

E-Type Readings of Quantifiers Under Ellipsis

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LAGB 2014
September 4th, 2014

1 Introduction

- There is a long tradition of capturing ellipsis (*VP Ellipsis (VPE)*, *sluicing*, etc.) in terms of unpronounced linguistic structure.¹

(2) $\frac{\text{IP}_A}{\text{Gary hates cauliflower}}, \text{but Craig doesn't know why} \frac{\text{IP}_E}{(\text{Gary hates cauliflower})}$. (sluicing)

- The so-called ‘silent structure’ analysis is a natural fit with an interpretive semantics, since the presence of the elided material in (1) derives the fact that it means what it does, without much else needing to be said.
 - Intuitively, in (1), the elided VP (VP_E) can go missing because it is sufficiently similar to an antecedent VP (VP_A) in the discourse. Similarly, the elided IP (IP_E) can go missing in (2) because it is sufficiently similar to an antecedent IP (IP_A).
 - The broad topic of this talk is the **identity question** (Merchant 2012):

(3) The Identity Question:

What is the correct formulation of the condition under which a constituent counts as ‘sufficiently similar’ to a discourse antecedent, such that it can successfully go missing?

- A naïve answer: An XP can go missing just in case it is identical in *every respect* to a discourse antecedent.
 - There is a growing body of work however that shows that this cannot be correct: XP_E and XP_A can apparently differ substantially, giving rise to a number of identity puzzles.²

¹ See e.g. Ross (1969) for sluicing and Sag (1976) for VPE. More recently, the ‘silent structure’ approach has been the subject of criticism from several quarters (Culicover and Jackendoff 2005, Jacobson 2013 a.o.). We do not attempt to address these criticisms here.

² See e.g. Sag (1976), Fiengo and May (1994), Merchant (2001), Thoms (2013), Merchant (2014), Barros, Elliott, and Thoms (under review), Elliott, Nicolae, and Sudo (in preparation).

- The empirical domain of inquiry will be cases where XP_A contains a Quantified Noun Phrase (QuNP), such as *a student*, *most students* or *every boy*.

Claim: when XP_A contains a QuNP, XP_E may

- also contain an identical QuNP (**Q reading**); or
 - contain a definite NP anaphoric to the QuNP (**E-type reading**).

- Examples:

- (4) Gary worked on a paper, right after Craig did . . . (VPE)
 a. (work on a paper) Q reading
 b. (work on it/the paper) E-type reading

(5) Someone applied to five graduate schools,
 but I don't know who (sluicing)
 a. (t_{wh} applied to five graduate schools) Q reading
 b. (t_{wh} applied to them/the five graduate schools) E-type reading

Although the ambiguity may not be so clear in these particular examples, we will provide more convincing cases where the two readings are clearly distinct.

- Roadmap:

§2: We will show:

1. that this ambiguity is real—the E-type reading does not arise due to pragmatic factors, but involves a definite phrase in XP_E anaphoric to the quantifier in XP_A (contra, e.g. Romero 2003);
 2. that this ambiguity persists across elliptical constructions (sluicing, VPE, etc.) (contra, e.g. Chung, Ladusaw, and McCloskey 2011); and
 3. that independent discourse constraints sometimes make one reading or the other unavailable.

§3: We will claim that this ambiguity is problematic for current theories of ellipsis identity.

§4: We will sketch an analysis that goes some way towards capturing the ambiguity in a constrained fashion, proposing a new identity condition formulated in terms of **mutual dynamic entailment**.

2 The Data

Observation: Across elliptical constructions, a quantifier in the antecedent gives rise to a Q reading and an E-type reading.

- We show that the two readings become clearly distinct with the following constructions:
 - *Why*-questions and other reason clauses
 - Donkey anaphora
 - (Previous studies: Merchant 1999, 2001, Romero 1998, 2003, Chung, Ladusaw, and Mc-Closkey 2011)

2.1 Sluicing

- Romero (2003) and Chung, Ladusaw, and McCloskey (2011) claim that the E-type reading is obligatory with sluicing. We take issue with this empirical claim – We argue that both Q and E-type readings are available under sluicing (modulo discourse factors; see §3).

