Unifying Presupposition and Implicature Projections

**Starting point.** Minimal pairs like (1) show that presuppositions project out of negation. As example (2) illustrates, scalar implicatures do not differ in that respect: negation automatically turns scalar implicatures into entailments (see Merin, 1999). This symmetry is not mysterious but if unnoticed, it might be a barrier to entertain the possibility of a single mechanism for presupposition and implicature projections.

(1) a. The king of France is bald. \( \rightsquigarrow \) There is a king of France.
   b. It’s not the case that the king of France is bald. \( \rightsquigarrow \) There is a king of France.

(2) a. Some students are happy. \( \rightsquigarrow \) Not all students are happy.
   b. It’s not the case that some students are happy. \( \rightsquigarrow \) Not all students are happy.

**Previous works.** argued for a scalar derivation of presuppositions.

- Roughly, Simons (2001) proposed that a sentence presupposes propositions it asymmetrically entails. Unfortunately, it is difficult to see how to restrict the alternatives so that the prediction is not vacuous (any sentence might be predicted to presuppose its whole semantic content \( s \): for any \( x \), \( s \) asymmetrically entails both \( s \lor x \) and \( s \lor \neg x \) which conjunction is \( s \)).
- Abusch (2005) relied on a precise definition of alternatives for presupposition triggers, but this proposal fails to account for projection properties.

**Proposal.** Let \( \varphi(S) \) represent a sentence \( S \) embedded under the environment \( \varphi \) (e.g., negation), we propose that \( [A \leftrightarrow B] \) stands for “\( A \) and \( B \) have the same truth-value”; \( B_s[p] \): the speaker believes that \( p \); \( \top \): tautology; \( \bot \): contradiction:

(3) If \( S' \) is an alternative to \( S \), \( \varphi(S) \) implies:
   a. \( \varphi(S') \leftrightarrow \varphi(\top) \), if \( S' \) is logically stronger than \( S' \) (e.g., \( all \) replaced with \( some \)).
   b. \( \varphi(S') \leftrightarrow \varphi(\bot) \), otherwise.

(4) Furthermore, if \( S \) is the conjunction or the disjunction of \( S_1 \) and \( S_2 \), \( \varphi(S) \) implies:
   \( B_s[\varphi(S_1)] \leftrightarrow B_s[\varphi(S_2)] \)

**Unfolding these principles.** In essence, (3) defines a certain notion of *local optimality*: a sentence is optimal if any substitution would have the same global effect as an extreme substitution (i.e. a substitution with a plain tautology or contradiction).

- (3a) states that (locally) replacing \( S \) with a weaker alternative would have (globally) the same effect as replacing it with a tautology (a pathologically weak alternative).
  
  Technically, this ensures that in most **downward entailing environments** (more precisely: in environments turning tautologies into contradictions), **weaker members** of a scale yield false sentences.

- The reverse holds for (3b) and non-weaker alternatives. The principles in (3a) and (3b) could be stated at once: \( \varphi(S') \leftrightarrow \varphi(\{S \text{ is stronger than } S'\}) \); they are kept apart for clarity.

- (4) says: the speaker is in the same epistemic status with regard to disjuncts, she believes both or none.

**Alternatives.** Let us clarify our assumptions about the construction of alternatives:

- Substitutions of scalar terms (e.g., from Horn-scales \( \langle some, all \rangle \), \( \langle or, and \rangle \)) produce alternatives of **atomic sentences** (nb: bare conjuncts are not alternatives of conjunctions; idem for disjunctions):
  - These substitutions produce alternatives of atomic sentences (e.g., It is not true that some students are happy has no “global” alternative, although the embedded some students are happy does have an alternative: all students are happy).
  - For the sake of simplicity, we do not admit multiple substitutions (e.g., Some students read some books has two alternatives: 1) Some students read all books and 2) All students read some books; All students read all books is not an alternative).
- If \( S \) is an atomic sentence with presupposition \( p \) and assertion \( a \): 1) The meaning of \( S \) is entirely bivalent: \( p \) and \( a \) and 2) \( S \) has two alternatives: \( p \) and \( \neg p \) (see Simons, 2001 for related ideas: presuppositions raise whether-questions).

**Main predictions for scalar implicatures.**

- Our system matches the predictions of neo-gricean accounts of scalar implicatures for uncontroversial cases e.g., single scalar terms in monotonic environments:

(5) John read some of the books.

(3a) predicts: [J. read all the books \( \leftrightarrow \bot \)] i.e. John didn’t read all the books.

(Explanation: the stronger alternative is equivalent to a contradiction, it looks exactly like neo-gricean global accounts since there is no embedding at all in this case).
The projection properties of scalar implicatures and presuppositions are not as different as
more than 3
presupposition
predictions are in line with Chemla et al.
Conclusion.

