Deterministic mapping and the nature of dependencies
An interface account of weak(er) crossover

Weak crossover challenges – The current view of crossover effects as quantifier-dependent phenomena (Chomsky 1976) raises two fundamental questions, ultimately bearing on the nature of dependencies and of the syntax/semantics mapping. Theoretically, in an optimal grammar we would expect the existence of crossover to follow from the tools for obtaining bound variable (BV) readings. But the syntactic rule of Quantifier Raising (QR) and the semantic rule of Predicate Abstraction (PA) (Heim & Kratzer 1998: p. 186) derive the weak crossover (WCO) structures in (1) with BV readings, to the effect that their agrammaticality is completely unexpected. The descriptive generalization that the trace/copy of the quantifier has to c-command the pronoun in order to license a BV reading of the latter remains an unjustified stipulation. More perspicuously: why should semantic binding entail syntactic binding?

(1) a. ?*His mother loves everyone
   LF: ?*[everyone] i [[his, mother] loves t_i]  
   Quantifier raising

   b. ?*Who i did [his, mother] love t_i?
   Wh-movement

Empirically, some fine-grained distinctions in the WCO paradigm have been shelved as a consequence of the bipartition between quantificational and referential antecedents. WCO is systematically present with quantifiers and operators moved in covert syntax (2-a) and with non-specific wh-phrases (2-b), however it can be circumvented by overtly-moved specific wh-elements (2-c) (weaker crossover) (Falco 2007). The issue of how to account for these fine-grained distinctions arises. More directly: why can overtly-moved specific wh-elements circumvent WCO?

(2) a. ?*His mother loves every baby
   LF: ?*[every baby] [[his mother] loves t]
   Specific quantifier

   b. ?*Who the hell do [his constituents] despise t_i?
   Non-specific Wh

   c. ?Which famous senator do [his constituents] despise t_i?
   Specific Wh

   (b. and c. from Culicover & Jackendoff 1995: ex. 39)

A new perspective on dependencies – Crossover is usually thought of as a syntactic dependency failure: for some reason, the pronoun fails to be dependent on the trace. The direction of this dependency is represented in (3) through the arrow connecting the dependent pronoun to the trace on which it depends.¹

(3) ?* \( \lambda_i \ldots [pro_i] \ldots t_i \)
   Standard perspective

We propose to look at WCO configurations from the mirror perspective: it is the Q-trace that must enter into a dependency relation with the pronoun. In itself this dependency is well-formed, but, in WCO configurations, it leads to a redundancy with PA, the interpretive mechanism at stake in these structures. The claim that the Q-trace is better conceived of as dependent on the pronoun follows once we consider the indexes proper to the pronoun and to the Q-trace. While it is sound to assume that pronouns are endowed with a referential index, Q-traces, due to their quantificational nature, are better conceived of as underspecified for such an index. Therefore, technically, the insertion of an index in trace position that Trace Conversion (TC) rules (Fox 1999; Elbourne 2005) posit is stipulative. The index underspecification is expressed by \( \emptyset \).

(4) ?* \( \lambda_i \ldots [pro_i] \ldots t_0 \)
   New perspective

Crossover can now be seen as a consequence of the process of index-valuation on the Q-trace, having two potential assigners: the intervening pronoun, through linking (Higginbotham 1983), and the predicate abstractor, through PA (5). Linking of the Q-trace to the local pronoun to resolve index-underspecification on the Q-trace does not affect in any way the result of the successive application of a generalized version of PA. Crossover is thus a case where locality constraints interfere with optimal mapping between syntactic representations and interpretation (Dellitto & Fiorin 2009). This is the principled solution we provide to the theoretical challenge.

(5) ?* \( \lambda_i \ldots [pro_i] \ldots t_0 \)
   WCO as redundancy

¹A dotted arrow indicates the dependency failure and distinguish it from the linking (Higginbotham 1983) relation denoted by a single-line arrow. Below, a dashed arrow represents the dependency established by a \( \lambda \)-abstractor.
The deep justification of the reversing of dependencies emerges from inspecting the nature of the empirical challenge.

