THE VARIABILITY OF IMPERSONAL SUBJECTS

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THE VARIABILITY OF IMPERSONAL SUBJECTS

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The Variability of Impersonal Subjects

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My goals in the present paper are the following:

• sketch a theory of adverbs of quantification;
• use it to explore the semantics of impersonal subject constructions.

By impersonal subject constructions I intend to refer to structures such as those in (1).

(1) a. In Italia si beve molto vino.
   b. In Italy si drinks a lot of wine.
   c. In Italy, everybody/people drink a lot of wine.

Italian si, French on or German man are morphemes that can occur only as subjects and express non-specific or indeterminate human subjects. They mean something like people. I will focus on impersonal si in Italian but I hope that what I have to say will extend to related constructions in other languages as well.

These constructions are very interesting both syntactically and semantically. From a semantic point view their interest lies primary in the fact that impersonal subjects display a great deal of variability in their quantificational force, which ranges from quasi-universal (as in (1) –cf. the gloss) to quasi-existential as in (2):

(2) a. In Italia ieri si e’ giocato male.
   b. yesterday in Italy si played poorly.
   c. yesterday somebody in Italy played poorly.

(2) could be naturally uttered having in mind a couple of prominent soccer players of the Italian national team who did particularly poorly in yesterday’s match. Such a variability seems to a considerable extent a function of the quantificational force of adverbs of quantification which may be present in the context (explicitly or implicitly). This dependency (which is the reason why I think the semantics of si cannot be studied independently of a theory of quantificational adverbs) is evidenced by data such as the following:

(3) a. In Italia, i risultati dei concorsi si sanno sempre prima che i concorsi abbiano luogo.
   b. In Italy the results of the competitions si always know before the competitions take place.

Sentence (3) has the same truth-conditions as (4):

(4) In Italia everybody knows the result of competitions before they take place.

If (4) is true, (3) also is, and vice versa. Per contrast, (5), where the adverb of quantification is changed from always to sometime, is truth-conditionally equivalent to (6):

(5) In Italia everybody knows the results of competitions sometime before they take place.

(6) In Italia everybody knows the results of some competitions sometime before they take place.

(5) is true in exactly the same cases as (3), so it is true whenever (3) is true. (6) however, is true whenever (4) is true, and it is true when (3) is true in some cases.
(5) a. In Italia i risultati dei concorsi talvolta si possono sapere prima che i concorsi abbiano luogo.
   
b. In Italy, the results of the competitions si can know before the competitions take place.

(6) In Italia there are people who can find out who will win a competition before it takes place.

This chameleonic behavior, as Heim puts it, is typical of indefinites and has been extensively studied within the framework of Discourse Representation Theory (DRT – Heim [13], Kamp [16]). The leading idea within DRT is that indefinites are semantically variables without a quantificational force of their own. Their quantificational force comes from the context. In particular determiners like every or most and adverbs of quantification are analyzed as unselective binders capable of binding simultaneously all the variables in their scope. Thus DRT should constitute a good framework for studying the semantic variability of si and related constructions.

There are several puzzling aspects of the behavior of si, however, that need to be addressed before we can celebrate a new theoretical triumph for DRT and related frameworks. Consider for example a sentence like (7):

(7) a. Se si ruba si va in prigione.
   
b. If si steals si goes to prison.

Here the second occurrence of si is understood as “bound” by the first occurrence. The first occurrence of si behaves like an indefinite, the second like a pronoun bound by the indefinite. So what is si? An indefinite, a pronoun or both? These and several other puzzles are what I hope to be able to shed some light on.

In studying the semantics of si, I will have to bypass several interesting problems. In particular, it has often been noted that si is associated with a sort of “empathy” phenomenon. When a speaker utters sentences like (1) or (2), it is as if he ideally includes himself in the relevant group or assumes the perspective of that group. I will not have anything to say about this effect here. I will rather concentrate on the quantificational force of si and on its anaphoric properties.

The present paper is organized as follows. In section 1 I will present the semantic framework that I will adopt. While this framework is much in the spirit of DRT, it also differs from classical DRT, in interesting ways, I think. In particular, it gives up the indefinites-as-free-variables ideology and goes back to the more traditional view that they are existentially quantified terms. But the framework to be presented empowers existential quantification of certain dynamic properties that enable us to achieve the same effects as classical DRT. In section 2, I will present a theory of quantificational adverbs couched within the framework developed in section 1. In section 3 I will discuss the empirical properties of impersonal si and, after some syntactic preliminaries, the essence of my proposal. Finally in section 4, I’ll consider the consequences of my proposal in relation to various properties of si.

1 The framework

The semantic framework that I will adopt is a version of Montague’s Intensional Logic, with a dynamic twist to it, which I will now describe informally.\footnote{My proposal is based on the work of Groenendijk and Stokhof [11] [12], to which I refer the reader for technical details. See also Chierchia [5].}

As, e.g. Stalnaker [26] argues, sentences affect the contexts in which they are uttered in many ways. They can increase the information of the illocutionary agents by narrowing down the alternatives under consideration. They can set up some discourse referents as potential topics of further discourse and shut others off. They
can put constraints on possible continuations of the discourse, and so on. Without trying to cover here all the context changing functions of a sentence, we may wonder whether at least those that are of more direct relevance to anaphora may be formally represented in a system like $\text{IL}$.

Suppose that $\phi$ represents the truth-conditions of a sentence $S$. We might represent the way in which $\phi$ can be used to update the context in which it is uttered as:

$$\lambda p[\phi \land \forall p], \text{ where } p \text{ ranges over propositions}$$

The function in (8) determines a set of propositions: those that constitute possible continuations of $\phi$. (Throughout this paper I will freely switch back and forth between characteristic functions and the corresponding sets. So I will refer to something of type $(a, t)$ sometimes as a function and sometimes as a set of $a$'s.) Let us call functions of this type “update functions” and let us assume that sentences are semantically associated with them. So for example the sentence in (9a) will be associated with the update function in (9b):

$$\lambda p[\text{blond}(x_1) \land \forall p]$$

The variable $p$ in (9b) can be viewed as a “hook” to which subsequent pieces of discourse are going to be attached. To see why update functions represent an aspect of the context change potential of a sentence, we have to consider how discourse sequencing may be viewed (i.e. how this “hook” is going to be used).

But before we do that, there is a preliminary issue that should be addressed. In general propositions are thought of as a set of worlds. But the aspects of quantification we are concerned with here can be studied more profitably, I think, if we keep them separate from intensional matters and we look at them first in purely extensional terms. Accordingly, rather than regarding propositions as sets of worlds, let us think of them as sets of assignments to variables. So let us assume that $\hat{\phi}$ denotes the assignments with respect to which $\phi$ is true rather than the worlds in which $\phi$ is true, i.e. where $\omega$ is an assignment to variables, $[\hat{\phi}]^\omega = \{\omega' : [\phi]^{\omega'} = 1\}$. We know that ultimately propositions cannot be modelled as sets of assignments. Nevertheless, it won’t hurt making this assumption here, for as far as I can see adding intensionality doesn’t affect what I want to say and merely complicate things. Following Lewis’ [20] suggestion, let us think of the assignments that satisfy a formula $\phi$ as the “cases” which make $\phi$ true.

Sets of cases are partially ordered by an inclusion relation $\subseteq$. For example, it will generally hold for any $\phi$ and any $\psi$ that $\hat{\phi \land \psi} \subseteq \hat{\phi}$, that $\hat{\phi} \subseteq \hat{\phi \lor \psi}$, and so on. The non empty minimal elements with respect to $\subseteq$ are singletons of the form $\{\omega\}$, where $\omega$ is an assignment. For all practical purposes singletons of this form can be identified with cases. This identification enables us to regard cases as particular propositions, namely the most specific ones. If we had worlds, it would be like identifying a world $w$ with the singleton $\{w\}$, i.e. the proposition that univocally characterizes $w$. In what follows I will use $c_1, c_2, \ldots$ as variables ranging over proposition-cases.

On the view just sketched, an update function like the one in (9b) relative to a case $\omega$ will correspond to the following set of sets of cases:

$$\{\text{the set of all sets of cases that contain } \omega, \text{ if } \omega \text{ satisfies blond}(x_1)\}; \text{ the empty set, otherwise.}$$

This reflects the fact that if $\omega(x_1)$ has the property of being blond, then any proposition also satisfied by $\omega$ will constitute a possible continuation of blond$(x_1)$. If, on the other hand, the individual that the current case $\omega$ identifies as the value of $x_1$
doesn’t have that property, then there is no way to successfully update the context with the information that that individual is blond.

This line of thinking can be exploited to formalize the idea that indefinites “set up discourse referents” as follows. The update function corresponding to (11a) can be taken to be (11b):

(11a)  a. A man walks in.

b. \( \lambda p \exists x_1[\text{man}(x_1) \land \text{walk.in}(x_1) \land \forall p] \)

(11b) says that a possible continuation of (11a) must be a set of cases containing a case \( \omega[u/x_1] \) which differs from the actual one at most in that \( x_1 \) is mapped onto \( u \), where \( u \) is a man that walks in. Continuations of (11b) are going to land in the position of the variable \( p \), that is inside the scope of \( \exists x_1 \). This makes the occurrence of \( \exists x_1 \) in (11b) “active”. Let us flesh this out some more. Imagine, for example, a discourse constituted of (11a) followed by (9a), namely:

(12) A man walks in. He is blond.

How shall it be interpreted? Given the assumption that sentences denote update functions, the natural way to interpret discourse sequencing is as a kind of function composition. Let us denote this form of composition as ‘;’, where ‘;’ is defined as follows:

(13) \( A;B = \lambda q[A(\forall B(q))] \)

Accordingly, (12) is interpreted as follows:

(14a)  a. A man walks in; he is blond’ = \( \lambda q[\lambda p \exists x_1[\text{man}(x_1) \land \text{walk.in}(x_1) \land \forall p(\forall p[\text{blond}(x_1) \land \forall p](q))] \)

b. \( \lambda q[\exists x_1[\text{man}(x_1) \land \text{walk.in}(x_1) \land \text{blond}(x_1) \land \forall q]] \)

(14a) reduces to (14b). (The interested reader can check in 1 in the Appendix the steps of the reduction). So as a result of composing these two functions, the denotation of the pronoun he lands in the scope of the quantifier associated with a man. This may give the reader the impression of an improper \( \lambda \)-reduction, where a variable which is free before the conversion ends up being bound after it. Such impression, however, is unwarranted for the cap operator \( \land \) in (14a) abstracts over cases. In the case at hand, it amounts to abstracting over \( x_1 \). In general, \( \forall \phi \) corresponds to abstracting unselectively on all the variables free in \( \phi \). This makes the reduction in (14) sound.