- **Data 1:** sprouting with *why*^{3,4}

(6) John applied to five graduate schools.

I don't know why

-
- | | |
|---|-----------------------|
| a. (John applied to five graduate schools) | <i>Q reading</i> |
| b. (John applied to them/the five graduate schools) | <i>E-type reading</i> |

These are distinct readings:

- (7) a. (6a) ≈ I don't know why John applied to so many graduate schools.
b. (6b) ≈ I don't know why John applied to these ones, and not others

These readings do not stand in any kind of entailment relation.⁵

Importantly, this ambiguity does not arise without sluicing. (8a) only means (7a), (8a) only means (7b).

- (8) John applied to five graduate schools.
a. I don't know why he applied to **five graduate schools**.
b. I don't know why he applied to **them**.

That (8a) only has a Q reading is especially important. this strongly suggests that the ambiguity is due to what is hidden in the ellipsis site, rather than due to some pragmatic factors like the domain restriction of the quantifier (as suggested by Romero 2003).

Methodological point: In every case we consider, it is important to contrast the reading(s) of the elliptical sentence with its putative overt counterpart(s). We assume that if the putative overt counterpart lacks a reading which the elliptical sentence possesses, then this cannot be the *only* source underlying the elliptical sentence.

- **Data 2:** donkey anaphora

³ We observe that a focal stress on *five* in IP_A disambiguates (6) in favor of the Q reading. However, this presumably has to do with the discourse pragmatics of focus, since analogous effects of focus are observed without sluicing.

(i) John applied to **FIVE** graduate schools.
a. I don't know why he applied to five graduate schools.
b. ??I don't know why he applied to them.

⁴ Chung et al. (1995) introduce the term *sprouting* to refer to cases of the sluicing where the *wh*-remnant in the elliptical clause lacks a correlate in the antecedent clause.

⁵ Details: One can know why John applied to the graduate schools that he did rather than others without knowing why he applied to *so many*, and likewise one can know why John applied to five rather than four graduate schools without knowing exactly why he applied to just the ones that he did.

- (9) If John asks me how a mathematical theorem was proved,
 I will also tell him by whom
- | | |
|---|-----------------------|
| a. (# a mathematical theorem was proved) | <i>Q reading</i> |
| b. (it/the mathematical theorem was proved) | <i>E-type reading</i> |

In this example, the Q reading is pragmatically odd for independent reasons.

Again, we observe that the ambiguity arises only with a sluicing.

- (10) If John asks me how a mathematical theorem was proved,
 a. #I will also tell him by whom **a mathematical theorem** was proved.
 b. I will also tell him by whom **it** was proved.

- For other kinds of sluicing the two readings are harder to distinguish, but there is no reason to doubt that both readings are available.

- (11) Someone speaks a Balkan language, but I don't know who
- | | |
|--|-------|
| a. (t_{wh} speaks a Balkan language) | ----- |
| b. (t_{wh} speaks it/the Balkan language) | ----- |

- Chung, Ladusaw, and McCloskey's (2011) putative counter-example
 Chung et al. (2011) claim that sluicing *obligatorily* receives an E-type reading, raising (12) as an example:⁶

- (12) Jill asked where someone had committed a crime, and Jack asked when.
 (Chung et al. 2011:43)

They remark that the only natural interpretation that (12) may receive is one where Jack is asking a question about the same crime and perpetrator that Jill is, which can be paraphrased with a anaphoric definite NP.

- (13) Jill asked where someone had committed a crime, and Jack asked when (they had committed it).

We disagree with Chung et al.'s empirical claim. Consider (13) in light of the following context:

- (14) *Context:* Jack and Jill are both embarking on a project to collect information on the crimes committed in their respective local areas. Jack lives in Romford, and Jill lives in Basingstoke. Jill is currently concentrating on *where* crimes are committed generally, whereas Jack is currently concentrating on *when* crimes are committed generally. Each of them visited their local police station today, and...
 Jill asked where someone had committed a crime, and Jack asked when.

