailable: ‘it is rarely the case that more than two windows are open in this building’

The GSEC also correctly predicts the following sentence to license an inverse-scope reading:

(34) Every window is rarely open in this building  
 $\rightsquigarrow$  inverse-scope available: ‘It is rarely the case that every window is open’

That the inverse-scope reading does not entail the surface-scope reading is straightforward. Consider indeed the following scenario. First a certain window is always

<sup>15</sup> We also need to assume that the denotation of ‘windows’ is constant across time, which is why we do not write ‘ $X$  is plurality made up of more than two windows at  $t$ ’. Strictly speaking, if the temporal argument of ‘windows’ is bound by *never*, the entailment does not go through. We assume that the GSEC operates on the assumption that the restrictor of the DP that is a potential target of a scope-shifting operation has a rigid denotation. See section 7 for relevant remarks.

<sup>16</sup> Of course, as in the case discussed in 2.3, more needs to be said in order to account for the perceived truth-conditions of the surface-scope reading. Such an account will rely, in a very similar way, on the homogeneity presupposition triggered by predicating a distributive predicate to a plurality.

open; second, on most days, only half of the windows are open (but in very rare occasions, all the windows are possibly open). In such a scenario, it is rarely the case that every window is open (hence the inverse-scope reading is true), but it is not true that every window is such that it is rarely open, since there is at least one window which is always open. Since the inverse-scope reading does not entail the surface-scope reading, it is correctly predicted to be available.

### 3 Local and global applications of the GSEC

Before discussing more data, we need to be more precise regarding the way in which the GSEC is applied to more complex cases. In this section, we investigate whether the GSEC must be thought of as a *global* principle or a *local* constraint, in a sense that we will make precise.

First, consider a sentence  $S$  in which applying a certain CSSO results in an inverse-scope reading which is a-entailed by the surface-scope reading. In such a case, the GSEC licenses the operation. Now, suppose that  $S$  is embedded under a downward-entailing (DE for short) operator,<sup>17</sup> resulting in a sentence  $S'$ . Now, relative to the overall meaning of  $S'$ , the logical relationships between the two possible readings for  $S$  are reversed: namely, the inverse-scope reading will now a-entail the surface-scope reading. So the GSEC, as we stated it, would disallow this operation, and we might expect the inverse-scope reading to disappear. If, however, the GSEC is allowed to be met *locally*, i.e., informally speaking, relative to the embedded sentence  $S$  rather than to  $S'$ , this would not be so.

Second, consider the reverse case, i.e. a sentence  $T$  in which applying a certain CSSO results in an inverse-scope reading which a-entails the surface-scope reading. Then the operation is ruled out by the GSEC. But suppose that  $T$  is itself embedded under a downward-entailing operator, resulting in a sentence  $T'$ . As in the previous case, relative to the overall meaning of  $T'$ , the logical relationships between the two possible readings for  $S$  are reversed: namely, the inverse-scope reading will now fail to a-entail the surface-scope reading. Hence the GSEC, as we stated it, predicts the inverse-scope reading to be able to surface in such a case.

In this section, we will consider these two cases in turn, and conclude that the GSEC must be thought of as a constraint that can be met either locally or globally.

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<sup>17</sup> DE operators switch entailment patterns between surface and inverse-scope interpretations. More formally:

- (i) a. Function  $f$  is upward-entailing (UE) iff for all arguments  $x$  and  $y$  such that  $x \subseteq y$ ,  $f(x) \subseteq f(y)$ .
- b. Function  $f$  is downward-entailing (DE) iff for all arguments  $x$  and  $y$  such that  $x \subseteq y$ ,  $f(y) \subseteq f(x)$ .

The first point will also provide an argument against a proposal potentially competing with the GSEC. We also discuss a distinct but conceptually related issue, namely whether the GSEC is a constraint that applies to each application of a CSSO, or to the final output of a sequence of CSSOs.

### 3.1 The GSEC can be met locally

Consider a sentence where inverse-scope interpretation is uncontroversially available, such as (35). According to us, the inverse-scope interpretation is licensed because it does not entail the inverse-scope interpretation. In fact, the reverse is the case: the surface-scope interpretation a-entails the inverse-scope interpretation.

(35) A boy heard every girl sing ( $\exists > \forall$ ) ( $\forall > \exists$ )

Now, consider what happens when (35) is embedded in a DE-context, as in (36). DE-contexts, like the restrictor of the universal quantifier *whenever*, reverse entailment patterns. For a sentence like (36), this means that the the inverse-scope construal gives rise to a reading that is now strictly stronger than the one based on the surface-scope reading. Therefore, if the GSEC is viewed as a purely global constraint, it predicts that the inverse scope interpretation should disappear.

(36) *Context: Talking about a singing competition taking place every year.*  
Whenever a boy heard every girl sing, the competition was a success ( $\exists > \forall$ ) ( $\forall > \exists$ )

- a. Surface-scope: 'Whenever there was a boy who heard every girl sing, the competition was a success.'
- b. Inverse-scope: 'Whenever for every girl there was a boy who heard her sing, the competition was a success.'

This is however not the case: the inverse scope reading (paraphrased in (36b)) seems to be clearly available. To make the case that the inverse-scope reading really exists, consider the following dialogue.

(37) *Context: Talking about a singing competition taking place every year. Female participants are not relatives of each other.*  
A: In the past years, whenever a boy heard every girl sing, the competition was a success.  
B: That's not true. In last year's competition, every girl was heard by her brother, and yet the competition was a disaster.

The reply in 2 sounds as a consistent objection to 2. But this can be so only if 2 is understood under its inverse-scope reading (i.e. ‘Whenever for every girl  $x$ , some boy  $y$  heard  $x$  sing’). On a surface-scope reading, 2 only claims that whenever every girl was heard by the *same* boy, the competition was a success. The fact that it was a disaster in a situation where every girl was heard by a *different* boy (namely her brother) would therefore not count as making the surface-scope reading of 2 false and thus would not be a felicitous objection to 2.

A completely parallel argument can be made on the basis of (38). (38) has a readily detectable inverse-scope reading.

(38) Every guest didn’t show up ( $\forall > \neg$ ) ( $\neg > \forall$ )

In (39) we place (38), as before, in the restrictor of *whenever*. Again, the inverse-scope reading in (39b) remains accessible.

(39) *Context: Talking about a party that takes place on every Saturday.*

Whenever every guest doesn’t show up, the party is a disaster.

( $\forall > \neg$ ) ( $\neg > \forall$ )

- a. Surface-scope: ‘Whenever every guest fails to show up, the party is a disaster.’
- b. Inverse-scope: ‘Whenever it is not the case that every guest shows up, the party is a disaster.’, i.e. ‘Whenever a guest fails to show up, the party is a disaster’.

The fact that the dialogue in (40) sounds coherent provides evidence for the availability of the inverse-scope reading ((39b)):

- (40) A: Whenever every guest doesn’t show up, the party is a disaster.  
 B: That’s not true. Last Saturday, only half of the guests showed up, and yet we all had a very good time.

Again, for 2 to count as a felicitous objection to 2, 2 has to be understood under the inverse-scope reading (i.e. as in (39b)).

We conclude that the GSEC never prevents an inverse-scope reading which is licensed in isolation from remaining licensed when the relevant sentence is embedded in a more complex environment. Specifically, we now state the GSEC as follows:

(41) *Generalized Scope Economy condition* (modified version)

A CSSO is licensed in a sentence  $S$  only if there exists a constituent  $C$  of  $S$  (possibly  $S$  itself) such that the CSSO does not make the semantic value of  $C$  stronger than or equivalent to what it would be without the CSSO.

This new formulation licenses the inverse-scope interpretations for (36), (39), and parallel examples – that is, cases where two operators are embedded in a DE-context such that, without embedding, the surface-scope interpretation is strictly stronger than the inverse-scope interpretation.