So ‘;’ can be viewed as a kind of dynamic conjunction. Dynamic because via ‘;’ existential quantifiers can bind variables that lie outside of their syntactic scope. This dynamic quality of existential quantifiers contrasts with the way universally quantified NP’s behave. Consider for example the following discourse:

(15) *Every man walks in. He is blond.

This sentence is ungrammatical in the interpretation indicated by the indices. I.e. quantifiers like every cannot, in general, bind variables that lie outside of their syntactic scope. They do not set up “discourse referents” that can be picked up in subsequent stretches of discourse. This means that the update function associated with the first sentence in (15) has to be:

(16) \( \lambda p[\forall x_1[\text{man}(x_1) \rightarrow \text{walk.in}(x_1)] \land \forall p] \)

Here the place-holder \( p \) lies outside of the scope of \( \forall x_1 \). \( \forall x_1 \) is not “active”. Occurrences of the variable \( x_1 \) that land in the position occupied by \( p \) will not be bound by \( \forall x_1 \) in this example. In Groenendijk and Stokhof’s [11] [12] terminology, the
update function in (16) is a “test”. It checks whether the current assignment \( \omega \) satisfies the conditions that make every man walks true. If so, any set of assignments that contains \( \omega \) constitutes an admissible continuation. Otherwise, we can’t go on, i.e. we can’t update the current context by means of (16).

The distinction between (11b) and (16) corresponds in DRT to the idea that universals introduce splitting of boxes, while existentials do not. This gives raise to a notion of “accessibility”, which determines the configuration in which a pronoun can have a certain discourse marker as antecedent. The notion of accessibility that we get in the present theory is thus the same as the one familiar from DRT. While this notion of accessibility appears to be empirically supported by contrasts such as the one between (12) and (15), there are also well-known counterexamples to it, exemplified by sentences like:

(17) Every chess set comes with a spare pawn. It is taped on top of the box.

To develop a treatment of these phenomena, known as “modal subordination” (see e.g. Roberts [22]), is something that exceeds what we can attempt to do here.

So the version of IL that I envisage, is the same as Montague’s with the modal and temporal operators ‘\( \Box \)’, ‘\( \Diamond \)’, ‘\( F \)’ and ‘\( P \)’ left out. Interpretations are only relativized to assignments, for we are not dealing with modal or temporal notions. “Intensions” are functions from assignments into extensions of the appropriate type. The cap ‘\( ^\wedge \)’ and cup ‘\( ^\vee \)’ operators are interpreted as follows:

(18) a. if \( \alpha \in M_{E_{t}} \), then \( [\alpha]^{\wedge} = h \), such that for any assignment \( \omega' \), \( h(\omega') = [\alpha]^{\wedge} \).

b. if \( \alpha \in M_{E_{(s,a)}} \), then \( [\alpha]^{\vee} = [\alpha]^{\wedge}(\alpha) \)

While the resulting system has an intensional flavour (because of the presence of ‘\( ^\wedge \)’ and ‘\( ^\vee \)’), its interpretation employs only extensional notions. Let us call it DTT (for “Dynamic Type Theory”).

Given any formula \( \phi \) (i.e. any member of \( ME_t \)), we use \( \uparrow \phi ( = \lambda p[\phi \wedge p]) \) to refer to the corresponding update function. Conversely, we may want to extract truth-conditional content from an update function \( A \). This can be done as follows. We saw above that if a formula is true, it will have a non empty set of possible continuations. Thus in particular, we will be able to continue our discourse with a tautology. But this means that to say that an update \( A \) corresponds to something true (i.e. that the truth-conditional content associated with an update function holds in a given context) is to say that that update is non-empty, which in turn means that it contains the tautologous proposition \( ^T \). So, for any update \( A \), we can get at its truth conditional content \( \downarrow A \) simply by checking whether \( A(\phi^T) \) holds.

(19) \( \downarrow A = A(\phi^T) \)

A simple computation shows that the following holds:

(20) a. \( \downarrow \uparrow \phi = \phi \)

b. proof: \( \downarrow \uparrow \phi = \downarrow \lambda p[\phi \wedge p] = \lambda p[\phi \wedge p](\phi^T) = \phi \wedge \phi^T = \phi \wedge \phi = \phi \)

Interestingly, the converse of this doesn’t hold. I.e.:

(21) \( \downarrow \downarrow A \neq A \)

Let’s check this with the example given in (11b):

(22) a. \( \uparrow [\lambda p \exists x_1[\text{man}(x_1) \wedge \text{walk in}(x_1) \wedge p]] = \)

b. \( \uparrow [\lambda p \exists x_1[\text{man}(x_1) \wedge \text{walk in}(x_1) \wedge p](\phi^T)] = \)

c. \( \exists x_1[\text{man}(x_1) \wedge \text{walk in}(x_1)] = \)
d. \( \lambda p[\exists x_1[\text{man}(x_1) \land \text{walk in}(x_1)] \land \forall p] \)

The variable \( p \) in (22d) is outside the scope of \( \exists x_1 \). Thus further occurrences of \( x_1 \) that will land in the position of \( p \) will not be bound by \( \exists x_1 \), unlike what happens with (11b). Thus, in a sense, \( \uparrow \text{I} \)-sequences “close off” all the active quantifiers in an update function. In what follows, we will write \( \uparrow \text{I} B \) for \( \uparrow \text{I} B \).

One can use \( \text{DTT} \) to set up an interpretive procedure that assigns the meanings in (11b) and (16) to the respective natural language sentences in a compositional, Montaguesque fashion. One way to do this is roughly as follows. In translating the relevant level of syntax into \( \text{DTT} \), one lifts systematically Montague’s type \( t \) to \( \langle s, t, t \rangle \), viz. the type of update functions. Let us abbreviate \( \langle s, t, t \rangle \) as \( \text{up} \) (for “updates”). Accordingly, the denotations of predicates like \( \text{man} \) and \( \text{walk in} \) is lifted from \( \langle e, t \rangle \) to \( \langle e, \text{up} \rangle \) as follows:

(23) a. \( \uparrow \text{man} = \lambda x \lambda p[\text{man}(x) \land \forall p] \)

b. \( \uparrow \text{walk in} = \lambda x \lambda p[\text{walk in}(x) \land \forall p] \)

Similarly, the type of the denotation of the determiner \( a \) (taken extensionally) is lifted from \( \langle \langle e, t \rangle, \langle e, t, t \rangle \rangle \) to \( \langle \langle e, \text{up} \rangle, \langle e, \text{up}, \text{up} \rangle \rangle \) as follows:

(24) \( a^+ = \lambda p \lambda Q \lambda p \exists z[\langle P(z); Q(x) \rangle(p)] \), where the type of \( P \) and \( Q \) is \( \langle e, \text{up} \rangle \)

Then we get the simple translation pattern:

(25) A man walks in \( \sim a^+ (\uparrow \text{man})(\uparrow \text{walk in}) \)

which reduces to (11b), by applying the relevant definitions (cf. 2 in the Appendix). An approach along similar lines is also possible for universally quantified NP’s (cf. 3 in the Appendix).

A rather elegant treatment of the relative clause version of donkey anaphora emerges from this approach. Classic donkey sentences like (26a) and (27a) can be translated in a way that respects their surface constituent structure, schematically illustrated in (26b) and (27b)\(^2\):

(26) a. A man who owns a donkey beats it.

b. \( a^+ (\text{man that owns a donkey})(\text{beats it}) \)

(27) a. Every man who owns a donkey beats it.

b. \( \text{every}^+ (\text{man that owns a donkey})(\text{beats it}) \)

In these structures, the translation of the pronoun \( i t \) in the right argument is not in the scope of the NP \( a \text{ donkey} \) in the left argument. Yet in virtue of the meaning assigned to \( a^+ \) and \( \text{every}^+ \) (where the former is given in (24)), (26b) and (27b) turn out to be equivalent to (28) and (29) respectively (cf. Groenendijk and Stokhof [12]):

(28) \( \lambda p \exists x \exists y[\text{man}(x) \land \text{donkey}(y) \land \text{own}(y)(x) \land \text{beats}(y)(x) \land \forall p] \)

(29) \( \lambda p[\forall x \forall y[\text{man}(x) \land \text{donkey}(y) \land \text{own}(y)(x) \rightarrow \text{beats}(y)(x)] \land \forall p] \)

So the truth-conditions and binding potential associated with (relative clause versions of) donkey sentences is the same as the one we find in classical \( \text{DTT} \).

Sketchy though this may be, I hope it gives the reader a feeling for how the system works. The main point is to reconstruct \( \text{DTT} \)’s insights concerning the binding capacities of indefinites, while maintaining that they are existentially quantified terms rather than free variables. This enables one to maintain that all NP’s are of the same type (the type \( \langle e, \text{up}, \text{up} \rangle \)), which we may call the type of dynamic

\(^2\)I adopt the convention that \( a^+ \) is the translation of \( a \) into \( \text{DTT} \).
generalized quantifiers. Besides formal elegance, this approach has arguably a number of empirical advantages over classical DRT. I will mention briefly two of them. The first is that if NP’s are of different logical types, it becomes difficult to account for coordinate structures like:

(30) (A thief and every guard that was pursuing him) rushed into the room.

On the present theory, all NP’s have the same type and it is a conjoinable one (in the sense of Partee and Rooth [21]) and it should therefore be possible to handle these forms of coordination in terms of a simple cross-categorical coordination schema.

The second advantage of the present approach has to do with sentences like:

(31) Most men that have a donkey beat it.

