Partial Control, Exhaustive Control and the Semantics of Anaphoric Control

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Landau [2000] observes that there are two types of obligatory control, *exhaustive control* (EC), where the reference of the controller and the controllee is identical, and *partial control* (PC), where the reference of the controllee is allowed to be a superset of the reference of the controller. The difference is lexically governed by the control predicate, and turns up in the ability to licence collective predicates and modifiers like *together* in the complement clause even when the controller is singular.

(1) a. The chair wanted to gather at six.
b. The chair preferred to gather at six.
c. The chair agreed to gather at six.

(2) a. *The chair tried to gather at six.
b. *The chair began to gather at six.
c. *The chair managed to gather at six.

PC has been analysed in an LFG setting by Asudeh [2005], who claims the difference between EC and PC is semantic only and that syntactically, PC and EC both instantiate functional control. He argues against Dalrymple [2001], for whom English control verbs instantiate (obligatory) anaphoric control. Falk [2001] takes a middle position in this debate and argues that some English control verbs have functional and others anaphoric control, but without relating the distinction to the PC/EC divide. In this paper we follow Falk's split view and argue that PC is anaphoric control and EC is functional control.

That PC instantiates anaphoric control seems in line with the intuition (to be made precise below) that anaphoric control is somehow 'looser' that functional control. Still, Asudeh [2005] argues that functional control accounts for PC better than anaphoric control. His argument is based on Landau [2000]'s observation that although PC verbs licence semantic plurality on the controllee, the controlleee is not syntactically plural, does not licence plural agreement or plural anaphors:

(3) *John told Mary that he preferred to meet each other at 6.

This follows directly if there is structure sharing in the f-structure, for then the same (singular) features are present both in the controller and the controllee. If the controllee is a semantically plural pronoun, Asudeh [2005] argues, we would expect it to be syntactically plural as well. However, the singular feature on the controllee could just be due to agreement with the antecedent. Agreement in spite of semantic number is found with overt bound pronouns too. In (4), *they* agrees with *all men* and is syntactically plural, but must be semantically singular because of the semantics of the predicate. Observe that if the embedded clause in (4) is used as a main clause, with *they* free, it is ungrammatical (5).

(4) All men think they are the smartest person in the world.

(5) *They are the smartest person in the world.

So there would be nothing wrong in assuming that in (3), the bound PRO subject of *meet* agrees in syntactic features with its antecedent and hence cannot licence the plural anaphor, even if it is semantically plural.

The agreement facts are therefore non-conclusive. Tests revolving around the COMP/XCOMP functions are also shown to be inconclusive by Asudeh [2005]. We therefore turn to the semantics. Asudeh [2005] proposes the analysis in (6) for the PC verb *prefer*; for comparison, the EC verb *try* is given in (7).[1]

(6) $\lambda x.\lambda P.[y|x \sqsubseteq y, \textit{prefer}(x, P(y))] : (\uparrow \textsc{subj})_\sigma \multimap [(\uparrow \textsc{xcomp subj})_\sigma \multimap (\uparrow \textsc{xcomp})_\sigma] \multimap \uparrow_\sigma$

(7) $\lambda x.\lambda P.[\ |try(x, P(x))] : (\uparrow \textsc{subj})_\sigma \multimap [(\uparrow \textsc{xcomp subj})_\sigma \multimap (\uparrow \textsc{xcomp})_\sigma] \multimap \uparrow_\sigma$

We see that the semantics of the PC verb does not directly insert the controllee (x) as the subject of the control infinitive, but rather constructs a new discourse referent y, which potentially includes more members than just x. From a theoretical standpoint it may seem dubious that the discourse referent introduced (or in static terms, the variable that is quantified over) by the meaning term associated with the verb's syntactic argument does not in fact occur as a semantic argument of the predicate. This seems like a strong syntax-semantics mismatch, where two argument positions that are identified through functional control in the syntax, do not get the same denotation in the semantics.

Empirically, the analysis does not do justice to the anaphoric nature of PC, which is repeatedly mentioned in the literature; cf. Grano [2012, p.18] who notes that a partially controlled subject must refer to a *contextually salient* plurality to be felicitous, as in (8), which would be odd if uttered out of context and without the material in parentheses.[2]

(8) #(Mary said that) John wished to have lunch together.

This is not predicted on the analysis in (6). The sentence should just mean 'There is some group that includes John and John wished to have lunch with this group.' In its dynamic formulation, (6) can be reformulated to capture the anaphoric nature of the embedded subject, as in (9), where the underscore marks y as an anaphoric discourse referent.

(9) $\lambda x.\lambda P.[\underline{y}|x \sqsubseteq y, prefer(x, P(y))] : (\uparrow \textsc{subj})_\sigma \multimap [(\uparrow \textsc{xcomp subj})_\sigma \multimap \textsc{xcomp}_\sigma] \multimap \uparrow_\sigma$

But (9) seems even less motivated as a lexical entry for a verb. Why would a functional control verb introduce an anaphoric discourse referent as the subject of its controllee? If we need to have the verb introduce a covert pronoun meaning in the semantics, the motivation for a functional control analysis seems weak. We might as well opt for anaphoric control.