Now, note that while (41) allows the GSEC to be met locally, it does not entail that it *must* be met locally. Rather, it says that as soon as one constituent is found relative to which the GSEC is met, the relevant CSSO is licensed, but nothing prevents this constituent to be, for instance, the entire sentence (even though it does not have to be). The GSEC is now viewed as a licensing condition that may be met either locally or globally (or at any intermediate constituent).<sup>18</sup> As we discuss in subsection 3.3, this predicts that embedding in DE-environments can sometimes license new inverse-scope readings. Before that we briefly turn to the discussion of an alternative proposal.

### 3.2 Embedding and ‘Truth Dominance’

This might be a good point to address a potential worry that the reader might have: how can we actually be sure that the inverse-scope reading is absent in cases where it a-entails the surface-scope interpretation? Consider how, in general, one can argue that a certain sentence *S* is ambiguous between two readings *R1* and *R2*, assuming that the existence of *R1* is uncontroversial. One would like to evaluate the truth-value of *S* in a situation where *R2* is true and *R1* is false. If the sentence is judged to be true, then this counts as evidence for *R2*. However, when *R2* entails *R1*, there can be no such situation. If *R1* corresponds to the surface-scope interpretation and *R2* to the inverse-scope interpretation, then when the inverse-scope interpretation a-entails the surface-scope interpretation, there is no simple way of *showing* that the inverse-scope exists, even if it is in fact generated by the grammar. Consequently the fact that the inverse-scope reading is not perceived in such cases might fail to provide compelling evidence that it really does not exist.<sup>19</sup>

In particular, there is a way of thinking about some of our data that makes quite similar predictions as the GSEC but is extremely different in spirit. In a recent paper, Meyer & Sauerland (2009) argue that in certain cases where a sentence is ambiguous between two readings that stand in an entailment relation, the stronger reading is not detectable by mere inspection of speakers’ truth-conditional intuitions. Due to some kind of principle of charity (Quine 1960), speakers tend to judge the

<sup>18</sup> In this respect, the GSEC operates in a way that is similar to the licensing of polarity items. See, e.g., Szabolcsi (2004), Homer (2011).

<sup>19</sup> Abusch (1994) and Reinhart (1997) discuss this methodological issue in connection with the scope-taking possibilities of indefinites. Related issues are discussed in connection with language acquisition (see Crain, Ni & Conway 1994, a.o., and Gualmini & Schwarz 2009) for a recent discussion.

relevant sentence true as soon as it is true on its most accessible reading, which makes stronger readings irrelevant, even if they are in principle available. More specifically, Meyer & Sauerland argue for the following principle:<sup>20</sup>

- (42) *Truth Dominance*: Whenever an ambiguous sentence S is true in a situation on its most accessible reading, we must judge sentence S to be true in that situation.<sup>21</sup>  
(Meyer & Sauerland 2009: 140)

Now, if one assumes that inverse-scope readings are never the “most accessible readings”, Truth Dominance predicts that an inverse-scope reading will be undetectable whenever it entails the surface-scope reading. Hence Truth Dominance is able to account for most of the facts we discussed.

Crucially though, Truth Dominance and the GSEC are genuinely *distinct* hypotheses: the GSEC says that the grammar rules out certain LF representations, while Truth Dominance does not. In fact, Meyer & Sauerland’s 2009 general argument for Truth Dominance is that one can provide independent evidence for the availability of certain LFs which happen to be undetectable by purely truth-conditional means. However, Truth Dominance is not empirically equivalent to the modified version of the GSEC given in (41), and does not predict the facts discussed in subsection 3.1. More specifically, Truth Dominance makes the following prediction:

- (43) *Prediction of Truth Dominance with respect to DE-environments*:  
Let S be a sentence where the inverse-scope interpretation is licensed by the grammar and is a-entailed by the surface-scope reading. Then the inverse-scope interpretation should be introspectively accessible for S, but should become undetectable when S is itself embedded in a DE-environment.<sup>22</sup>

As we just saw, this prediction is not empirically supported. In fact, embedding a scopally ambiguous sentence in a DE-environment does not remove the relevant scopal ambiguity. The fact that the GSEC, under the formulation given in (41), can be met locally thus distinguishes the GSEC-based account from a Truth-Dominance-based account.<sup>23</sup>

20 See also Gualmini, Hulsey, Hacquard & Fox (2008) for a related though different principle.

21 Note, however, that it does not strictly follow from such a principle that a stronger reading which is not the most accessible one will not be available to introspection. It only follows that our truth-value judgments will be based only on the weaker reading.

22 This is the reverse argument from Abusch’s 1994 for intermediate/wide scope of indefinites. See also Reinhart (1997).

23 In a preliminary version of this paper (Mayr & Spector 2010) we discuss further evidence against Truth Dominance. We show, for instance, that following Fox (2000) facts from VP-ellipsis and scope parallelism strongly favor the GSEC over Truth Dominance. In particular, we show that

### 3.3 The GSEC can be met globally: new scope interactions in DE contexts

Given (41), if a sentence  $S$  whose inverse-scope interpretation is blocked by the GSEC is embedded under DE-material, one expects that the resulting sentence  $S'$  will license the inverse-scope interpretation. This is so because, according to (41), the licensing of a CSSO can take place in *any* constituent, including the full sentence. Consider (44) in this light. The CSSO necessary to generate the inverse-scope interpretation is blocked because the resulting reading would be strictly stronger than the surface-scope interpretation. The reading that is ruled out is the following: ‘No more than two guests showed up’.

(44) More than two guests didn’t show up ( $\exists > \neg$ ) ??( $\neg > \exists$ )

When (44) is embedded in a DE-environment as in (45)– that is, in the antecedent of a conditional – the inverse-scope interpretation becomes available (cf. Spector (2004)). In particular, (45) can have as a possible interpretation the reading ‘If no more than two guests had shown up, the party would have been a disaster.’ In order to obtain this interpretation, a CSSO is necessary. This CSSO, however, was not available in (44).

(45) If more than two guests had not showed up, the party would have been a disaster ( $\exists > \neg$ ) ( $\neg > \exists$ )

Likewise, consider now the scopal interactions of negation and universal quantifiers. Consider again (5), repeated below as (46)

(46) John didn’t meet every student of mine on time ( $\neg > \forall$ ) \*( $\forall > \neg$ )

As we observed, the universally quantified object cannot outscope negation, which follows from the GSEC. Let us now look at what happens if (46) is embedded in a DE-environment.

(47) *Context: Peter and Sue are both students of mine.*  
I don’t think that John didn’t meet every student of mine on time. I know he didn’t meet Peter on time, but I think he met Sue on time.

The very fact that the discourse in (47) sounds coherent shows that the inverse-scope reading is licensed for the first sentence. The second sentence entails that the

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scope parallelism blocks the inverse-scope interpretation in an antecedent sentence for a VP-ellipsis sentences where the GSEC predicts inverse-scope to be possible in the former but impossible in the latter. As Fox already argues, this effect can only be accounted for if the absence of the inverse-scope representation in the ellipsis sentence blocks the absence of the same representation in the antecedent. Truth Dominance has no way to ensure this.

speaker thinks that there is a student that John failed to meet, and this is incompatible with a surface-scope interpretation for the first sentence (which is more or less equivalent to ‘I think that John met every student of mine on time’). The inverse-scope interpretation, on the other hand, only says that I think that John must have met at least one student, which is compatible with the second sentence.

### 3.4 Step-wise application of the GSEC

We have just seen that the GSEC should be viewed as a licensing condition that can be met either locally or globally. However, the GSEC also gives rise to another ‘locality’ issue. As it is stated, the GSEC is evaluated at each application of a CSSO, rather than relative to the final output of several CSSOs. More precisely, the GSEC does not allow an operator to first undergo a ‘legal’ CSSO and then a vacuous or strengthening CSSO, even if the overall result does not entail the surface-scope interpretation. We would like to provide evidence that this is a desirable feature.