If indefinites are free variables and quantifiers like every and most bind all the variables accessible to them, (31) is expected to mean that most man-donkey pairs that satisfy the left argument of most (the restriction, in Heim’s terms) satisfy its right argument (the nuclear scope in Heim’s terms). But it can be shown that this results in the wrong truth-conditions for sentences like (31). (31) involves counting men who have donkeys and comparing them with the men that beat their donkeys, rather than counting pairs. On the present approach, instead, determiners relate the dynamic counterparts of predicates. Thus there is no reason to expect that such a determiner will involve counting pairs (or n-tuples) rather than donkey-owning men.\(^2\)

At the same time, the present approach supports a theory of adverbs of quantification which is very close in spirit to Lewis’s original proposal (and thus to the way they are treated in DRT). To this I now turn.

2 Adverbs of quantification

The leading idea developed within DRT is that the logical form of sentences with adverbs of quantification is as follows:

(32) \(ADV(\phi)(\psi)\)

where if/when clauses provide the left argument of adverbs of quantification, while the main clause provides the right argument. In DRT, \(ADV\) binds unselectively every indefinite in its scope. It is furthermore generally assumed that an adverb of quantification roughly equivalent to always is implicitly present in examples like:

(33) When a man is in the bathtub, he sings.

It is also generally assumed that the restriction of a quantificational adverb can be left implicit, as in:

(34) John always sings

(34) does not mean that John sings at all times, but only that he does so whenever some implicit conditions are satisfied (e.g. when he is happy, his mouth isn’t full, etc.). Adverbs of quantification are also generally associated with a modality of some kind. But for simplicity, we will constrain ourselves to a consideration of their quantificational and anaphoric properties.

On our approach, indefinites are quantified NP’s, not free variables. Hence the standard DRT account cannot be simply taken over. At the same time, the dynamic value of a sentence is a set of sets of cases. Thus we can rebuild in our framework Lewis’ ideas in a fairly direct way. Intuitively, an adverb of quantification compares two sets of cases. For example, in when a man is in the bathtub, he always sings, we are comparing the cases in (35a) with those in (35b):

\(^2\)For further discussion cf. Kadmon [15], Heim [14], Kratzer [17] and Chierchia [7].
(35) a. \( \lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall c] \)

b. \( \lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \text{sing}(x) \wedge \forall c] \)

(35a) and (35b) denote sets of assignments. Which assignment they denote can be specified as follows:

(36) a. those assignments that differ from the current one at most in that \( z \) is mapped onto a man in the bathtub.

b. those assignments that differ from the current one at most in that \( z \) is mapped onto a man who is in the bathtub and sings.

To say that when a man is in the bathtub he always sings, is to say that the set (35a) is a subset of (35b). To say that when a man is in the bathtub he usually sings is to say that the cardinality of (35b) is greater than half of the cardinality of (35a). And so on. So adverbs of quantification can in general be viewed as relations between sets like those denoted by (35a) and (35b)\(^4\).

Now, it is easy to see how to arrive compositionally at these sets. (35a) is simply the denotation of the when-clause (37) restricted to cases, (which, in the present set up are maximally specific propositions):

(37) a. A man is in the bathtub \( \sim \lambda p \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall p] \)

b. restricting a. to cases: \( \lambda c[\lambda p \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall p](c)] = \lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall c] \)

In general, if \( A \) is an update function, we indicate by \( !A(= \lambda c[A(c)]) \) its restriction to cases.

(35b), the nuclear scope of the quantificational adverb, is the result of conjoining dynamically the when-clause with the main clause and taking the corresponding set of cases. I.e.:

(38) a. \( ![\lambda p \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall p]; \lambda p[\text{sing}(x) \wedge \forall p]] \)

b. \( ![\lambda p \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall p]]; \lambda p[\text{sing}(x) \wedge \forall p]] \)

c. \( \lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \text{sing}(x) \wedge \forall c] \)

(38a) reduces to (38c) \((= (35b))\). We can then analyze a sentence like (39a) simply as (39b):

(39) a. When a man is in the bathtub, he always sings.

b. \( \text{EVERY}(\lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall c]) \)

(\( \lambda c \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \text{sing}(x) \wedge \forall c]) \)

Here \( \text{EVERY} \) is the ordinary static meaning of the determiner \textit{every}, only applied to cases\(^5\). Accordingly, (39b) reduces to:

(40) \( \forall c[\exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \forall c] \rightarrow \exists x[\text{man}(x) \wedge \text{in_the_bathtub}(x) \wedge \text{sing}(x) \wedge \forall c]] \)

The semantics of (40) should be reasonably transparent. It says roughly: take any assignment to discourse markers such that \( x \) is mapped onto a man in a bathtub. Such an assignment must also be such that \( x \) is mapped onto someone who is singing. So (40) has the same truth-conditions as:

\(^4\) This is how for example Stump's \cite{Stump} insights on adverbs of quantification can be integrated with a DRT-like treatment of pronouns. See Chierchia \cite{Chierchia} for further discussion.

\(^5\) In DTT, \text{EVERY} will be represented as \( \lambda P \lambda Q \forall c[P(c) \rightarrow Q(c)] \), where \( P \) and \( Q \) are of type \( \langle s, t, \theta \rangle \).
(41) \( \forall x[[\text{man}(x) \land \text{in\_the\_bathtub}(x)] \rightarrow \text{sing}(x)]^6 \)

This seems to be as good an approximation to the meaning of (49a) as the one we find in classical DRT.

We have to fine tune our analysis slightly. If we apply it exactly as described to examples which contain indefinites in the main clause such as (42), we get wrong truth-conditions:

(42) When a man is in the bathtub he always sings a love song.

Our semantics would yield (43) as the value of (42):

(43) \( \forall c[\exists x[\text{man}(x) \land \text{in\_the\_bathtub}(x) \land \text{love\_song}(y) \land \text{sing}(y)(x) \land \exists c]] \)

By working out the truth-conditions of (43) it is not hard to see that they turn out to be equivalent to:

(44) \( \forall x\forall y[[\text{man}(x) \land \text{in\_the\_bathtub}(x)] \rightarrow [\text{love\_song}(y) \land \text{sing}(y)(x)]] \)

But this is wrong. What we need is an analogue of the existential closure of the nuclear scope of an adverb of quantification which we find in DRT. The right truth-conditions are given by the formula:

(45) \( \forall c[\exists x[\text{man}(x) \land \text{in\_the\_bathtub}(x) \land \exists y[\text{love\_song}(y) \land \text{sing}(y)(x) \land \exists c]] \)

The only difference between (43) and (45) is that the second occurrence of \( c \) in (45) is outside of the scope of \( \exists y \). This makes (45) equivalent to:

(46) \( \forall x[[\text{man}(x) \land \text{in\_the\_bathtub}(x)] \rightarrow [\text{love\_song}(y) \land \text{sing}(y)(x)]] \)

We can amend our analysis accordingly by defining a quantifier EVERY’ as follows:

(47) EVERY’(A)(B) = EVERY(!A)(!A; cB), where the type of A and B is up and c is the closure operator defined in (21).

It can be shown that by using the schema in (47), we get the right results (cf. 4 in the Appendix).

We can take this as a basis for characterizing adverbs of quantification in general. If \( D \) is an ordinary determiner meaning (raised to the level of up), \( D’ \) will be the meaning of the corresponding adverb of quantification, where \( D’ \) is defined on the model of (47), i.e.:

(48) \( D’(A)(B) = D(!A)(!A; cB) \)

Adverbs of quantification are relations among sentence denotations (i.e. update functions). Given two updates \( \uparrow \phi \) and \( \uparrow \psi \), we first extract the satisfaction sets of \( \phi \) and \( \psi \) (i.e. the set of cases relative to which they hold). We then conjoin dynamically these satisfaction sets while closing the right argument. Finally we quantify, in the ordinary, static sense over the resulting sets. This enables us to see adverbs of quantification as generalized quantifiers of a kind and to relate their meanings in a systematic way to the meanings of the corresponding determiners. In what follows I will translate always as EVERY’, usually as MOST’, never as NO’, etc.

This method of handling adverbs of quantification delivers what is known in the literature as the “symmetric” reading of sentences involving usually, like:

\(^6\)A proof of this claim can be found in Chierchia [7].
(49) Usually, if Mary lends a book to a student, he returns it with insightful comments.

The truth-conditions we get for (49) are describable roughly as follows: the number of assignments such that $x$ is a book, $y$ a student, Mary lends $x$ to $y$, and $y$ returns $x$ with insightful comments must be greater than the number of assignments such that $x$ is a book, $y$ a student, Mary lends $x$ to $y$ but $y$ does not return $x$ with insightful comments. This reading appears to be adequate for (49). In classical DRT, this readings would correspond to a quantification over book-student pairs.

It has been noted, however, that sentence (49) has also at least two other readings. The first one is made salient in the following context:

(50) Mary’s books have a different impact on her students and on her colleagues.

  a. When Mary lends a book to A STUDENT, he usually returns it with insightful comments (while when she lends them to a colleague, he or she returns them with narrow minded criticisms).
  
  b. Most books that are lent by Mary to a student are returned by him with insightful comments.

Capitals indicate here focal stress. The topic of the discourse in (50) is Mary’s books. And the adverb of quantification doesn’t seem to quantify over all cases in which the antecedent is true, but over the books that Mary lends to students. (50a), in other terms, seems to have the same reading as (50b).

The second alternative reading of (49) can be made salient by a context like the following:

(51) Mary’s students have an erratic behaviour.

  a. If Mary lends A BOOK to a student, he usually returns it with good comments (while if she lends them a tape, they don’t know how to work with it).

  b. Most students that are lent a book by Mary, return it with good comments.

In the context set up in (51), the topic is Mary’s students and this is what the adverb of quantification appears to quantify over. Accordingly, (51a) seems to have the same meaning as (51b).

What emerges from this is that adverbs of quantification are highly sensitive to the topic/comment or theme/rheme structuring of the clauses they operate on. The theme or topic is mapped onto the restriction of the adverb. The comment or rheme is mapped into the nuclear scope. If/when clauses are generally construed as topics (and hence mapped onto the restriction). But sometimes the adverb of quantification can select as its restriction not the if/when clause as a whole but a subpart of it.

The reading that we get if the whole if/when clause is taken as the restriction corresponds to a quantification over all the indefinites in it (i.e. corresponds to a quantification over $n$-tuples). This is symmetric reading discussed above. The reading that we get by associating the adverb of quantification with a topic selected from an if/when clause, is generally called an asymmetric reading. It corresponds to selecting one of the indefinites (the subject, direct object, indirect object, etc.) as the restriction for the quantificational adverb.