This system captures exclusive readings of multiple disjunctions as the combination of implicatures
associated with each disjunction (note that no implicature vanishes when the sentence is embedded under
two DE operators, contrary to localist systems à la Chierchia).

**John ate an apple, a banana or a coconut.**

- (3a) applied to the first “v”: \(((a \land b) \lor c) \leftrightarrow (\bot) \lor c\) i.e. \(a \land b \rightarrow c\)
- (3a) applied to the second “v”: \(((a \lor b) \land c) \leftrightarrow \bot\) i.e. \(c \rightarrow \neg(a \lor b)\)
- (4) yields the ignorance implicatures with regard to each disjunct.

In sum, we obtain the reading: **John ate exactly one of these fruits, I don’t know which.**

The following example schematically illustrates how free choice effects come into play:

**John may eat an apple or a banana.**

- (3b) predicts: \(\Diamond(a \lor b) \leftrightarrow \Diamond\bot\) i.e. **John cannot eat both.**
- (4) predicts: \(B_s[\Diamond a] \leftrightarrow B_s[\Diamond b]\), i.e. either the speaker believes both (free choice) or she does not
know which permission holds (ignorance). If the speaker is competent, this yields the free choice
reading: **John may eat a and John may eat b.**

Examples (9) and (10) briefly illustrate our predictions in non-monotonic environments:

**Exactly three students ate an apple or a banana.** Schematically: \(\exists x : (a(x) \lor b(x))\)

- (3b) predicts: \(\exists x : (a(x) \land b(x)) \leftrightarrow \exists x : \bot(x)\) i.e. \(\neg \exists x : (a(x) \land b(x))\)

Together with the assertion, this guarantees that less than 3 students ate both fruits.

- (4) applies and predicts: \(B_s[\exists x : a(x)] \leftrightarrow B_s[\exists x : b(x)]\)

Under a competence assumption, this guarantees that: less than 3 st. ate a. and less than 3 ate b.

In sum, we predict: **some (of these 3 st.) ate only an apple; some ate only a banana.**

**Exactly three students ate an apple and a banana.**

Similarly, we predict: **some (other students) ate only an apple; some ate only a banana.**

Main predictions for presuppositions.

- Propositional case. The present system is equivalent to (the global version of) Schlenker’s recent Transparency theory. To illustrate our mechanism, let us consider an atomic sentence \(S_p\) with presupposition \(p\): it has two alternatives \(p\) and \(\neg p\). For the negation \(\neg S_p\) of such a sentence, we then predict two inferences: \(\neg(p) \leftrightarrow \neg(\top)\) and \(\neg(\neg p) \leftrightarrow \neg(\bot)\). These two inferences are equivalent to the original presupposition \(p\): presuppositions project out of negation.

- Quantified sentences (as well as corresponding universal or existential modals for instance). Our new predictions are in line with Chemla et al. (2006)’s experimental data: each and no support robust universal presuppositions, more than 3 does not:

**Each of these 10 students knows that he is stupid.** Schematically: \(\forall x : S_p(x)\)

- \(\forall x : p(x) \leftrightarrow \forall x : \top(x)\) i.e. \(\forall x : p(x)\) (universal presupposition)
- \(\forall x : \neg p(x) \leftrightarrow \forall x : \bot(x)\) i.e. \(\exists x : p(x)\) (existential presupposition)

In sum, we predict a universal presupposition.

**None of these 10 students knows that he is stupid.** Schematically: \(\neg\exists x : S_p(x)\)

- \(\neg\exists x : p(x) \leftrightarrow \neg\exists x : \top(x)\) i.e. \(\exists x : p(x)\) (existential presupposition)
- \(\neg\exists x : \neg p(x) \leftrightarrow \neg\exists x : \bot(x)\) i.e. \(\forall x : p(x)\) (universal presupposition)

In sum, we predict a universal presupposition.

**More than 3 of these 10 students know that they are stupid.** Schematically: \(\mathcal{M}x : S_p(x)\)

- \(\mathcal{M}x : p(x) \leftrightarrow \mathcal{M}x : \top(x)\) (i.e. More than 3 of them are stupid.)
- \(\mathcal{M}x : \neg p(x) \leftrightarrow \mathcal{M}x : \bot(x)\) (i.e. At most 3 of them are not stupid.)

In sum, we predict an almost universal presupposition: **At least 7 are stupid (≈ most are stupid).**

**Conclusion.** The projection properties of scalar implicatures and presuppositions are not as different as
usually thought, the argument is of a technical nature: we exhibit a mechanism which could predict both
together. Actual differences between the two types of phenomena are certainly not in contradiction with
this system (e.g., the predicted inferences may attach to the “common ground” for presuppositions and
at the level of the speaker’s beliefs for implicatures).