To illustrate, consider the abstract representation in (48). Let us assume that in such a structure, in order for  $Q_3$  to have maximal scope, it should undergo a CSSO with  $Q_2$  first and then a second CSSO with  $Q_1$ .

$$(48) \quad [ \dots Q_1 \dots [ \dots Q_2 \dots [ \dots Q_3 \dots ] ] ]$$

Assume that in (48) the inverse-scope interpretation ( $Q_3 > Q_1 > Q_2$ ) is not stronger than the surface-scope reading ( $Q_1 > Q_2 > Q_3$ ). Assume moreover that the reading that we get by applying only the first CSSO between  $Q_2$  and  $Q_3$  (i.e.  $Q_1 > Q_3 > Q_2$ ) is entailed by the reading that arises if  $Q_3$  then shifts its scope with  $Q_1$  (i.e.  $Q_3 > Q_1 > Q_2$ ). If we are correct in assuming that the GSEC evaluates each individual CSSO rather than comparing the final result to the surface-scope interpretation, we predict that the second CSSO is blocked, i.e. that maximal scope of  $Q_3$  is blocked in such a situation (i.e.  $Q_3 > Q_1 > Q_2$ ), even though it does not entail the surface-scope reading.

(49) is an instantiation of this situation. The inverse-scope reading ( $Q_3 > Q_1 > Q_2$ ), (50b), is not stronger than the surface-scope reading ( $Q_1 > Q_2 > Q_3$ ), (50a). In fact the two interpretations are logically unrelated. But (49) does not have the interpretation where the quantifier *more than three problems* has widest scope. This follows from our account under the assumption that this reading could only be obtained by applying two CSSOs in turn – one CSSO would shift the scopes of the object and the negation, and the other one would shift the scopes of the object and the subject. The first step is licensed by the GSEC, but the second one is not: moving an existential quantifier over a universal one strengthens the interpretation.<sup>24</sup>

<sup>24</sup> Note that this prediction is made even on the modified version of the GSEC given in (41): there is

(49) Every student didn't solve more than three problems

$(\forall > \neg > \text{more than } 3) (\forall > \text{more than } 3 > \neg) *(\text{more than } 3 > \forall > \neg)$

- (50) a. 'Every student is such that he didn't solve more than 3 problems.'  
 b. 'For more than 3 problems it is the case that every student is such that he didn't solve them.'

#### 4 DE-indefinites and universal operators

We have seen that scope interactions between negative elements and existential quantifiers, on the one hand, and negative elements and universal quantifiers, on the other hand, systematically differ. Similarly, we expect that upward-entailing (UE) indefinites should behave differently from downward-entailing (DE) indefinites in their scope-taking possibilities with respect to a universal quantifier. This is so because readings in which a universal quantifier scopes over a DE-indefinite are logically stronger than readings in which the universal quantifier is under the scope of the DE-indefinite (everything else being equal), while the reverse is true in the case of UE-indefinites. As a result, subject UE-indefinites are expected to be able to take scope below a universally quantified object, but subject DE-indefinites are not.

Specifically, the GSEC leads us to expect the following generalization:

- (51) An indefinite which c-commands a universal operator in surface syntax can take scope below it if it is UE (modulo locality considerations) and cannot if it is DE.

The two examples in (52) support the claim in (51). (52b) cannot mean that for every building there are few soldiers who are standing on it, which would be the absent inverse-scope interpretation. (52a), however, clearly allows for the inverse-scope interpretation.

- (52) a. Many soldiers are standing on every building  $\#(\exists > \forall) (\forall > \exists)$   
 b. #Few soldiers are standing on every building  $\#(\text{few} > \forall) *(\forall > \text{few})$

How does this difference come about? In the case of (52a), the surface-scope interpretation a-entails its inverse-scope interpretation. The former says that there are many soldiers who are standing on every building, which is not a plausible interpretation. The latter says that for every building, there are many (different) soldiers standing on it. If the former holds, the latter cannot fail to hold, for if there

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no constituent *C* in (49) relative to which the second CSSO does not yield an equivalent or stronger meaning. Also recall that modified numerals do not give rise to 'exceptional wide scope' readings (cf. footnote 2).

are many soldiers who each stand on every building, then it is the case that for building there are many soldiers standing on it. But the reverse is not true. If for every building, there are many soldiers standing on it, it does not follow that a single soldier is simultaneously standing on every building. Thus the GSEC correctly predicts that a CSSO shifting the relative scopes of *many soldiers* and *every building* is licensed.

Consider now (52b). Here the hypothetical inverse-scope interpretation entails the surface-scope interpretation. The former states that for every building, there are few soldiers standing on it, whereas the latter says that there are few soldiers who are standing on every building (which is trivially true given the fact that nobody can stand on two buildings simultaneously). Assume that the former is true, i.e., for every building  $b$  the number of soldiers standing on it, call it  $n_b$ , is small, i.e. below a certain threshold  $s$ . Consider now the number of soldiers who are standing on every building - call it  $m$ . For every building  $b$ ,  $m$  is necessarily smaller than  $n_b$ , hence is itself smaller than  $s$ . Therefore, the number of soldiers who are standing on every building is itself below the relevant threshold, which is exactly what the surface-scope interpretation means. This shows that the inverse-scope reading entails the surface-scope reading, with the result that the GSEC does not license the inverse-scope reading. Since the surface-scope interpretation expresses a very implausible reading, (52b) is expected to sound odd, which it does.

To predict the generalization in (51) in full generality, let us first remark that a UE-indefinite can be assimilated to an existential quantifier ranging over its so-called *witness sets* (cf. Barwise & Cooper 1981).<sup>25</sup> A witness set for *many students*, for instance, is any set containing many students. Hence the relevant ambiguity in the examples in (52) is reducible to an ambiguity in the relative scope of a universal quantifier and an existential quantifier. Given that the reading where the universal quantifier scopes over the existential quantifier is the weaker reading, as already shown above, it is not ruled out by the GSEC, and the inverse-scope interpretation is predicted to be possible in cases like (52a). In contrast with this, a DE-indefinite is equivalent to the negation of a UE-indefinite, i.e. it can be paraphrased as a negated existential quantifier ranging over the witness sets of some UE-indefinite. That is, the relevant readings in cases involving a DE-indefinite can be schematically represented as follows in (53). Now, (53b) entails (53a), and therefore the inverse-scope reading is ruled out by the GSEC.

(53) a. Surface scope:  $\neg\exists x(P(x) \wedge \forall yQ(x,y))$

<sup>25</sup> A witness set is defined as in (i). The auxiliary notion of ‘live-on set’ is defined in footnote 12.

(i) A *witness set* for a quantifier  $D(A)$  living on  $A$  is any subset  $w$  of  $A$  such that  $w \in D(A)$ . (Barwise & Cooper 1981: 191)

- b. Inverse scope:  $\forall y \neg \exists x (P(x) \wedge Q(x, y))$

There is, however, a complication. As we will discuss in subsection 7.2.1, DE-indefinites can give rise to so-called ‘split-scope’ readings, which suggest that they should be thought of as spelling out the combination of a negation and a UE-indefinite (‘few’ is then treated as spelling out ‘not many’). If so, under the assumption that negation cannot be interpreted lower than its surface-position (i.e. that it does not ‘reconstruct’), one might argue that the absence of an inverse-scope reading for (52b) provides no argument for the GSEC. If it is assumed, following Hornstein (1995), Johnson & Tomioka (1997), that reconstructing the subject into its VP-internal position is a prerequisite for the object to take scope over it, then there is no way the inverse-scope reading could be generated to begin with. However, there is no agreement in the literature that reconstruction of the subject is indeed obligatory in order for the inverse-scope reading to arise (see Fox 2000). In fact, we can build on our remarks in section 3.3 in order to determine whether the GSEC is responsible for the unavailability of an inverse-scope reading for (52b). Suppose we embed (52b) in a DE-environment. Then, as discussed in subsection 3.3, the GSEC should no longer rule out the inverse-scope reading. Therefore, if the inverse-scope reading remained unavailable, some other constraint (e.g. the fact that a DE-indefinite cannot undergo reconstruction) would have to be responsible for the lack of ambiguity in (52b). If, on the contrary, we find that the inverse-scope reading becomes available, it would suggest that the GSEC is the culprit. So let us consider the following sentence:

- (54) If few soldiers had been standing on every building, the enemies would have won the battle.

