Fine-grained syntax/semantics mapping and the nature of dependencies
An interface account of Weak Crossover

The observation that specificity plays a role in the weak crossover (WCO) phenomenology (Falco 2007) opens a window into the properties of the syntax/semantics mapping and the nature of dependencies. We propose a fine-grained mapping between Rizzi’s (2001) LF syntax for specific vs. non-specific chains and a refined version of Elbourne’s (2005) semantics for traces-copies and pronouns. The nature of this mapping supports the reversing of the standard perspective on dependencies in crossover configurations: the pronoun depends on the Q-trace. While pronouns are endowed with a referential index, copies of Q-phrases can be endowed or devoid of a referential index depending on the the form of the syntactic chains they give rise. Underspecified indexes are compelled to get a value as soon as possible but in standard WCO this give rise to a redundancy in the valuation process.

The crossover challenges – The current view of crossover effects as quantifier-dependent phenomena (Chomsky, 1976) raises two fundamental questions for the syntax/semantics interface. 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 WCO structures in (1-a) and (1-b) 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?

(a) a. *His mother loves everyone
   LF: ?*[everyone] i [[his, mother] loves t]
   Quantifier raising
b. ?*Who i did his, mother love t?
   Wh-movement

Empirically, some fine-grained distinctions in the crossover 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 and with non-specific wh-phrases (2-a), but it can be circumvented by overtly-moved specific wh-elements (2-b) (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?

(b) a. ?*Who the hell do his students admire t?
   Non-specific
b. ?Which famous professor do his students admire t?
   Specific - weaker crossover

Crossover as redundancy – 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) ?* λi ... [pro] ... ti
   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 θ.

(4) ?* λi ... [pro] ... tθ
   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

1A dotted arrow indicates the dependency failure and distinguish it from the linking relation denoted by a single-line arrow. Below, a dashed arrow represents the dependency established by a λ-abstractor.
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.

(5) \[ \lambda_i \ldots [\text{pro}_j] \ldots t_0 \]  

WCO as redundancy

This is the principled solution we provide to the theoretical challenge. Its deepness and scope emerge from inspecting the nature of the empirical challenge.

**The 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) \[ \lambda_i \ldots [\text{pro}_j] \ldots t_i \]  

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 in the ‘familiar’ NP-restriction of the DPs, as in Enç 1991. Therefore specific Q-phrases have the following format: \([DP Q [\text{NP}]]_\lambda\). 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 using the angled brackets notation. According to Rizzi (2001), if the *wh*-phrase is D-linked, 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) a. \([\text{TOP NP}]_j \ldots [Q [\{\text{NP}\}]_\lambda] \ldots [\text{pro} j] \ldots ([Q [\{\text{NP}\}]_\lambda]) \]  

Specific LF chain

b. \([Q [\{NP\}]_\lambda] \ldots [\text{pro} j] \ldots [\{Q [\text{NP}]]_\lambda] \]  

Non-specific LF chain

In the specific case (7-a), the restriction coincides with the portion of structure that counts as a trace; in a sense, 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. The LF-mechanism of index-inheritance is excluded with operators moved in the covert syntax, because 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. Therefore, the intuitions on the indexing possibilities receive theory internal support. This is the gist of our answer to the empirical question. More technically, we formalize Enç’s (1991) index \(j\) as the same referential index that Elbourne posits for referential DPs and provide a semantics for this format, implementing a transparent mapping algorithm of the LF chains to the semantics. On the basis of these we propose a modified version of the TC and PA rules, that make sound use of indexes.

Putting the answers together, the overall result is that combining a semantically motivated theory of referential indexes with a syntactically motivated chain-formation algorithm at the LF-interface, we arrive at a theoretically principled and empirically adequate theory of crossover as a conflict of fundamental principles of interface economy.

**References**