While no fully satisfactory treatment of this phenomenon will be forthcoming till focus isn’t understood better\footnote{See Rooth [23], [24] for an interesting attempt to develop a formal theory of association with focus.}, let me give an indication of how one might proceed. To facilitate things, let us consider a concrete example, say the direct object asymmetric reading of (50), repeated here:
(50) When Mary lends a book to a student, he usually returns it with insightful comments (while when she lends them to a colleague, he or she returns them with narrow minded criticisms).

Here we don’t want the whole when-clause in the restriction of *usually*. We only want the unstressed material in the restriction. In other terms, the left argument of *usually* should be something like “books that are lent by Mary to a student”. Now, the meaning of the when-clause, according to our proposal so far, will be:

\[ \lambda p \exists x \exists y [\text{book}(x) \land \text{student}(y) \land \text{lend}(y)(x)(m) \land \gamma p] \]

Within the present set-up, it is possible to abstract, in a sense, over a variable which is already existentially quantified over. That is, it is possible to define compositionally an operation that maps (53a) into (53b):

\[ \lambda p \exists x \exists y [\text{man}(x) \land \text{walk.in}(x) \land \gamma p] \leadsto \lambda x [\text{man}(x) \land \text{walk.in}(x)] \]

Informally, in our framework an existential with index \( n \) can bind variables with the same index even if they aren’t in its syntactic scope. So, we can obtain dynamically add to (53a) something like \( x = u \) and then abstract over \( u \):

\[ \begin{align*}
  (54a) & \quad \exists x [\text{man}(x) \land \text{walk.in}(x)] + x = u \sim \exists x [\text{man}(x) \land \text{walk.in}(x) \land x = u] \\
  (54b) & \quad \text{abstraction over } u \text{ in } a: \lambda u \exists x [\text{man}(x) \land \text{walk.in}(x) \land x = u]
\end{align*} \]

The result in (54b) is equivalent to (53b). In general, if \( A \) is an update function which contains an active occurrence \( \exists x_n \) of an existential quantifier, we can turn it into a property by abstracting over \( x_n \). One has to be careful about details\(^4\). But I will not do so here (cf. on this Chierchia [7]), for my concern is just to give an intuitive grasp of the options that the present system makes available to us. By making existential quantifiers dynamic, we can easily get them to act as free variables and hence abstract over them. We can have our cake and eat it too. This is one of the main novelty, I think, of the present framework.

Going back to example (52), we can abstract, along the lines just indicated on the topic (books, in the case at hand) and thus obtain:

\[ \lambda x \lambda p \exists y [\text{book}(x) \land \text{student}(y) \land \text{lend}(y)(x)(m) \land \gamma p] \]

This is the desired restriction for the adverb of quantification.

Where do we go from here? The target is to assign to (50a) the same truth-conditions that (50b), repeated here, has:

(50) Most books lent by Mary to a student are returned by him with insightful comments.

The truth-conditions of (50b) are controversial. There are two main plausible candidates, namely:

(56) Most books lent by Mary to a student are books which are lent to and returned by a student to Mary with insightful comments.

(57) For most books lent by Mary to a student: Every student to whom Mary lent them returned them with insightful comments.

(56) and (57) are truth conditionally distinct. (56) requires that all the relevant students return books with good comments. For (57) to be true it suffices that the majority of Mary’s books are returned with insightful comments by some of the students to which Mary lent them.

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\(^4\)Formally, for any update \( A \) with an active occurrence of \( \exists x_n \) in it, let \( \lambda u A =_q \lambda u [A; u = x_n] \). See Chierchia [7] for details.
This is not the place to try to take a stand on the truth-conditions of *most*. Both readings in (56) and (57) can be represented in our (as in other) frameworks. What matters to our present concern is simply that we are able to assign to (50a) the same truth conditions as (50b), whatever the correct ones may turn out to be, because we can “re-open” an existentially quantified term. So, schematically, the asymmetric readings of *usually* can be gotten by a schema of the kind given in (58):

\[(58) \text{MOST}_n(A)(B) = \text{MOST}^\ast(\lambda x_n A)(\lambda x_n B)\]

Where \(\text{MOST}^\ast\) is the dynamic meaning of the determiner *most*. *Usually* can be interpreted as \(\text{MOST}^\ast\) or \(\text{MOST}_n\). \(\text{MOST}^\ast\) gives us the symmetric reading, \(\text{MOST}_n\) the asymmetric one.

So, the idea is that adverbs of quantification can associate with a topic contained in an if/when clause. We can turn the arguments of the adverb of quantification into properties and use the (dynamic) meaning of the determiner *most* to combine them (whichever of its interpretations may be appropriate). The net outcome is that, for example, a sentence like (50a) gets the same reading as (50b), as desired. The approach I have sketched extends to all adverbs of quantification, as far as I can tell.

The sensitivity to focal structure of adverbs of quantification can be observed also when an overt restriction is absent. Booth [24], for example, gives the following nice minimal pair:

\[(59)\]

\[\begin{align*}
\text{a.} & \quad \text{A u usually follows a q.} \\
\text{b.} & \quad \text{A u usually follows a q.}
\end{align*}\]

where italics mark focal stress. Here there is no restrictive if/when-clause and the content of the left argument of *usually* must be reconstructed from contextual clues. One such important clue is of course focal stress. Now, it seems that the most prominent (perhaps the only) interpretation of (59a) is that most u’s follow a q. This is false of, say, English texts. On this reading, is a u is mapped onto the restriction (i.e. the left argument) of the adverb of quantification. In contrast with this, the most prominent interpretation of (59b) is that most q’s are followed by a u, which is true of English texts. On this reading, it is is a q that is construed as the left argument of *usually*.

The account we have developed extends in a natural way to these cases\(^9\). We saw that we can reopen an existentially quantified term. So, in particular, we can go from an NP meaning to its restriction as shown:

\[(60) \lambda P \lambda p \exists x[\text{man}(x) \wedge P(x) \wedge \forall p] \rightarrow \lambda x[\text{man}(x)]\]

If NP* is a dynamic generalized existential quantifier, let NP* be the corresponding property\(^10\). Given a sentence S where NP_n is the topic, we can then extend our way of associating adverbs of quantification with the topic as shown:

\[(61) \text{Usually } [s\ldots \text{NP}_n \ldots] \rightarrow \text{MOST } (\text{NP}_n^*, \lambda x_n S')\]

Here I am assuming that the NP_n is not the element that bears focal stress, for generally focal stress falls with the comment or theme. NP_n is the theme or topic: that determines what we quantify over (and generally doesn’t carry contrastive stress). For example, (59b) would be treated as follows:

\[(62)\]

\[\begin{align*}
\text{a.} & \quad \text{A u usually follows a q } \rightarrow \text{MOST } (a \phi_n^*, \lambda x_n [a \ u \ follows \ x_n])
\end{align*}\]

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\(^9\)Booth [24] develops an account of the facts in (59), but I currently do not see how it would extend to the case where if/when clauses are overtly present.

\(^10\)Formally, where NP_n is a dynamic generalized existential quantifier, let NP* \(=_{df} \forall u[NP(\forall[u = x_n])]\).
b. MOST(\lambda x q(x)) (\lambda z \exists y [u(y) \land \text{follow}(x)(y)])

This gives us the reading we want (i.e. that most q's are followed by u's). The assumption here is that adverbs of quantification have access to topics, whether they occur in a restrictive if/when clause or in a main clause. This property of adverbs of quantification is well known (cf. e.g. Rooth [24] or Krifka [18]). There are various ways to implement this, which depend on one's assumptions concerning binding, scope and focus. One possibility is to move the topic to a position where it is governed by the adverb of quantification. An equivalent possibility is to introduce the adverb of quantification via a Montague style quantifying in rule. A third possibility is to develop a recursive definition of focus along the lines explored in Rooth [23] [24]. In conclusion, there are two main aspects of my proposals concerning adverbs of quantification. One is the development of a version of Lewis' idea that they are quantifiers over cases in a way that is compatible with a uniform treatment of NP's. The second aspect is a mechanism whereby adverbs of quantification associate with topics. This mechanism exploits the possibility of reopening existentially quantified terms that the present view of quantification makes readily available. If D is a static determiner meaning, D' is the corresponding unselective adverbs of quantification (defined in (48)), D_n (n the index of the topic) is the selective, asymmetric adverb of quantification which selects a topic from the if/when clauses (as in (58)) and D(NP, S') (NP the topic in S) is the adverb of quantification that selects a topic from the main clause (as in (61)). All this are formally simple type-shifts on ordinary determiner-meanings and thus adverbs of quantification can be viewed as different incarnations of determiner-meanings. This second aspect of the proposal is as tentative as are the other proposals in the literature on association with topics. To make real progress on this score, focal structure need to be better understood. Equipped with this approach to quantificational adverbs, we can now turn to impersonal subjects.

3 Impersonal subjects as context dependent indefinites

3.1 Syntactic preliminaries

My main concern here is to study the quantificational and anaphoric properties of impersonal *si*. What I have to say about this is largely neutral, as far as I can tell, with respect to the syntactic properties of *si*, an interesting and complex topic in its own right. So, for example, the semantics that I will sketch is compatible with a flexible categorial syntax, such the one explored in, e.g., Bach et al. [2]. It is also compatible with a Government and Binding syntactic analyses of *si* (cf., e.g., Burzio [4] or Cinque [9]). In order to give some concreteness to my proposals, it is, however, useful to be able to relate it to some relatively precise syntactic analysis of the construction under consideration. Since the most explicit and detailed syntactic proposals in this domain are those developed within GB, I am going to adopt for the present purposes a GB-style syntax for *si*. In doing so, I will have to leave aside, however, many aspects of the syntax of *si* that while important to an overall understanding of how *si* and related constructions work do not affect, as far as I can the semantics of *si* in a central way.