The mere fact that (54) does not sound particularly odd shows that the inverse-scope reading is available. On the surface-scope interpretation, (54) would be interpreted as ‘If the number of soldiers who were each standing on all buildings simultaneously had been low, the enemies would have won’, with the implication that the number in question wasn’t low. This is a very implausible reading, given that no soldier could have been standing on several buildings simultaneously. The inverse-scope interpretation, on the other hand, makes perfect sense (‘If each building had been protected by a small number of soldiers, the enemies would have won the battle’).

We conclude that the interactions between DE-indefinites and universal quantifiers provide further support for the GSEC.

In the next sections, we discuss several other predictions of the GSEC, and in particular, apparent counterexamples to it. In section 5, we show that when quantifiers are on the “right edge” of a sentence, their scope does not seem to be constrained by the GSEC, and we motivate an account of these apparent exceptions in terms of overt but string-vacuous movement to the right. In section 6, we discuss the

exceptional behavior of indefinites. In section 7, we discuss in detail the interactions between quantifiers and modals.

## 5 Quantifiers at the right edge

Recall that (2a), repeated below as (55) does not have an inverse-scope interpretation.

(55) John didn't meet every student of mine on time  $(\neg > \forall) *(\forall > \neg)$

In the case of (56), however, the inverse-scope reading *is* available under a particular intonation.<sup>26</sup> At first sight this is completely unexpected. The quantifiers involved in (56) are the same as in (55), and the GSEC should rule out the inverse-scope reading in both cases.

(56) The student couldn't answer every question that was marked with a star  $(\neg > \forall) (\forall > \neg)$

We contend that these apparent counterexamples to the GSEC are only found when the operator that is to undergo a scope-shifting operation is positioned at the right edge of the sentence. In such a situation the operator can undergo an *overt* but string-vacuous movement operation to the right, which (i) gives wide-scope to the operator, and (ii) is not subject to the GSEC (since it is overt). In other words, a scope-shifting operation must fulfill two requirements to be subject to the GSEC: it must be *movement* and it must be *covert*. Overt movement is free to alter scope relations, modulo locality conditions.

According to this, what distinguishes (56) from (55) is that in the former case, but not in the latter it is possible that the universal quantifier undergoes Heavy NP Shift (HNPS) – that is, string-vacuous movement to the right – to scope over negation. This is impossible or at least difficult for the universal quantifier in (55), because for HNPS in (55) to be string-vacuous, it would have been necessary that the phrase *on time* itself had moved to the right, in a position that outscopes negation, while the most natural interpretation for *on time* is the one where it scopes below negation.<sup>27</sup> Furthermore, HNPS requires that the quantifier be sufficiently 'heavy'. This means that (56) has (57) both as its LF and *surface* representation under the inverse-scope construal.<sup>28</sup>

26 We thank an anonymous reviewer for SuB 14 for pointing out data like (56).

27 The reading where both *on time* and the universal quantifier outscope negation could be paraphrased as follows: 'Every student of mine is such that John managed, on time, *not* to have met her', which does not make much sense.

28 Note that Kayne (1998) proposes a system where all QR is actually overt rightward movement (also cf. Fox & Nissenbaum (1999) for a related though distinct proposal). Such an analysis is not

- (57) [the student [couldn't answer  $t_1$ ]] [every question that was marked with a star]<sub>1</sub>

This approach makes certain predictions. For instance, the availability of the inverse-scope reading in (56) should disappear once we make sure that the universal quantifier cannot undergo string-vacuous HNPS. So if we place some material  $X$  that needs to be in the scope of negation to the right of the universal quantifier, the latter should not be able to move overtly but string-vacuously high enough to take scope over negation: this is so because in order for it to scope over negation, it should also scope over  $X$ , hence should move to the right of  $X$ . A CSSO would be called for, but the CSSO would violate the GSEC. This is, arguably, what is going on in (55), to the extent that the adverbial *on time* has to be interpreted in the scope of negation.<sup>27</sup>

But our prediction can be shown to be borne out in a much clearer way, by considering examples in which the universal quantifier is either followed or preceded by an item that is necessarily trapped under the scope of negation, such as a NPI. Thus consider the scopally ambiguous (58) and the unambiguous (59). Both examples use NPI *yet*, which must be in the scope of negation to be licensed. In (58) the universal precedes the NPI. In order for it to take scope over negation itself, it has to undergo movement. Covert movement is blocked by the GSEC. Overt movement to the right would not be high enough if it is string-vacuous, because in order to take scope over negation the universal would have to move past the NPI, which is trapped under negation. Therefore the observed lack of ambiguity is expected.

- (58) I haven't solved every problem that was marked with a star yet  
 $(\neg > yet > \forall) *(\forall > \neg > yet)$

(59) differs from (58) in having the universal follow the NPI, and this apparently allows for an inverse-scope interpretation. The latter can be plausibly attributed to the fact that the universal underwent HNPS (indeed, if the universal is replaced with a 'light' DP, the sentence becomes ungrammatical). What is important is that the landing site of the HNPS is in this case not forced to be under the scope of negation. Therefore the scope ambiguity in (59) is again explained by appeal to overt movement, which is not subject to the GSEC.<sup>29</sup>

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compatible with our approach. If we are on the right track, it is necessary that there is a type of movement that is distinguishable from overt movement, i.e., covert movement. Also cf. [Wagner \(2006\)](#) for related discussion.

<sup>29</sup> [Kayne \(1998\)](#) made similar observations in cases that do not involve a violation of the GSEC. He noticed that quantifiers at the right edge can violate the clause-boundedness of QR ([May 1985](#)) and assumed that overt rightward movement was responsible for this (despite the fact that rightward movement is usually taken to be clause-bound as well – a constraint known as the right roof constraint ([Ross 1967](#))). We do not know why this restriction does not apply in the cases considered here.):

- (59) I haven't solved yet every problem that was marked with a star  
 $(\neg > yet > \forall) (\forall > \neg > yet)$

Now contrast (58) with (60), where the universal is replaced with a modified numeral (which do not take exceptional wide scope (cf. footnote 2 above)). We notice that here the inverse-scope interpretation is available. (60) can mean that there are more than two problems which I haven't solved yet. The reason for this is, of course, that the GSEC does not rule out the necessary CSSO. Assume that there are 100 problems and I solved 50 of them. Then the inverse-scope reading is true since there are more than two problems that I did not solve. The surface-scope reading, however, is false because I solved more than two problems. So the inverse-scope interpretation does not entail the surface-scope interpretation, and therefore the CSSO is licensed by the GSEC.

- (60) I haven't solved more than two problems that were marked with a star yet  
 $(\neg > yet > \text{more than } 2) (\text{more than } 2 > \neg > yet)$

The difference in the availability of the inverse-scope interpretation for the constructions in (61) makes a point parallel to the one observed with (58) and (60), once it is observed that the *before*-clause, much like *on time* in (55), strongly prefers to be interpreted under the scope of negation.

- (61) a. I didn't solve every problem that was marked with a star before the deadline  
 $(\neg > \text{before} > \forall) *(\forall > \neg > \text{before})$   
 b. I didn't solve more than two problems that were marked with a star before the deadline  
 $(\neg > \text{before} > \text{more than } 2) (\text{more than } 2 > \neg > \text{before})$

Similarly, the account relying on overt movement to the right predicts that the ECM-marked universal quantifier in (62) cannot take scope over negation. It is not on the right edge. Therefore a CSSO is the only way wide scope could be achieved. But,

- (i) a. I will force you to turn down no one.  $(\text{force} > \neg\exists) (\neg\exists > \text{force})$   
 b. I will force you to turn no one down.  $(\text{force} > \neg\exists) *(\neg\exists > \text{force})$   
 (Kayne 1998: 142)
- (ii) a. She has requested that they read not a single linguistics book.  
 $(\text{request} > \neg\exists) (\neg\exists > \text{request})$   
 b. She has requested that not a single student read our book.  
 $(\text{request} > \neg\exists) *(\neg\exists > \text{request})$   
 (Kayne 1998: 128f.)

again, this movement is blocked by the GSEC.<sup>30</sup>

- (62) *Context: These students usually don't solve any problem whatsoever.*  
 I don't expect every problem that was marked with a star to be solved  
 $(\neg > \forall) *(\forall > \neg)$

A fully parallel explanation accounts for the fact that universal quantifiers embedded as subjects under perception verbs, as in (63), cannot take scope over matrix negation.