[1] We have translated Asudeh's static proposal into a dynamic meaning language, CDRT.

[2] But note that PC is not the same as split control, where the controllee is syntactically plural.

However, although moving to anaphoric control introduces a pronoun in the controlled position, it does not necessarily alter the semantics of the construction. That depends on the semantics of anaphora that one adopts. Historically, Glue + LFG has treated pronouns as functions either on their antecedents [Dalrymple et al., 1999, Asudeh, 2012], or on contexts (treated as resources in the linear logic, Dalrymple [2001]). Both these approaches deal with anaphora on in the Glue, and as such they have problems in dealing with cases where the relationship between anaphor and antecedent is not simple identity. But although identity is the default (and more so for pronouns than for definite descriptions), it is easy to find cases where the pronoun resolves by some bridging inference:

(10) I bought an iPad today$_1$. They$_1$ are so cool.

(11) The restaurant$_1$ went bust when the liquour license they$_1$ applied for was refused.

To have a more sophisticated account of anaphora available, we use (a partial version of) Compositional DRT [Muskens, 1996] instead. Partial CDRT allows us to define discourse referents that must have a discourse antecedent, and those that must have a sentence-internal antecedent. The first ones are marked with underscore $\underline{x}$ and are singled out by the predicate $ant(\underline{x})$; the latter ones are marked with a bar $\bar{x}$ and are singled out by the predicate $anaph(\bar{x})$. The function $\mathcal{A}$ (supplied by pragmatics rather than monotonic semantics; we skip details here) maps anaphoric discourse referents (of both kinds) to their (not necessarily fully coreferent) antecedents.

In partial CDRT, a discourse representation structure (DRS) is a relation between input and output states. We can think of states as partial assignments of inhabitants to discourse referents. If i and o are states, then $U(i, o)$ denotes the set of discourse referents in the domain of o but not in i, i.e. the ones that are new in o. We can now define an function `bind` mapping pairs of states and DRSs to DRSs , as in (12).

(12) $\texttt{bind}(j, K(i)(o)) \equiv K(i)(o) \wedge \forall d.((d \in U(i, o) \wedge anaph(d)) \rightarrow \partial(\mathcal{A}(d) \in U(j, i)))$

This returns the DRS K augmented with conditions that any sentence-bound anaphors in K be bound in a restricted part of its input state, namely $U(j, i)$. Intuitively, $U(j, i)$ is the set of discourse referents in the matrix clause only. In the abbreviated DRS language, we write $\texttt{bind}(K')$ on the understanding that anaphors in K' must be bound in the matrix DRS.

We can now derive the meaning of *He preferred to gather (at six)*, using the lexical meanings in (13). X is a variable over plural referents. These combine as in (14) (meanings left out except in the conclusion).

(13)

he	$\lambda P.[\underline{x_1}\mid\,]; P(\underline{x_1})$	$(h \multimap p) \multimap p$
prefer	$\lambda K.\lambda x.[\,\mid \textit{prefer}(x, \texttt{bind}(K))]$	$g \multimap h \multimap p$
PRO	$\lambda P.[\bar{x_2}\mid\,]; P(\bar{x_2})$	$(pro \multimap g) \multimap g$
gather	$\lambda X.[\,\mid \textit{gather}(X)]$	$pro \multimap g$

(14)

$$\dfrac{\dfrac{pro \multimap g \qquad (pro \multimap g) \multimap g}{g} \qquad g \multimap h \multimap p}{\dfrac{h \multimap p \qquad (h \multimap p) \multimap p}{p{:}[\underline{x_1}\mid \textit{prefer}(\underline{x_1}, \texttt{bind}([\bar{x_2}\mid \textit{gather}(\bar{x_2})]))]}}$$

This analysis achieves the (near-)unification of GB's pro and PRO that was argued for by Bresnan [1982, p.380]. As the semantic entries for **he** and **PRO** make clear, both are just pronouns, although they differ in the domain where they must find their antecedent: the matrix sentence in the case of PRO; the discourse in the case of pro. Moreover, the analysis generalizes to so-called arbitrary PRO, for although PRO is marked as a pronoun that must be bound in the sentence, this requirement is only 'activated' by the `bind` operator provided by the control verb: if PRO does not meet a control verb in the semantic derivation, it can be bound in the discourse. Finally, the analysis also covers the looser temporal connection that is allowed in PC constructions, but not in EC, as illustrated in (15).

(15) Yesterday, the chair (preferred/*tried) to gather tomorrow.

This follows directly if the time variable of the infinitive in PC is a 'temporal PRO' that must be anaphorically bound in the sentence whereas the time variable of EC infinitives are statically bound by the matrix tense. Finally, observe that on this account anaphoric control (unlike functional) is semantic in the sense of Culicover and Jackendoff [2005]: the controllee finds its antecedent by semantic reasoning, although within a very limited domain. This accounts for facts such as variable control:

(16) John$_i$ asked his parents$_j$ to (PRO$_j$ leave)/(PRO$_i$ be left alone)

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