Within the GB framework it is assumed that surface structures (SS's) are mapped into logical forms (LF's) which are then semantically interpreted. The map from SS into LF exploits an instance of move alpha (namely, quantifier raising, QR) which adjoins NP's to S (or IP) nodes, thereby fixing their syntactic scope. I will assume that semantics takes the form of a compositional, Montagueque translation of LF into a logic (in our case, DTT). Concerning more specifically *si*, both Burzio [4] and Cinque [9] argue that *si* is a clitic adjoined to the INFL node (the node where clitics are generally placed, along with other inflectional, temporal and modal elements). So the structure of a simple sentence like (63a) is taken to be,
irrelevant details aside, something like (63b)

(63) a. Si sa.
   Si knows.
   People know.

   b. \[ r [p_{NPc} \, r [i \, [r \, [v \, [v \, [s \, a]]]]]] \]

Si in (63b) is coindexed with the empty subject position (either by move alpha or, perhaps, by whatever form subject-verb agreement takes). It is structures of this sort that, I assume, are semantically interpreted.

It has been pointed out in the literature that there are several si’s. For example, when si is in construction with transitive verbs, we have two options. Either the verb shows singular agreement (i.e. it agrees with si). Or else the verb agrees with the object (which, in these cases, tends to be preposed). These options are illustrated in (64a) and (64b) respectively:

(64) a. Da qui si vede le montagne.
   From here si sees (sn) the mountains. (pl)
   From here, one can see the mountains.

   b. Da qui le montagne si vedono bene.
   From here the mountains (pl) si see (pl) well.
   From here the mountains can be seen well.

(64a) is only marginally grammatical. The form in (64b), which is the more standard one, bears many similarities with passive and is sometimes called “si passivante”.

On top of this distinction, Cinque [9] has argued that besides an argument si, there is also a si which from the point of view of GB’s θ-theory is not an argument. In spite of these differences, I believe that all these si-constructions have a common core of quantificational and anaphoric properties. This common core, which I will try to identify in the next section, constitute the focus of present theory. My hope is that to be able to regard si as a semantically uniform phenomenon (at the appropriate level of abstraction).

With these preliminaries out of the way, I am going now to circumscribe the main empirical aspects of the quantificational and anaphoric properties of si that any semantics for it would have, I think, to accommodate.

3.2 Quantificational and anaphoric properties of si

Perhaps the most salient characteristic of impersonal si is the variability of its quantificational force, alluded to in the introduction. In habitual sentences like (65), si appears to have a quasi-universal force, as the paraphrase indicates.

(65) In Italia si beve molto vino.
   In Italy si drinks a lot of wine.
   In Italy, everybody/people drink a lot of wine.

For (65) to be true it has to be the case that in Italy people generally drink a lot of wine. This contrasts with non-habitual, episodic sentences, where si appears to have a quasi-existential force, as the example in (66) illustrates.

(66) a. Ieri in Italia si e’ bevuto molto.
   Yesterday in Italy si drank a lot.
   Yesterday in Italy people drank a lot.

   b. Domani si berra’ molto.
   Tomorrow si will drink a lot.
   Tomorrow people will drink a lot.
These sentences talk about a particular contextually salient group of people, not about all people in general. For example, (66) could be uttered after a victory of the Italian soccer team, with reference to all or most Italians. But it also could be uttered by me after I won the New York State lottery, with reference to my Italian friends and relatives who are celebrating my sudden wealth. In this second case, (66a) is made true by the existence of a small group of Italians that drank a lot. This shows that both (65) and (66) are context dependent, but in different ways. In (65) the contextually understood restrictions are the typical ones of generic sentences: we are talking about adults in normal conditions (who at the relevant time weren’t unconscious, or in jail, etc.). In (66) the context is set up by how the domain of quantification is selected by the conversational dynamics, by what is known to the illocutionary agents, and so on. The shifts in quantificational force exemplified by (65) and (66) appear to be quite similar to those in (67), discussed by Carlson and by many others after him.

(67) a. Dogs are barking in the courtyard.
   b. Dogs bark (when they are hungry).

The bare NP dogs has a quasi-existential force in (67a) and a quasi-universal force in (67b). Carlson has argued that bare plurals denote kinds and that the different quantificational force of (67a) vs. (67b) is due to the fact that the predicate in (67a) is stage-level and talks about a particular spatio-temporal manifestation of the dog-kind, while the predicate in (67b) is individual-level and talks about the dog-kind in general. It should be noted in this connection in spite of this strong analogy, impersonal si does not seem to denote a kind (like, say, people or humans). Consider:

(68) a. On normal hiking trails, one meets a lot of people, but in the desert, people are pretty rare.
   b. *Nel deserto, si e’ piuttosto rari.
The desert, si is pretty rare.

The predicate rare is kind-level: it can be meaningfully attributed only to kinds. And in fact, it is fine to attribute it to bare plural subjects, which supports the hypothesis that they denote (sometimes at least) kinds. Si, on the other hand, cannot easily take kind-level predicates, as (68b) shows. This is in spite of the pragmatic plausibility of the context (cf. 68a), and in spite of the fact that si is semantically plural (i.e. it can refer to groups)\(^1\). These facts suggest that si cannot be taken to simply denote something like the kind humans, and that one cannot simply lift it to Carlson’s approach.

A second, related characteristic of impersonal si is the fact, noted in the introduction, that its quantificational force varies according to the type of adverb of quantification which may be present. This property, also shared by bare plurals and singular indefinite NP’s, is illustrated in (69):

(69) Quando si fa così, succede sempre/spesso/quakhe volta un disastro.
When si does so, happens always/often/sometimes a disaster.

When someone does that, a disaster always/often/sometimes happens.

Here the quantificational force of si varies just like the quantificational force of the indefinite someone in the English translation. Similar effects can be noted also when an overt if/when clause is absent:

\(^1\)Morphologically the behavior of si with respect to plurality is complex: it triggers singular agreement on the main finite verb and plural agreement in the past participle or adjective:
- Si e’ stanchi.
- Si is(are) tired(pl).
- People are tired.
Cf. e.g. Burnio [4] for discussion.
(70) a. In Italia, qualche volta si puo' sapere chi vincera' un concorso prima del concorso stesso.
   In Italy, sometime si can know who will win a competition before the competition itself.
   Someone in Italy can find out who will win a competition before that competition has taken place.

b. In Italia, spesso si puo' sapere chi vincera' un concorso prima del concorso stesso.
   In Italy, often si can know who will win a competition before the competition itself.
   Most people in Italy can find out who will win a competition before that competition has taken place.

c. In Italia, si puo' sempre sapere chi vincera' un concorso prima del concorso stesso.
   In Italy, si can always know who will win a competition before the competition itself.
   Everyone in Italy can find out who will win a competition before that competition has taken place.

Here too *si* ends up being understood as being roughly equivalent to *someone, most people or everyone* depending of the quantificational adverb present in the sentence.

Further peculiar properties of *si* concern the kind of anaphoric elements that it can antecede. *Si* can antecede, for example, reflexives:

(71) *Si* e' troppo spesso ingiustificatamente orgogliosi di se' stessi.

   *Si* is too often proud of oneself without justification.

   People are too often proud of themselves for no reason

Moreover, *si* can control an infinitive. That is, given the standard GB analysys of infinitives as clauses with a null pronominal PRO as subject, *si* can act as the antecedent of PRO:

(72) *Si* e' cercato di [PROj vincere].

   *Si* tried to win.

   People tried to win.

However, *si* cannot antecede an ordinary pronoun:

(73) *Si* e' detto che loro hanno sbagliato.

   *Si* said that they were wrong.

   People said that they were wrong.

This sentence is only grammatical if the embedded pronominal subject *loro* is understood as disjoint in reference from the reference of *si*. The same applies to the null pronominal subjects (usually indicated as *pro*) that Italian, being a null subject language, allows:

(74) *Si* e' detto che proj vinceranno.

   *Si* said that proj will win.

In this connection, it should also be noted that *si* can, as it were, antecede itself. This happens in conditionals, as noted in the introduction:

(75) Se *si* ruba, *si* va in galera.

   If *si* steals, *si* goes to prison.

   If one steals, one goes to prison.
Here the two occurrences of $si$ are understood as co-varying. We get a donkey-type dependency between them.

To my knowledge, no satisfactory analysis of these phenomena that does justice to the semantics of $si$ is currently available. In what follows, I would like to propose that they all receive a simple and interesting account on the basis of the approach to adverbs of quantification sketched above and other independently plausible assumptions on the nature of the contractions with which $si$ interacts.

3.3 The proposal

The quantificational variability of $si$ make it a prime candidate to analyzing it as an indefinite within DRT. In the latter framework, this would lead us to interpret $si$ as a variable that gets its quantificational force from the environment. In our elaboration of DRT’s insights, we would expect, accordingly, to be able to interpret $si$ by means of a dynamic existential quantifier. A reasonable approximation to its meaning would be something like (76a):

$$\lambda P\lambda p\exists x_{arb}[C(x_{arb}) \land P(x_{arb}) \land \forall p]$$

b. $\lambda P\lambda p\exists x_{arb}[\text{woman}(x) \land P(x) \land \forall p]$, where $P$ is of type $(e, t)$

This proposal can be best understood by comparing (76a) with (76b), viz. our proposed analysis of the meaning of the NP a woman. (76a) and (76b) are dynamic generalized quantifiers. They differ in two ways. First, we assume that $si$ carries a distinguished index $arb$ and that a variable $x_{arb}$ carrying that index is sorrally restricted to ranging over groups of humans. In other terms, the variables associated with $si$ are distinct from other (sorrally unrestricted) variables. This is one way of capturing the fact that $si$ cannot be understood as referring to non-humans. The second difference between (76) and (76b) concerns the fact that the domain of quantification in (76b) is narrowed down to the set of women. This domain in ordinary quantificational NP’s is determined by the common noun (or nominal phrase) that a determiner (a in the case at hand) is in construction with. With $si$, however, no such restriction is explicitly provided. As we saw above, this restriction is specified by the context. A simple way to account for this is to assume that the restriction for $si$ (i.e. what would be the left argument of a determiner) is given in the form of a variable $C$ ranging over predicates. The value of this variable is set differently in differently contexts. This technique for handling context-dependency has been exploited in several occasions\textsuperscript{12}. Eventually and hopefully it may become superfluous once context dependency will be understood better. On the basis of this hypothesis, a simple (episodic) sentence like (77a) is associated with update function in (77b):

$$\lambda P\exists x_{arb}[C(x_{arb}) \land \text{dance}(x_{arb}) \land \forall p]$$

The truth-conditions associated with (77b) would be expressed in DRT as shown in (78):

$$\begin{align*}
& x_{arb} \\
& C(x_{arb}) \\
& \text{dance}(x_{arb})
\end{align*}$$

So (77b) (or (78)) says that there is a contextually salient group of people that dances (we are ignoring tense only for simplicity). This seems adequate as a rendering of the truth-conditions of a sentence like (77a). It captures the fact that $si$

\textsuperscript{12}See for example Siegel's [25] treatment of subsective adjectives.
in an episodic sentence seems to be interpreted existentially, where the domain of quantification is restricted to humans and further restricted by contextual factors.