- (63) a. I didn't see every building collapse  $(\neg > \forall) *(\forall > \neg)$   
 b. I didn't see every girl laugh  $(\neg > \forall) *(\forall > \neg)$

The fact that the linear position of certain quantifiers matters for their scope taking abilities has thus been shown to actually lend support to the GSEC rather than to contradict it. Apparent exceptions to the GSEC involve quantifiers on the right edge and can thus be analyzed in terms of overt but string-vacuous movement to the right, which arguably is not subject to the GSEC. We saw independent evidence for such an analysis.

## 6 Wide-scope indefinites

It is widely assumed that in a sentence such as (64), the indefinite can take scope over the universally quantified subject. This looks like a violation of the GSEC, since in this case the inverse-scope reading entails the surface-scope reading.<sup>31</sup>

- (64) Every student heard some/a teacher talking on the phone

However, we want to point out that this fact is not a real problem for the GSEC. Such indefinites are indeed widely assumed to be able to get a wide scope interpretation without QR. The actual process that achieves this is immaterial to the discussion at hand. Assume for concreteness, however, that such indefinites can be analyzed as denoting choice-function variables that can be bound by an existential operator

<sup>30</sup> (i) shows that ECM-marked subjects can take scope over the matrix subject (cf. (May 1985: 44)), i.e. covert movement to the matrix level is not blocked in general. We thus expect the relevant CSSO to be subject to the GSEC, as assumed in the text.

- (i) A different boy wants every girl to marry him  $(\exists > \forall) (\forall > \exists)$

<sup>31</sup> Judgments are in fact notoriously difficult for cases such as (64), probably due to a principle such as Truth Dominance (cf. Abusch (1994), Reinhart (1997)).



the surface-scope reading. More generally, reconstructing a universal quantifier below an operator with existential force (such as an epistemic possibility modal) gives rise to a reading which is strictly stronger than the surface-scope reading, and yet the corresponding readings seem available with epistemic modals.

(66) #Every student may be the tallest person in the department.  $*(\forall > \diamond) (\diamond > \forall)$

Second, we note that examples like (67) also license an inverse-scope reading. In section 4, we saw evidence that a DE-indefinite cannot be interpreted under the scope of a universal operator c-commanded in surface syntax, as predicted by the GSEC. In the context in (67), however, it appears that the DE-indefinite *fewer than ten linguists* can be interpreted as taking scope below the necessity modal *must*. The context is chosen in such a way that the surface-scope interpretation is disfavored. The modal used is a deontic one.

(67) *Context: A party is to take place. The host hopes that there will not be too many linguists attending because linguists are really obnoxious when too many of them are together. The host thus thinks . . .*

Fewer than ten linguists must come for the party to be pleasant

$\#(\text{fewer than } 10 > \square) (\square > \text{fewer than } 10)$

- a. #‘There are fewer than ten linguists  $x$  such that  $x$  must come for the party to be pleasant.’
- b. ‘It must be the case that fewer than ten linguists come for the party to be pleasant.’<sup>33</sup>

If we take the view that reconstruction is not an option for DE-indefinites (cf. our discussion in section 4), these data are problematic even independently of the GSEC.<sup>34</sup> From the point of view of the GSEC, however, this state of affairs is problematic only if we ignore the fine details of the semantics of modal constructions. For the inverse-scope reading of (67) entails the surface-scope reading only on the assumption that the extension of the predicate *linguists* is the same in the actual world and in the worlds quantified over by the necessity modal. That is, the entailment goes through only if the predicate *linguists* is interpreted *de re* in the case of the inverse-scope reading. In other words, assuming that reconstruction under a modal

33 Note that (67) has an additional interpretation, called the split-scope reading, which can be paraphrased as ‘the number  $n$  such that it must be the case that  $n$  linguists come and it is not necessary that more than  $n$  people come for the party to be pleasant is smaller than 10’. We return to this type of reading in the next subsection.

34 As we discuss below, the existence of so-called ‘split-scope’ readings suggests that DE-indefinites spell out a complex structure made up of a negation and a UE-indefinite. One might then expect that they can *never* fully reconstruct, because negation itself is not subject to CSSOs. This is in fact the position taken by Iatridou & Sichel (2011), who follow Sportiche (2005). See our discussion below.

licenses a *de dicto* reading for the restrictor of the DE-quantifier, it follows that there is an inverse-scope reading (namely, the *de dicto*-reading) that does not logically entail the surface-scope reading. Thus one might be tempted to assume that the observed inverse-scope interpretation in (67) is the *de dicto* interpretation, which the GSEC does not block. This could be a sufficient answer to the puzzle posed by (67).<sup>35</sup>

However, the GSEC makes clear predictions for *de re* construals – that is, the GSEC blocks an inverse-scope (*de re*) reading if it entails the surface-scope interpretation.<sup>36</sup> In particular, if a quantifier comes with a salient domain-restriction, we may assume that only the *de re*-construal is available. But in even when we force a *de re*-reading, sentences such as (67) seem to license the inverse-scope reading, contrary to what the GSEC predicts. For instance, even if we are talking about a salient set of linguists, with the result that the denotation of *linguist* is understood to include the same individuals in every world, the inverse-scope reading for (67) remains clearly accessible. Building on Iatridou & Sichel (2011), we will argue in the next section that this counterexample and similar ones can be explained in terms of a) the specific behavior of DE-indefinites, i.e. the fact they license so-called split-scope readings, and b) the fact the modals that are involved in such counterexamples tend to outscope negation even when c-commanded by it. However, obligatory inverse-scope in the case (66) will remain a genuine mystery, which leads us to assume that the epistemic containment principle trumps the GSEC.<sup>37</sup> Finally, we will

35 We should note that this line of reasoning cannot apply to epistemic necessity modals. In the specific case of epistemic necessity modals, the entailment from the inverse-scope reading to the surface-scope reading goes through even on a *de dicto* construal. This is so because the accessibility relation associated with epistemic modals is generally assumed to be such that any world (hence the actual world in particular) is accessible to itself – this ensures that *must p* entails *p*. See von Stechow & Gillies (2010). As a result, the inverse-scope reading of (i) below entails the surface-scope reading even on a *de dicto* construal of *linguists*. Indeed, if in every world *w* accessible from the actual world fewer than five people who are linguists in *w* attend, then in the actual world in particular, fewer than five linguists attend, and therefore there are fewer than five people who are linguists in the actual world and who attend in every accessible world.

(i) Fewer than five linguists must have attended the party.

So claiming that unexpected inverse-scope interpretations are always the result of a *de dicto* construal will not do to explain cases like (i) away. Our discussion in section 7.2 will shed light on this problem

36 Strictly speaking, examples involving temporal quantification, such as the ones we discussed in section 2.5, give rise to the same issue. That is, the GSEC rules out certain scope interactions between DPs and temporal operators only with respect to cases in which the temporal argument of the DP is not bound by the temporal operator

37 We speculate that, for some reason, epistemic modals are not even interpretable if they do not take maximal scope, with the result that there might be no real ‘competitor’ that could serve as input for the GSEC. Fox, in the context of his original Economy Condition, assumes something similar in the

tentatively show that non-epistemic possibility modals c-commanded by a universal quantifier behave more in line with the GSEC.

## 7.2 DE-indefinites and necessity modals

We have just seen data suggesting that a DE-indefinite can take scope below a deontic necessity modal, (67) above. We further note that negative quantifiers like *no linguist* can also take scope below a universal deontic modal. Again, the context makes the surface-scope interpretation unlikely:

- (68) *Context: A party is to take place. The host hopes that no linguists will attend because a single linguist is already too obnoxious. The host thus thinks . . .*  
 No linguist must attend #( $\neg\exists > \Box$ ) ( $\Box > \neg\exists$ )

(69) shows a parallel situation with an epistemic necessity modal.