**Deterministic syntax/semantics mapping** – From the point of view proposed, the possibility to escape WCO for specific wh-element reduces to the possibility of their trace/copy to be endowed with a referential index, so that the intervening WCO pronoun would not count as a potential antecedent and the redundancy causing WCO would not arise (6).

\[(6) \quad \lambda_i \ldots [\text{pro}_j] \ldots \langle t_i \rangle \quad \text{No redundancy}\]

Intuitively, in a semantically motivated theory of referential indexes, there are two types of indexes. On the one hand we have the index on object-referring DPs denoting an entity; crucially in Q-phrases this index is underspecified. On the other hand, it is natural to assume that an index denoting a set is present on the ‘familiar’ NP-restriction of the DPs, as in Enç 1991. Therefore specific Q-phrases have the following format: \([\text{DP} \ Q \ [\text{NP}]_j]\). It is this second NP index \(j\) that can be ‘transmitted’ to the whole DP-trace when it is a specific overtly-moved wh-element. This basic insight can be neatly formalized refining Elbourne’s (2005) semantics of referential expressions - names, pronouns and definite descriptions - if we combine it with Rizzi’s (2001) LF syntax for specific vs. non-specific chains. Consider the abstract LF configurations in (7-a) and (7-b), where copies/traces are expressed by angled brackets. According to Rizzi (2001), if the wh-phrase is specific, a chain limited to the restriction of the wh-element is formed, since the restriction alone is moved, due to its topical nature, to the relevant position within the left-periphery (7-a). Conversely, the non-specific wh-phrases form a chain which does not contain the restriction, since the restriction has not to be interpreted in the left-periphery (7-b). Rizzi’s configurational definition of chains enforces a *shrinking* mechanism that redefines the portion of structure that counts as a trace, as illustrated in the LFs below.

\[(7) \quad \begin{align*}
\text{a.} & \quad [\text{TOP} \ [\text{NP}]_j] \ldots [Q \langle [\text{NP}]_j\rangle_0] \ldots [\text{pro}_j] \ldots ([Q \langle [\text{NP}]_j\rangle_0] \langle t_i \rangle) \quad \text{Specific LF chain} \\
\text{b.} & \quad [Q \langle [\text{NP}]_j\rangle_0] \ldots [\text{pro}_j] \ldots ([Q \langle [\text{NP}]_j\rangle_0] \langle t_i \rangle) \quad \text{Non-specific LF chain}
\end{align*}\]

In the specific case (7-a), the restriction coincides with the portion of structure that counts as a trace; the specificity index is no longer embedded (it qualifies as the index of the chain), and it is thus available as an index for the whole DP. The index-underspecification on the Q-trace is resolved ‘in-situ’ in this case, by using the index of the NP-restriction, which is directly available in the same syntactic position as an effect of shrinking. Crucially, the LF-mechanism of index-inheritance is excluded with operators moved after Spell-Out - overtly or covertly restricted quantifiers (2-a) and wh-in-situ - because the grammar does not allow more than one covert movement step, so, the restriction, if present, is frozen in the DP it belongs to, after the first covert movement step (Luigi Rizzi p.c.). Therefore, the intuitions on the indexing possibilities and the ensuing reversed perspective on dependencies receive theory internal support. This is the gist of our answer to the empirical question. More technically, in the full paper, we enrich Elbourne’s (2005) proposal so that non-specific Q-phrases end up with the following syntactic format: [THE θ [NP j]]. We provide an explicit semantics for this format. Accordingly, TC and PA rules are modified, making a sound use of indexes.

**Conclusions** – Putting the answers together, the overall result is that deterministically mapping syntactically motivated LF representations to a semantics making a non-arbitrary use of indexes, a new perspective on dependencies ensues. A theoretically principled and empirically adequate account of WCO follows from conflicting principles of economy.

**References**