Before moving onto more challenging aspects of the behavior of si, one thing should be noted. Si is not a noun phrase like a woman. It is a clitic, viz.: a verbal affix. A natural move, in this connection, might be to analyze it not as a generalized quantifier as we just did, for it doesn’t really act as such (e.g. it doesn’t conjoin with other generalized quantifiers). We can analyze si, rather, as an operation on predicates. Such an operation, call it \( si_{arb} \), maps predicates into updates and is defined as follows:

\[
(79) \quad si_{arb}(Q) = \lambda p \exists x_{arb}[C(x_{arb}) \land Q(x_{arb}) \land \forall p]
\]

This treatment of si parallels fairly standard assumptions about the semantics of passive. Passive is quite generally viewed semantically as an operation that reduces the adicity of a relation by existentially quantifying over the slot of the relation that corresponds to the subject\(^{13}\). While passive operates on transitive verbs (i.e. verbs that are interpreted as a two- or more-place relations), \( si_{arb} \) is not so restricted: it can operate on any property and maps it into a proposition. So, the present proposal amounts to saying that semantically si is essentially similar to passive. This is natural in view of the known syntactic similarities between si and passive mentioned above and widely discussed in the literature.

I would like to suggest that all the observed properties of si follow from analyzing it as in \( (79) \). In the following section, I will consider all of them in turn.

4 Consequences

4.1 How do adverbs of quantification affect the force of si?

In looking at the interaction between adverbs of quantification and si we will limit ourselves first to cases that do not involve anaphoric dependencies between occurrences of si. I.e. for now we will exclude from consideration cases like \( (75) \) above. Below (in section 4.7) we will come back to the latter cases.

Adverbs of quantification either quantify over cases or over topics. For simple sentences like \( (69) \) above, repeated here, it will make no difference which readings we choose, for their different readings turn out to be equivalent.

\[
(69) \quad \text{Quando si fa cosi', di solito succede un disastro.}
\]

When si does so, usually happens a disaster.

When someone does that, usually a disaster happens.

If we use usually as a quantifier over cases (as per the general schema in \( (48) \) above) we get:

\[
(80) \quad \text{MOST}[(\lambda c \exists x_{arb}[C(x_{arb}) \land \text{does that}(x_{arb}) \land \forall c)](\lambda c[\text{a_disaster\_happens} \land \forall c])
\]

This says that most cases where people behave in a certain way are cases where a disaster happens, which seems correct and is equivalent to the reading we would get by associating usually with the only possible topic in the when-clause, namely si. Different adverbs of quantification would result, of course, in different quantificational forces for si.

If the if/when clause contains other indefinites besides si, we would expect to have different options. We should be able to select the symmetric reading (by quantifying over cases) or an asymmetric one (by choosing one of the indefinites as topic). Thus we should expect the sentence to be ambiguous. That this is indeed so can be seen by considering examples like the following:

\(^{13}\) See, e.g., Dowty [10] or Bach [1] for explicit proposals along these lines.
(81) Nella comunità degli artisti, se si sceglie di vivere in un villaggio, di solito il villaggio è pittoresco e secluso.
In the artists' community, if si chooses to live in a village, the village is usually picturesque and secluded.

Among artists, if one chooses to live in a village, it is usually picturesque and secluded.

Here the adverbial among artists acts as a domain restrictor for the variable associated with si. There are, then, three ways to understand (81). We can understand it as a claim about artists. The question that we would be seeking an answer for, in this case, would be: among the artists that live in a village, how many live in a secluded and picturesque one? The reading of (81) that would constitute an answer to this question is the subject asymmetric one (which will be obtained by using MOST_{ars}). Or we can understand (81) as a statement about villages inhabited by artists. In this case we would be seeking an answer to: of the villages inhabited by artists, how many are picturesque and secluded? The reading of (81) according to which it would constitute an answer to this question is the object asymmetric one (obtained by using MOST_{n}, n the index of the object). Or, finally, we could be wondering about the frequency of certain choices by artists: of the pairs (w, v) such that v is an artist who lives in v, how many are such that v is pitoresque and secluded? (81), on its symmetric reading, constitutes an answer to this question (and would be obtained by choosing MOST').

As is generally the case with ambiguities of this sort, the context (i.e. the topic of the discourse, the inherent features of the situation described, etc.) may select one reading over another. For example, I think that against the set up in (82a), the most plausible reading of (82b) is the object asymmetric one:

(82) a. Non molti tipi di macchine sono dotate di batterie che non richiedono manutenzione.
Not many kinds of cars are equipped with maintenance-free batteries.

b. Se si possiede una macchina, di solito bisogna controllarle l'acqua della batteria.
If si owns a car, usually it is necessary to check to it (cl.) the water of the battery.

Here we are talking about how many cars require checking their batteries periodically. (82b) can well be true even if a lot of people own, say, a Nissan Stanza Wagon, whose battery is maintenance free.

The point of these examples is to show that when si occurs in an if/when clause it behaves just like we would expect, given our theory of quantificational adverbs.

Let us turn now to cases where si occurs in a main clause with an overt quantificational adverb and no if/when clause. The relevant examples are cases like (70b) repeated here:

(70) In Italia, spesso si puo' sapere chi vincera' un concorso prima del concorso stesso.
In Italy, often si can know who will win a competition before the competition itself.

Most people in Italy can find out who will win a competition before that competition has taken place.

Here the restriction of the adverb of quantification is partly provided by the adverbial in Italy and partly must be reconstructed from contextual clues. In these cases si tends to be understood as part of the restriction. It is in fact difficult to construct cases where si is understood as part of the nuclear scope of the adverb
(but cf. below). There is a plausible explanation for this tendency, I believe. *Si* is an indefinite restricted by a contextually specified property. This means that the property or properties that determine the range of humans under consideration has to be somehow given in the context for the utterance to be felicitous. This in turn means that these properties will have to be known or old, viz. part of the topic rather than part of the comment, part of the restriction of the adverb rather than part of its nuclear scope. In the case at hand, therefore, (70b) will be interpreted as:

\[(83) \text{MOST}\left(\lambda x_{arb}[\text{in\_Italy}(x_{arb})]\right)\left(\lambda x_{arb}[\text{in\_Italy}(x_{arb})\land\text{find\_out\_etc.}(x_{arb})]\right)\]

This is the very same type of construal of quantificational adverbs discussed in connection with Rooth’s example (59).

While mapping *si* onto the nuclear scope is difficult, it isn’t impossible, as the following example (modelled on an example by Greg Carlson) shows:

\[(84) \text{In una nave Romana, di solito si tirava su l’ancora a mano.}\
\text{In a Roman ship, usually si pulled up the anchor by hand.}\]

This says that for most Roman ships there was someone who would pull up the anchor without the help of any machine. The *si* here is construed as an existential quantifier under the scope of the quantifier *most*. Thus Roman ships are mapped onto the restriction of *most* and *si* into its nuclear scope.

The point that emerges from these considerations is that semantic variability of *si* under adverbs of quantification indeed seems to follow up to a considerable level of detail from our hypothesis on the semantics of *si* and our approach to quantificational adverbs.

### 4.2 Why is *si* a quasi-universal quantifier in generic sentences?

Obviously this is a very complex topic and we cannot do justice to it. But we can give a fairly explicit indication of the line one can follow. Consider for example a typical generic *si*-sentence like:

\[(85) \text{In Olanda, si mangia aringa.}\
\text{In the Netherlands, si eats herring.}\]

The consensus which I believe emerges from current literature on genericity centers around the idea that generics involve modalized quantificational structures akin to those associated with adverbs of quantification. The basic idea is that a sentence like (84) is interpreted roughly as shown (86):

\[(86) \text{In Holland always, when one is hungry, not sick and more generally not in conditions that prevent eating herring, one does eat herring.}\]

In (86) there are two important parts. One is an adverb of quantification (*always*). And the second part is the implicit restrictions on this adverb. What they are depends on the nature of the activity in question. To actually spell this out involves a lot of hard work. But the important point for us is that the basic structure of a sentence like (86) can essentially be reconducted to the structure of adverbs of quantification. A rough approximation to what (86) means would be:

\[(87) \text{EVERY}\left(\lambda x_{arb}[\text{in\_Holland}(x_{arb})\land C(x_{arb})]\right)\left(\lambda x_{arb}[\text{in\_Holland}(x_{arb})\land C(x_{arb})\land \text{eat\_herring}(x_{arb})]\right)\]

This reading would be obtained by taking *si* as the topic of an implicit *always*-like adverb of quantification. This, which is in line with what emerges from current research on this difficult topic, suffices to explain why *si* tends to have a quasi-universal force in generic contexts.

\[\text{14 See e.g. the papers collected in Kriska [19].}\]
4.3 Why can si antecede reflexives?

The interpretation of reflexives involves identifying two slots in a relation. This means that given a relation $R$ we will need an operation (call it ref) that identifies two slots in $R$, e.g. if $R$ is two-place:

(88) $\text{ref}(R) = \lambda x[R(x)(x)]$

So in fact reflexivization amounts to attributing a reflexive property to an argument\(^{15}\). Now, groups of humans however selected can of course be meaningfully attributed reflexive properties. So nothing prevents si from anteceding reflexives. Predicating reflexive predicates of a sortally restricted variable per se is not going to lead sortal deviance: it will depend on the nature of the predicate. The logical translation of e.g. (89a) will be as shown in (89b)

(89) a. Si e' orgogliosi di se stessi.
   b. $\exists x_{arb}[C(x_{arb}) \land \lambda y[\text{proudf.of}(y,y)](x_{arb})]$

This means essentially that the relation between a reflexive and its antecedent is not direct (i.e. it is not like the relation between $\forall$ and $x$ in $\forall x P(x)$), it is mediated by an operator, an abstractor that identifies two designated slots. If we were to represent this as a relation at LF, we might do so along the following lines:

(90) John likes himself $\sim [\text{John's}\text{O'f}[\text{likeselff}]]$

In (90) the reflexive-antecedent relation is factored out in two components: a relation between the reflexive and an operator (to be interpreted as the operation self) and a predication relation between an operator and an argument (the subject in this case)\(^{16}\). This view of reflexives as operator-bound anaphoric elements seems to be needed, among other things, to handle cases of VP anaphora like (91)

(91) John likes himself and Bill does too

The VP proform does here has to be interpreted as self-liking. This entails that there must be a binder for the reflexive inside the VP. Williams [29] proposed a pronoun rule to do this. I think that something very similar to what Williams proposed is needed to interpret reflexives in general (and not just in VP-anaphora contexts).