- (69) *Context: Of the 20 copies of handouts made for the talk almost all are left after the talk. The professor thinks . . .*  
 Fewer than ten students must have attended this talk  
#(fewer than 10 >  $\Box$ ) ( $\Box >$  fewer than 10)  
 a. #‘There are fewer than ten students  $x$  such that  $x$  must have attended the talk.’  
 b. ‘It must be the case that fewer than ten students attended the talk.’

These data go against the GSEC because the inverse-scope readings entail the respective surface-scope readings. It turns out, however, that most of the problematic patterns have been studied in a recent paper by Iatridou & Sichel (2011). They show that nearly all the relevant data can be explained by appealing to two independent facts. The first fact is that DE-indefinites allow for so-called ‘split-scope’ readings in modal contexts. The second fact is that certain modals have the property of being ‘neg-raising’: when under the syntactic scope of negation, they can or must be interpreted as if they scoped over negation. As a result, split-scope readings involving neg-raising modals give rise to readings which are equivalent to an inverse-scope reading, without there being any need for the DE-indefinite to have been fully reconstructed into a position below the modal. We will now discuss this account in more detail.

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case of obligatory QR, i.e. QR that is mandated by type-theoretic considerations.

### 7.2.1 Split-scope readings and the GSEC

(70) below can be interpreted as saying that there do not need to be ten people or more at the party for it to be successful.

- (70) Fewer than ten people need to attend the party for it to be successful  
 $\rightsquigarrow$  Intended reading: There does not need to be ten or more than ten people attending for the party to be successful.

Now, this reading is neither equivalent to the surface-scope reading nor to the reading that would arise if *fewer than ten people* were interpreted under the scope of *need*. In order to account for this type of readings, one natural possibility is to view such DE-indefinites as spelling out the combination of a negation and a UE-indefinite. More specifically, *fewer than ten people* is then analyzed as  $\neg(\text{ten people or more})$ . The reading we have just observed is then expected if the indefinite part of the DE-indefinite can reconstruct below *need* but with negation taking matrix scope - hence the label ‘split-scope’ readings. When the UE-indefinite is interpreted below the modal but negation stays upstairs, we get the following logical form:

- (71)  $\neg[\text{need}(\text{ten people or more attend the party})]$

It has to be noted that the split-scope interpretation entails the surface-scope interpretation (still on the assumption that the GSEC treats all quantifiers as Aristotelian). If it is not the case that in every accessible world more than ten people attend the party, then there aren’t more than ten people who attend the party in every accessible world. This might lead us to conclude that the GSEC should block the split-scope interpretation. Recall, however, that in subsection 3.1, we argued that the GSEC should be stated as a *local* constraint, i.e. as follows, repeated from (41):

- (72) *Generalized Scope Economy condition* (modified version)  
 A CSSO is licensed in a sentence *S* only if there exists a constituent *C* of *S* (possibly *S* itself) such that the CSSO does not make the semantic value of *C* stronger than or equivalent to what it would be without the CSSO.

Now, consider again (71). Such an LF could be obtained from the surface-scope representation by reconstructing the indefinite part of *fewer than ten people* below *need*. That is, the two structures to be compared are the following:

- (73) a. Surface-scope:  
 $\text{NEG}_{(S_1)}[\text{ten people or more}][\lambda X. [\text{need}(X \text{ attend the party})]]$   
 b. Split-scope (involving partial reconstruction):  
 $\text{NEG}_{(S_2)} \text{need}(\text{ten people or more attend the party})$

While the split-scope reading entails the surface-scope reading, things are the other way around when one focusses not on the full sentences but only on the constituents which are in the scope of negation, that is, the constituents labelled  $S_1$  and  $S_2$ . That is,  $S_2$  does not entail  $S_1$ , but the other way around. As a result the GSEC, as formulated in (72), does not rule out the split-scope reading.<sup>38</sup>

### 7.2.2 Neg-raising and split-scope

Iatridou & Sichel (2011) note that the following sentence can be interpreted as if the negative quantifier scoped below the necessity modal.

- (74) No student should leave  
 $\leadsto$  Available interpretation: It should be the case that no student leaves.

They argue that the way this reading is derived is as follows: the relevant LF is just the one that results from partial reconstruction, on the assumption that *no* spells out the combination *NOT* + *indefinite article*:

- (75) NOT[should a student leave]

Now, it turns out that *should* is ‘neg-raising’ in the sense that even when negation occurs in a position where it should normally scope over the modal, it ends up being interpreted as scoping below *should*. For instance, *Mary shouldn’t leave* is not interpreted as meaning that Mary does not have a requirement to leave, but rather that she has a requirement not to leave. Whatever the source of this phenomenon (cf. Gajewski (2005) for one approach and references), it is then expected that (75) will end up being interpreted as stating that it should be the case that no student leaves.

Clearly, this approach can be extended to all DE-indefinites that allow for split-scope readings. We thus expect, following Iatridou & Sichel’s 2011 insight, that all apparent counterexamples to the GSEC involving DE-indefinites and necessity modals will involve ‘neg-raising’ modals.

In fact, all the cases mentioned above where a DE indefinite subject could be interpreted below a necessity modal involved neg-raising modals in the following sense: these modals, when adjacent to negation, license an interpretation in which negation applies to the proposition embedded under them. This is illustrated in (76) for *must*.

- (76) a. John mustn’t come for the party to be a success  
 b. ‘In all accessible worlds, for the party to be a success, John doesn’t

<sup>38</sup> We should note that split-scope readings don’t seem to be available across regular quantifiers, while they are across modals.

come.’

Not all deontic necessity modals, however, behave in this way. Consider *need* in (77a) and the corresponding paraphrase in (77b).

- (77) a. John need not come for the party to be a success  
 b. ‘It is not the case that in all accessible worlds, for the party to be a success, John comes.’

If neg-raising is the property that allows a DE-indefinite subject to be interpreted under the scope of a necessity modal, then when we replace *must* with *need* in, say, (67), the relevant reading should not be observed. In other words, the sentence should sound awkward in the given context, repeated in (78). Due to the GSEC and the non-neg raising status of *need*, only the surface-scope interpretation (78a), which does not fit the context, should be available. In other words, the inverse-scope reading in (78c) is unavailable due to the GSEC. The sentence, indeed, sounds odd in this specific context, indicating that the prediction is borne out.

- (78) *Context: A party is to take place. The host hopes that there will not be too many linguists attending because linguists are really obnoxious when too many of them are together. The host thus thinks . . .*  
 #Fewer than ten linguists need to come for the party to be pleasant

#(fewer than 10 > □) \*(□ > fewer than 10)

- a. Surface-scope: #‘There are fewer than ten linguists  $x$  such that  $x$  need to come for the party to be pleasant.’  
 b. Split-scope: \*‘There does not need to be ten linguists or more at the party for it to be pleasant’  
 c. Inverse-scope: \*‘It needs to be the case that fewer than ten linguists come for the party to be pleasant.’

Further evidence that modal or attitude predicates that do not seem to be well-behaved with respect to the GSEC exhibit the neg-raising property comes from the difference between the doxastic predicates *be believed to* and *be supposed to*, on the one hand, and *be known to* and *be claimed to*, on the other hand. Only the former are neg-raising predicates but not the latter, as shown by the paraphrases for sentences involving negation in (79a), (79b), (79c), and (79d) respectively.<sup>39</sup>

<sup>39</sup> Again, the bi-clausal examples in (i) fully confirm our claims about which predicates are neg-raising and which are not:

- (i) a. Mary doesn’t believe that John is home  
 ‘Mary believes that John is not home.’

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- (79)
- a. John is not believed to be home  
'John is believed not to be home.'
  - b. John is not supposed to be home  
'John is supposed not to be home.'
  - c. John is not known to be home  
'It is not known that John is home.'
  - d. John is not claimed to be home  
'It is not claimed that John is home.'

If what we said above is correct, it is predicted, on the one hand, that the neg-raising predicates *be believed to* and *be supposed to* license an apparent violation of the GSEC. The non-neg-raising predicates *be known to* and *be claimed to*, on the other hand, should not do so. That this is correct is illustrated in (80a) and (80b), respectively. Note that the examples only make sense on the inverse-scope interpretation: an epidemiological model presumably makes no prediction about any specific individual. But if the inverse-scope interpretation is blocked by the GSEC for (80b) – since the predicates involved are not neg-raising – the sentence is predicted to be odd.

- (80)
- a. On the basis of this epidemiological model, fewer than 20% of the American people are believed/supposed to have been hit by this disease  
(fewer than 20% > believe/suppose) (believe/suppose > fewer than 20%)
  - b. #On the basis of this epidemiological model, fewer than 20% of the American people have been claimed/are known to have been hit by this disease  
(fewer than 20% > claim/know) \*(claim/know > fewer than 20%)

A UE-indefinite, on the other hand, can reconstruct below a non-neg-raising predicate, as shown by (81).

- (81) On the basis of this epidemiological model, more than 20% of the American people have been claimed/are known to have been hit by this disease  
(more than 20% > claim/know) (claim/know > more than 20%)

- 
- b. Mary doesn't suppose that John is home  
'Mary supposes that John is not home.'
  - c. Mary doesn't know that John is home  
'It is not the case that Mary knows that John is home.'
  - d. Mary doesn't claim that John is home  
'It is not the case that Mary claims that John is home.'

The data in (80) and (81) thus lend further support to the conjecture that it is the neg-raising property of certain modal predicates that lets them violate the GSEC.

### 7.3 Universal quantifiers and possibility modals

Consider the example with the possibility modal in (82). Here an inverse-scope interpretation is apparently possible. The sentence can be understood to mean that it might be the case that all the students attend the class. Yet the inverse-scope reading (under a *de re* interpretation for ‘students’) is strictly stronger than the surface-scope reading, and therefore is prohibited by the GSEC.<sup>40</sup>

(82) All the students might attend the class

Note, however, that there is a way to generate a reading equivalent to the inverse-scope construal without reconstruction of the universal quantifier. Again, this involves a careful consideration of the relationship between distributivity and plural semantics (cf. section 2.3). Note that ‘All the students’ is compatible with a collective construal (as in ‘All the students gathered’). It is thus reasonable to assume that, in the case of ‘all the students’, distributive readings are achieved by means of a distributivity operator applying to predicates, and whose scope can in principle be distinct from that of ‘All the students’. With this in mind, consider the following structure:

(83) [All the students][ $\lambda X$ . $[$ might(*DIST*(attend the class))]( $X$ )]  
 $\rightsquigarrow$  ‘The plurality  $X$  made up of all students is such that it might be the case that each atomic member of  $X$  attends the class.’

Now, note that this reading is equivalent to the *de re* inverse-scope reading. This is so because, in such a representation, *all the students* behaves just like a referential plural expression, hence (putting aside the *de dicto/de re* distinction) is ‘scopally inert’. This shows that the apparent inverse-scope reading can in fact be achieved without reconstruction of the subject – namely by ensuring that the distributivity operator itself takes scope below ‘might’, which does not require any movement operation.

This approach directly predicts that this fake ‘inverse’ scope reading should disappear when an obligatorily distributive universal quantifier is used and the modal

<sup>40</sup> The inverse-scope reading entails the surface-scope reading on a *de re* interpretation for ‘students’, where ‘students’ has the same extension as in the actual world in all the accessible worlds. If there is an accessible world in which all the students attend the class, then for each student there is an accessible world where he or she attends the class – hence the *de re* inverse-scope reading entails the surface-scope reading.

used is preferably interpreted as non-epistemic.<sup>41</sup> The examples in (84) allow us to test this prediction. The preceding discourse makes the surface-scope interpretation of the examples in (84) ('every professor is such that he can be fired individually') uninformative, i.e., disfavored. Given the discussion in the preceding paragraphs and the predictions of the GSEC, the contrast between (84a) (which uses *all*) and (84b) (which uses *each*) is fully expected. (84a) licenses a reading which is equivalent to the inverse-scope reading because the quantifier 'all the professors' is not inherently distributive, so that a structure comparable to (83) is available. Because *each* is strongly distributive, no representation of the type given in (83) is available for it, and the inverse-scope reading could only be achieved by reconstructing the subject below the modal, but this is ruled out by the GSEC. Note that there is nothing inherently wrong with *each professor* in such a context, as (84d) shows.

- (84) In this department, every professor can of course be individually fired. No one has tenure. What's more, ...
- a. all the professors can be fired at the same time.
  - b. #each professor can be fired at the same time.
  - c. every professor can be fired at the same time.
  - d. once each professor was fired at the same time.

As to (84d), which involves the quantifier *every* and sounds fine in this context, we would like to suggest that this is due to the fact that *every* is not as strongly distributive as *each* is. In fact, a phrase of the form *every NP* marginally lends itself to collective interpretations, as had already been observed by Beghelli & Stowell (1997). This assumption is further supported by the example in (85). In the context given only the collective interpretation 'all the students together fit into this room' is informative. The fact that the sentence with *every* is acceptable suggests that the collective interpretation is available.

- (85) *Context: Talking about a normal sized room.*  
Every student fits into this room.

Likewise, a predicate like *to be equal* cannot apply to atomic individuals, cf. (86a) and (86b) i.e., it is a collective predicate. Nevertheless, (86c), with *every citizen*, is acceptable.

- (86) a. #John is equal.  
b. #In this country, each citizen is equal.  
c. In this country, every citizen is equal.

<sup>41</sup> We assume that the lexical entry of obligatorily distributive quantifiers make them inherently distributive, as in standard Generalized Quantifier theory

The examples in (87) show the same behavior in the context of a rule-based game, with a clearly deontic possibility modal *to be allowed*. Again, the discourse is chosen so that the surface-scope interpretation of the examples is disfavored because it would be uninformative. And again, in the case *every player* and *all the players* a fake ‘inverse scope’ interpretation is possible, but not so for the strongly distributive *each player* – which would have to undergo an illicit CSSO in order to license this reading. Notice once more that there is nothing wrong with *each player* in this context per se, (87d).<sup>42</sup>

- (87) In American football, every player can of course be taken out individually. What’s more, . . .
- a. all the players are allowed to be taken out of the game at the same time.
  - b. #each player is allowed to be taken out of the game at the same time.
  - c. every player is allowed to be taken out of the game at the same time.
  - d. once each player was taken out of the game at the same time.

Lastly, consider the context and the examples in (88). The context is such that an inverse-scope interpretation is favored for the sentences in (88c), (88d) and (88e). The surface-scope distributive interpretation (‘each ball individually could be put into the box’) would be uninformative in the specified context. Again, we notice that the sentences with *all the balls* and *every ball* are fine but not the one with *each ball*.

- (88) *Context: There is an enormous number of very small balls. Each ball individually can fit in a small box, but they could not all be together in a small or average box. You would need a huge box.*
- a. This box is enormous: all the balls have been put into it
  - b. This box is enormous: every/each ball has been put into it.
  - c. This box is enormous: all the balls could be put into it.
  - d. This box is enormous: #each ball could be put into it.
  - e. This box is enormous: every ball could be put into it.

We thus conclude that the GSEC makes correct predictions for the respective scope of universal quantifiers and non-epistemic possibility modals, when we acknowledge the existence of fake ‘inverse-scope’ interpretations for some collectively interpreted universal quantifiers. However, Asarina (*to appear*), reacting to a preliminary version of our proposal (Mayr & Spector 2010), cites (89) as a problem for the GSEC. She argues that the context in (89) is such that the inverse-scope

<sup>42</sup> Thanks to Jonah Katz (p.c.) who provided this example and the examples in (86) below.

interpretation of *Each student is allowed to get an A*,<sup>43</sup> on the one hand, is facilitated. According to her, on the other hand, the surface-scope reading should sound odd (in the given context). Since the discourse is felicitous, this is supposed to show that the inverse-scope reading must be available, contrary to what the GSEC predicts.