I must emphasize that there are many options as to the exact status of reflexives at LF. But the point is that I know of no way of interpreting reflexives that doesn’t resort at some level to an operation that identifies two arguments of a relation, creating a reflexive property. And there is no reason why we shouldn’t be able to predicate such a property of humans, the range of the denotation of si. This is why si is a legitimate antecedent for reflexives.

4.4 Why can si antecede PRO?

Let us consider next the case of infinitives. Within the GB theory, infinitives are taken to be clausal structures of the form in (92).

(92) [s PRO to win]

Dowty [10], myself (Chierchia [5] [6]) and others have provided several arguments in favour of the view that semantically infinitives do not denote propositional creatures (like sets of worlds or states of affairs) but properties. This means that the control relation, exemplified in (93) must be understood as a kind of predication relation, along lines similar to what Williams [30] proposed.

\(^{15}\) Explicit proposals along these lines can be found in Bach and Partee [3] and Szabolcsi [28].

\(^{16}\) Another possibility is that reflexives move to INFL where they are construed (i.e. interpreted) as operators.
(93) John tried [PRO to win]

Semantically, (93) is interpreted as saying that John tries to have the property of winning. Given the assumptions we are adopting on the syntax of infinitives, this view, dubbed by Higginbotham the attributive view of control, entails that infinitives must be derived predicates, i.e. predicates that have the internal structure of a clause. An analogy with the logical syntax of the λ-abstractor may be helpful. Consider a λ-term like:

(94) \( \lambda x[\text{win}(x)] \) vs. \text{win}

Win is a basic predicate, \( \lambda x[\text{win}(x)] \) a derived one. It is derived by abstracting over the formula \text{win}(x). The syntax of English, it can be argued, makes a similar distinction. It also has basic, lexical predicates and derived ones, which have the internal syntactic structure of a clause. A case in point is constituted by relative clauses, like:

(95) John is a student one can rely on.

(95) says that John is a student and that one can rely on John. Thus the relative clause one can rely on is interpreted semantically as a predicate (attributed to John), but it clearly has the internal structure of a clause (with a gap). The attributive view of control maintains that the same holds of infinitives. Accordingly, PRO is interpreted as a λ-abstractor and the compositional semantics of (93) is simply:

(96) \( \text{try}(\lambda x[\text{win}(x)](j)) \)

This may arise as a purely interpretive procedure concerning PRO. Alternatively, there could turn out to be syntactic reasons to assume that PRO is at some syntactic level construed as (or with) an operator, say along the lines sketched in (97):

(97) [PRO to win] \( \leadsto Q_i[si \text{to win}] \)

I will not take a stand on this issue here. Nor will I try to defend the attributive view of control, referring for that to the papers mentioned above. The point of relevance to our present concerns is that given the attributive theory of control, it follows immediately that si will be able to control, simply because it can of course enter a predication relation. Once more nothing prevent attribution of predicates to entities of the sort 'humans'. The logical representation of (98a) will simply be (98b):

(98) a. Si e' tentato di vincere.
    Si tried to win.
    b. \( \exists x_{arb}[C(x_{arb}) \land \text{try}(\lambda y[\text{win}(y)](x_{arb}))] \)

In (98), the complex predicate try to win is attributed to a group of humans. That seems to be all there is to say concerning si's capacity to antecede PRO.

4.5 Why can't si antecede overt pronouns and pro?

Consider next the case of ordinary pronouns and of pro. Semantically these elements are simply interpreted as (sortally unrestricted) variables, which may be bound by a quantifier or whose value can be otherwise fixed by the context. We conjectured that si is an existential term with a distinguished index, designated as \( s_i \). From this alone, it follows that the quantifier associated with si will be unable to bind other variables. In order for a quantifier \( \exists x_i \) to bind a variable \( x_k \), they must have the same index (i.e. it must be the case that \( i = k \)). But, by hypothesis, si carries an index distinct from the one of ordinary variables. This is a consequence of the fact that si is associated with variables of a special sort, restricted to ranging over
groups of human. While there might be other ways of obtaining sortal restrictions, the use of distinguished variables (or, equivalently, of distinguished indeces) is the canonical way to do it.

Attributing a predicate to a group of humans is no problem, if such a predicate can meaningfully attributed to humans. This is the basis of our account for 4.3 and 4.4. But when it comes to bind another pronoun it won’t be possible across sortally different variables.

4.6 Further consequences

The generalization that emerges from the above considerations is that si will only be able to antecede operator bound elements, like, arguably, reflexives and PRO. This leads to try to look for other constructions that have been argued to involve operator-binding and check how si behaves with respect to them.

One class of cases that have been argued to involve a form of operator binding are parasitic gaps like:

(99) Here is the book that John filed without reading.

However, it turns out that we will not be able to test our prediction with parasitic gaps structures. The reason for this is that these constructions involve typically A'-binding (e.g. relativization or question formation) and si cannot be an A'-binder (it has no wh- counterpart and can’t head relative clauses).

A class of cases where we can test the tenability of our hypothesis is provided by the long distance reflexive proprio. In view of its reflexive character, proprio must be operator-bound\(^{17}\). So si should be able to antecede it, and indeed this expectation is borne out:

(100) Spesso si pensa che i proprii genitori siano creature senza sesso.
    Often si thinks that self parents be (subjunc.) creatures without sex.

Another unrelated class of dependencies which are quite generally assumed to be mediated by operator-binding is constituted by tough-constructions. In Italian they are illustrated in (101a):

(101) a. Gianni è difficile da accettare.
    Gianni is hard to please.

b. Gianni\(_2\) è
di difficile [PRO\(_{ar}^3\) da accettare t\(_4\)].

Chomsky [8] has proposed an analysis of these structure which, transposed in our current notation, would look like (101b). We should, accordingly, expect si to be able to control the object gap in tough-constructions. In fact, this is so:

(102) Se si è difficili da accettare, se ne pagano le conseguenze.
    If si is hard to please, si of it (cl.) pays the consequences.

If one is hard to please, one must accept the consequences.

Here si controls (via predication) the object gap of accettare. These preliminary considerations show that our hypothesis appears to be supported beyond the data we originally considered.

4.7 Why can si antecede itself?

I have left the case where si apparently antecedes itself last, because it is of special interest to a theory of anaphora that wants to accomodate donkey-type dependencies. The most salient cases (in fact, the only cases, as we will argue) where an occurrence of si seems to act as the antecedent of another occurrence of si is in conditionals like:

\(^{17}\)In Chierchia [6] I have argued that there are also other independent reasons why proprio must be operator bound, reasons having to do with its special 'self-oriented' semantics.
(103) Senza alcuna eccezione, se si ruba si va in galera.

Without exception, if one steals one goes to jail

Let us see how this is to be analyzed. Recall that we are assuming, in line with DRT, that the role of if/when clauses is to restrict an adverb of quantification. When no adverb is overtly present, the presence by default of an always-like adverb is assumed. What does this predict in the case where si occurs both in the antecedent and in the consequent and the consequent of a conditional? It will depend by whether we go for the symmetric or the asymmetric reading. If we go for the symmetric reading, we quantify over cases and the two occurrences of si will be existentially quantified each by their own existential quantifier, so to speak. In this case the two occurrences of si will not co-vary, i.e. the second one (in the consequent) will not be understood as ‘bound’ by the first one (in the antecedent). If instead we go for the subject asymmetric reading, the two occurrences of si will be re-open (as is generally the case with asymmetric readings) and will be directly linked by the adverb of quantification. This is what our approach predicts.

Let us flesh these predictions out by means of concrete examples, which will also enable us to test them. Consider a sentence like (104a). Its symmetric reading is going to be something like (104b):

(104) a. Se si fa così, non si capisce nulla.
    If si does so, not si understand anything.
    If one does that, one won’t understand anything.

b. \( \text{EVERY} (\lambda p \exists x_{arb}[C(x_{arb}) \land \text{does\_that}(x_{arb}) \land \forall p]) \)
    \( (\lambda p \exists x_{arb}[C'(x_{arb}) \land \neg \text{understand\_anything}(x_{arb}) \land \forall p]) \)

(104b) has roughly the following truth-conditions:

(105) Every case in which people/someone (from a contextually specified set) does that is a case in which people/someone (from a contextually specified set) doesn’t understand anything.

The two occurrences of si here are not dependent on one another. Each one is associated with its own existential quantifier. This does not exclude that the two occurrences of si may in a sense be understood as covarying. The context variables \( C \) and \( C' \) in (104b) may pick the same group of people. And the only value of \( x_{arb} \) that satisfies the antecedent and the consequent might include all the members of the contextually specified group. In this case, (104a) can be understood as roughly equivalent to something like (106):

(106) If we do that, we won’t understand anything.

But this is arguably a pragmatic fact, not a matter of anaphoric dependency between the two occurrences of si. By playing with the context, we can make disappear the feeling of a dependency between the two occurrences of si. For example, it is very natural to imagine a professor uttering (104a) at a meeting with her T.A.’s in preparation for an exam. Then the value of x that satisfies the antecedent is the group of the professor with her T.A.’s. While the group that satisfies the consequent is the students. These two groups have no member in common.

This “now you see it now you don’t”-effect is typical of pragmatic phenomena. I thus conclude that (104b) correctly characterizes one of the readings that (104a) has.