- (89) We don't grade on a curve here. Each student is allowed to get an A.  
 #( $\forall > allowed$ ): No individual student is prohibited from getting an A.  
 ( $allowed > \forall$ ): It is permitted for all students to get A's.

There is an objection to this reasoning: it is in fact not clear at all that the surface-scope interpretation would be odd in the given context. The first sentence in (89) means that we are grading fairly. The second sentence, on its surface-scope construal, means that for each student there is a permissible world in which they get an A. In this context, this is understood as meaning that everyone can get an A if they deserve it. Now, assuming that it is possible in principle that every student does well on the exam, it follows there is a possible world where every student gets an A. In other terms, this is a case where the surface-scope reading may become nearly indistinguishable from the inverse-scope reading, given plausible background assumptions. We can in fact make sure that the surface-scope interpretation is natural in this context by using minimally different sentences in which we know that the subject cannot reconstruct below the possibility modal, as in (90).<sup>44</sup>

- (90) a. We don't grade on a curve here. Each student knows that he is allowed to get an A.  
 b. We don't grade on a curve here. Each student is allowed to get an A and knows it.

Asarina's objection thus does not seem to be warranted.

## 8 The GSEC as a modular principle

In the course of this paper, we needed to make a number of auxiliary assumptions which were by no means straightforward, without which some of our predictions would be lost. For instance, we assumed that the GSEC treats quantifiers as Aristotelian. We also assumed that, in cases involving scope interactions between

43 Asarina used an example with *every* instead of *each*, but given the above discussion, her argument, to have any strength, should be based on the behavior of *each*.

44 In (90b), *every student* is the subject of two coordinated TPs. Given the VP-internal subject hypothesis, such a structure involves across-the-board movement from two VP-internal positions to the specifier of T. As argued in Fox (2000), reconstructing the subject below 'allowed' in the first conjunct is only possible if a parallel reconstruction operation occurs in the second conjunct. But this second reconstruction operation would violate Fox's original version of *Scope Economy*.

quantifiers and modal and temporal operators, the GSEC did not take into account the *de dicto/de re* distinction, and, more specifically, that it computed entailment relations based on the assumption that the denotation of the relevant NPs is constant across possible worlds. Both these assumptions are not really warranted on the basis of truth-conditional intuitions.

Let us start with the assumption that quantifiers presuppose their restrictors to be non-empty. Even though there is good evidence that all quantifiers tend to trigger the inference that their restrictor does not have an empty denotation, and that this inference behaves more or less like a presupposition (cf. Geurts 2007 and the references cited therein), there are clear cases where such an inference is absent. For instance, a sentence such as *There exist no unicorns* makes perfect sense. But, if the use of *no unicorns* necessarily triggered the presupposition that there are unicorns, then such a sentence would be contradictory.<sup>45</sup> One possible way out would be to claim that, putting aside such existential statements, quantifiers are interpreted as Aristotelian *by default*. More specifically, the relevant existence presuppositions would be cancelled only when needed in order to avoid contradictions or tautologies, or when the context creates a strong bias against this presupposition. If this is the case, then some of the patterns we observed might be expected to be obviated whenever the relevant existence presuppositions need to be cancelled. In fact, Asarina (to appear) provides some data which might suggest that this expectation is borne out. For instance, she discusses the following example.

(91) A script hasn't been written, so we cannot shoot the movie.

As Asarina notes, the only sensible reading in this case is the inverse-scope reading ('There wasn't any script written'). Furthermore, she points out that given that no script for the relevant movie could exist unless it has been written, this is a case where the indefinite can certainly not trigger an existence presupposition, and argues that this is why the inverse-scope reading is licensed in this case. One way to make sense of this would be to assume that an existential quantifier is interpreted as Aristotelian by default, so that it cannot normally be interpreted below a negation that it c-commands (given the GSEC), but that in a limited set of cases the existence presupposition is eliminated, and in such cases the indefinite can then be interpreted under the scope of negation.

We believe that further work is needed in order to assess such a proposal. If this strategy does not turn out to be successful, we would like to resort to another type of approach. In fact, we need to assume, for reasons that were already pointed out by Fox (2000) in the context of his own economy condition, that the GSEC does not

<sup>45</sup> Furthermore, it might be even expected to be ungrammatical given the so-called *definiteness effect* (Milsark 1974)

operate on the basis of the actual truth-conditions of the relevant sentences. Rather, it makes use of a modular ‘deductive system’ that does not access all the information that is relevant to the final truth-conditions. The reason why Fox needed to adopt such an approach is the following: in some cases where scope-shifting can in fact give rise to a change of meaning, scope-shifting appears to be impossible. According to Fox, this is because the deductive system on which the semantic economy principle depends fails to see that scope-shifting is not vacuous. More specifically, according to Fox, what the scope economy principle looks at is just the pair of operators that are candidates for scope-shifting, ignoring some of the intervening material. If the two operators normally ‘commute’ when no operator occurs between them, then scope-shifting is disallowed, even if some of the intervening material would in fact make the relevant scope-shifting operation non-vacuous (adopting this view might be problematic in light of our discussions in section 2.4). A closely related approach (Gajewski 2002, Fox & Hackl 2007) consists in distinguishing between the logical vocabulary and the non-logical vocabulary, and assuming that the relevant economy condition ignores the identity of non-logical items. In any case, given that we need to make some specific assumption about the properties of the ‘deductive system’ that are relevant to the application of the GSEC, we might impose that, *from the point of view of this system*, all quantifiers are Aristotelian. One way to achieve this is to define the notion of entailment relevant to the GSEC in terms of models in which all the predicates that appear as restrictors in the relevant sentences are assigned a non-empty extension.

In this connection, let us come back to an issue we briefly touched upon in footnote 7. Our GSEC does not make the strong claim that inverse-scope readings are licensed only if they are a-symmetrically entailed by the surface-scope reading. It only says that they should not entail the surface-scope reading. We mentioned that one could consider a stronger version of the GSEC, namely (92).

(92) *Strong GSEC*

A CSSO can apply only if the meaning of the resulting reading is a-symmetrically entailed by the meaning that would have resulted without it.

Contrary to this strong version, our actual formulation predicts that inverse-scope readings are available also when they are logically independent of the corresponding surface-scope readings. While we did not investigate such cases in detail in this paper, we should briefly mention that non-monotonic indefinites such as *exactly two boys* are correctly predicted to be able to be interpreted under the scope of a universal quantifier that they c-command in surface-syntax, (93):

(93) Exactly two boys danced with every girl (exactly 2 >  $\forall$ ) ( $\forall$  > exactly 2)

In this case the surface-scope and inverse-scope readings are logically independent, and the inverse-scope interpretation is thus predicted to be licensed. Judgments are less clear, however, for cases involving a non-monotonic quantifier and negation, as in (94).

(94) Exactly two guests didn't show up.

In this case, the version of the GSEC proposed in this paper does not block the inverse-scope reading, but it is not clear that the inverse-scope reading is in fact available. Together with the availability of the inverse-scope reading for (93), the lack of an inverse-scope reading for (94) might suggest that the underlying system does not distinguish between such apparently non-monotonic indefinites and monotone-increasing indefinites, and views them as expressing existential quantification. This would make sense under a strong modularity assumption according to which the GSEC operates on very impoverished representations in which some of the fine logical properties of various operators are obliterated. Fox also argues for his modularity assumption partly on the basis of the behavior of non-monotonic quantifiers. Given these considerations, it is not entirely clear whether the choice between our GSEC and (92) really matters.

These considerations are only tentative. But it is clear that, as was already the case for Fox's (2000) approach, a certain amount of modularity is needed in order for our proposal to work. To the extent that we have been successful in providing a unified theory of scope interactions, the modularity assumptions that are needed to make the proposal viable receive significant support.

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