At the same time, we can select si as the topic. In this case (104a) would be interpreted roughly as:

(107) \( \text{EVERY}_{arb}(\lambda p \exists x_{arb}[C(x_{arb}) \land \text{does\_that}(x_{arb}) \land \forall p]) \)
    \( (\lambda p \exists x_{arb}[C(x_{arb}) \land \neg \text{understand\_anything}(x_{arb}) \land \forall p]) \)
By definition of EVERY_{arb}, this is equivalent to:

(108) \forall x_{arb}[[C(x_{arb}) \land does\_that(x_{arb})] \rightarrow \neg understand\_anything(x_{arb})]

cf. 5 in the appendix for details)

This gives us the reading according to which if \( x \) does that, \( x \) (and not somebody else) won’t understand anything anymore. This reading is the one salient in (103) and gives the effects of \( si \) anteceding itself.

A question that arises in this connection is: is (104a) really ambiguous as our theory predicts? Couldn’t it be the case that (104a) really only has, say, the reading in (104b) and that pragmatic factors trigger the understanding that the same value of \( x_{arb} \) satisfies the antecedent and the consequent? The answer to this is no, for a very simple reason. A sentence like (103) can be taken to be false if a single human (from the relevant domain) steels but doesn’t go to jail. If the only reading of (103) would be parallel to (104b) there would be no way to account for this fact. At the same time, (104a) cannot have just reading (108), for there are contexts where that sentence is true and yet the values of \( si \) that make it true are different.

There is a further prediction that our theory makes. The donkey-type effects in conditionals are due to the fact that adverbs of quantifications can associate with a topic and \( si \) can (and likes to be) a topic. Consequently, we shouldn’t expect these effects to arise in contexts where donkey-dependencies do not arise via adverbs of quantifications, such as relative clauses. This indeed seems to be so. Consider:

(109) Ogni persona che si inviti a cena pensa che la si debba trattare bene.

Every person that \( si \) invites for dinner thinks that her \( si \) must treat well.

Every person that gets invited for dinner thinks that \( s/he \) should be treated well.

Here the pragmatic set up favours the reading where the someone who is expected to treat a guest well is the same that has invited that guest. Yet, on our semantics there is no way to get the first occurrence of \( si \) to bind the second. Hence, we expect that it should be impossible to take this sentence as false if there is an \( x \) such that someone is invited by \( x \) but doesn’t expect him or herself to be treated well by \( x \). And in fact, the thought described in (109) is perfectly consistent with a situation where the one who does the invitation is different from the one who is expected to be a good host. For example I can think that whenever I am invited, I should be treated well even if I know that sometimes the person who invites me and the person who actually hosts me are different. I don’t think that cases parallel to (103) can be constructed using relative clauses.

It may be worth pointing out that it is not immediately obvious how to accommodate these facts within classical DRT. The translation of the present theory within classical DRT would assimilate \( si \) to an indefinite. So \( si \) would always introduce a discourse marker in the relevant box (in the terms of Kamp [16]) or would always be associated with a new variable (in the terms of Heim [13]). While this could be set up in a way as to lead to results similar to ours for most properties of \( si \), it would yield only a reading equivalent to (104b) for the cases at hand and thus it would leave the fact that \( si \) seems able to antecede itself without an account. In order to obtain the present results, one would have to reproduce within DRT the present approach to adverbs of quantification.

5 Conclusions

In the present paper, I have first sketched a theory of adverbs of quantification as generalized quantifiers over cases (viewed as assignments to variables). This follows the lead of Lewis (Lewis) and subsequent work in DRT. Adverbs of quantification can either unselectively bind all the indefinites in a clause (but it should be noted
that unselective binding here is just a metaphor), or can select and associate with a topic. In either case, adverbs of quantification are generated by a formally simple schema from the meaning of the corresponding determiners. Furthermore, I have formulated the hypothesis that \( si \) is semantically interpreted in terms of an operation analogous to passive that introduces a (dynamic) existential quantifier over subjects. This hypothesis interacts with the theory of adverbs of quantification previously sketched and other independent assumptions concerning reflexives and infinitives so as to provide a rather simple account of the core quantificational and anaphoric properties of \( si \). This is only a begining, for impersonal subject constructions are very complex. But the evidence we have considered suggests that the line we have undertaken is promising. The present results have been obtained within a framework where all NP’s have a uniform semantics and where construction specific stipulations are reduced to a bare minimum (essentially: \( si \) is a context dependent indefinite).

6 Appendix

6.1 Dynamic conjunction: reductions for example (12)
\[
\lambda p \exists x[\text{man}(x) \land \text{walk in}(x) \land \forall p]; \lambda p[\text{blond}(x) \land \forall p]
\]
\[
\lambda q[\lambda p \exists x[\text{man}(x) \land \text{walk in}(x) \land \forall p] \land \forall q], \text{def. of } \forall; \text{ alphabetic change of variables}
\]
\[
\lambda q[\lambda p \exists x[\text{man}(x) \land \text{walk in}(x) \land \forall p] \land \forall q], \text{\( \lambda \)-reduction}
\]
\[
\lambda q[\exists x[\text{man}(x) \land \text{walk in}(x) \land \forall q]], \text{\( \forall \)-cancellation}
\]

6.2 Reductions for example (25)
\[
a^+(\langle \text{man} \rangle \langle \text{walk} \rangle)
\]
\[
\lambda P \lambda Q \lambda p \exists y[[P(x); Q(x)](p)](\langle \text{man} \rangle \langle \text{walk} \rangle), \text{def. of } a^+
\]
\[
\lambda p \exists y[\langle \text{man}(y) \rangle \langle \text{walk}(y) \rangle], \text{\( \lambda \)-reduction}
\]
\[
\lambda p \exists y[\lambda y \lambda q[\text{man}(y) \land \forall q(x)]; \lambda y \lambda q[\text{walk}(y) \land \forall q(x)](p)], \text{def. of } \forall, \text{ alphabetic change of variables}
\]
\[
\lambda p \exists y[\lambda q[\text{man}(x) \land \forall q]; \lambda q[\text{walk}(x) \land \forall q]](p), \text{\( \lambda \)-reduction}
\]
\[
\lambda p \exists y[\lambda q[\text{man}(x) \land \forall q]((p)), \text{def. of } \forall;
\]
\[
\lambda p \exists y[\text{man}(x) \land \forall q], \text{\( \lambda \)-reduction}
\]

6.3 Universal quantification
Let the logic of updates be defined as follows, for any \( A, B \) of type \( up \):

\[
neg\, \text{negation } \neg A \equiv \top \rightarrow \neg A
\]

\[
\text{disjunction } A \lor B \equiv \neg(\neg A \land \neg B)
\]

\[
\text{implication } A \rightarrow B \equiv \neg A \lor B
\]

A dynamic universal determiner can then be defined as follows:

\[
every^+ = \lambda P \lambda Q \lambda q \forall x[[P(x) \rightarrow Q(x)](q)]
\]

6.4 Adverbs of quantification: example (41)
\[
\text{EVERY}(\lambda p \exists x[\text{man}(x) \land \text{in the bathtub}(x) \land \forall p])(\lambda p \exists y[\text{love song}(y) \land \text{sing}(y)(x) \land \forall p]), \text{unreduced translation of (41)}
\]
\[
\text{EVERY}(\lambda p \exists x[\text{man}(x) \land \text{in the bathtub}(x) \land \forall p])([\lambda p \exists x[\text{man}(x) \land \text{in the bathtub}(x) \land \forall p] \land \forall q], \text{definition of EVERY'}
\]
\[
\text{EVERY}(\lambda p \exists x[\text{man}(x) \land \text{in the bathtub}(x) \land \forall p])([\lambda p \exists x[\text{man}(x) \land \text{in the bathtub}(x) \land \forall p] \land \forall q], \text{definition of } \forall'
\]

26
EVERY(λp∃z[man(x)∧in.the.bathtub(x)∧
ylove.song(y)∧sing(y)(x)]∧p)), definition of ‘;’
EVERY(λc∃x[man(x)∧in.the.bathtub(x)∧c]), definition of ‘:’.
∀c∃x[man(x)∧in.the.bathtub(x)∧c]→∃y[man(x)∧in.the.bathtub(x)∧y]
ylove.song(y)∧sing(y)(x)]∧c]], definition of EVERY given in footnote 5.

6.5 Subject asymmetric readings with si
Se si fa così, non si capisce nulla.
If si does so, not si understand anything.
If one does that, one won’t understand anything.

Definitions:
EVERY_{arb}(A)(B) = EVERY(λu_{arb}A)(λu_{arb}B) (where for any A of type up: u_{n}, A
(n any index) is defined as in footnote 8)

EVERY = λPλQλx[∀z[[P(x)⇒Q(x)](y)]

Translations:
si fa cosi’ —→ λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧y]
non si capisce nulla —→ λp∃x_{arb}[C(x_{arb})∧¬understand.anything(x_{arb})∧y]
Se si fa così’ di solito non si capisce nulla —→
EVERY_{arb}(λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧y])
(λp∃x_{arb}[C(x_{arb})∧¬understand.anything(x_{arb})∧y])

Reductions:
EVERY(λu_{arb}λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧y])((λu_{arb}λp∃x_{arb}[C(x_{arb})∧
¬understand.anything(x_{arb})∧y]); def. of EVERY_{arb}.
EVERY(λu_{arb}λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧y]; [u = x_{arb}])(λu_{arb}λp∃x_{arb}[C(x_{arb})∧
¬understand.anything(x_{arb})∧y]); [u = x_{arb}]), def. of λu_{n}A.
λPλQλx[∀z[[P(x)⇒Q(x)](y)](λu_{arb}λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧u = x_{arb}∧
y])((λu_{arb}λp∃x_{arb}[C(x_{arb})∧¬understand.anything(x_{arb})∧u = x_{arb}∧y]), def. of
EVERY.
λQ∀x[[λu_{arb}λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧u = x_{arb}∧y]](z)⇒λu_{arb}λp∃x_{arb}[C(x_{arb})∧
¬understand.anything(x_{arb})∧u = x_{arb}∧¬y](z)(q)], λ-red.
λQ∀x[[λp∃x_{arb}[C(x_{arb})∧fa.cosi(x_{arb})∧z = x_{arb}∧y]](x)⇒λp∃x_{arb}[C(x_{arb})∧
¬understand.anything(x_{arb})∧z = x_{arb}∧¬y](q)], λ-red.
λQ∀x[¬understand.anything(x_{arb})∧fa.cosi(x_{arb})]→¬understand.anything(x_{arb})∧q], def. of
⇒ and tautological transformations.

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