⁶ Chung et al. (2011) give several other cases of sluicing which they claim lack a Q reading. We will refrain from discussing those here, but we believe that once discourse factors are controlled for they are amenable to a similar analysis.

Several native informants have corroborated our judgement that the most natural reading of (14) is a Q reading, paraphrased with QuNPs:

- (15) Jill asked where someone had committed a crime,
 and Jack asked when .
(someone had committed a crime)

- We stress that which reading is available is subject to independent discourse constraints.
 - The Q reading of (9) is pragmatically odd, so the E-type reading is favoured.
 - Conversely, the E-type reading of (16), which involves *contrastive sluicing*, is pragmatically odd (because the same museum does not exist in different cities).
- (16) I know that I visited a museum in STOCKHOLM,
 but I can't remember where ELSE .
- | | |
|--|-----------------------|
| a. (I visited a museum t_{wh}) | <i>Q reading</i> |
| b. (#I visited it t_{wh}) | <i>E-type reading</i> |
- Similarly, consider (17), where the non-referring indefinite *a unicorn* is interpreted as *non-specific de re* (i.e. in John's *want* worlds, he captures a unicorn, but he has no particular unicorn in mind that he specifically wants to capture):
- (17) John wants to capture a unicorn,
 but I can't imagine why .
- | | |
|--|-----------------------|
| a. (he wants to capture a unicorn) | <i>Q reading</i> |
| b. (#he wants to capture it) | <i>E-type reading</i> |

(16) and (17) provides a straightforward argument for the availability of the Q reading under sluicing (contra Chung, Ladusaw, and McCloskey 2011).

Conclusion: Sluicing allows for both a Q reading and an E-type reading

2.2 VP-Ellipsis

- Romero (2003) and Chung, Ladusaw, and McCloskey (2011) claim that the E-type reading is unavailable with VPE. At first blush, this seems plausible:

- (18) John proved two important theorems,
 and Bill did too.
- | | |
|---|-----------------------|
| a. (prove two important theorems) | <i>Q reading</i> |
| b. (*prove them/the two important theorems) | <i>E-type reading</i> |

We argue below that their claim does not generalize to all cases of VPE.

- **Data 1: Reason clauses**

- (19) John applied to five graduate schools, because they were high in the league tables.
 Why else would he ?
- | | |
|--|-----------------------|
| a. (#apply to five graduate schools) | <i>Q reading</i> |
| b. (apply to them) | <i>E-type reading</i> |

Here, the Q-reading (19a) is pragmatically odd. This depends on what *else* is referring to. E.g. in (20), the Q-reading is the more natural choice.

- (20) John applied to ~~five graduate schools~~, because he was anxious.

Why else would he

- a. (apply to **five graduate schools**)
b. (#apply to **them**)

Q reading
E-type reading

- **Data 2:** Donkey anaphora

- (21) Whenever Prof. Jones is working on **a paper**,

the postdocs cannot

- a. (work on **a paper**)
b. (work on **it/the paper**)

Q reading
E-type reading

- (20) and (21) are clearly ambiguous, showing that VPE also gives rise to the Q vs. E-type ambiguity.

- Discourse conditions: Then why does (18) strongly favour a Q reading? We claim that an independent discourse constraint precludes the E-type reading in this case.

- Typical examples of VPE, including (18), involve two sentences that are part of an answer to the same (often implicit) question, e.g.:⁷

- For (22), the question is *Who came?*

- (22) a. JOHN came, but BILL didn't.
b. JOHN came, and BILL did, too.

- Similarly, for (18), the question is *Who proved two important theorems*.

Notice that the two sentences in (22) contrast John vs. Bill, which is reflected in the prosody.

- It is widely known that a question imposes a condition on the focus structures of its felicitous answers. Adopting the alternative semantics for questions and focus (for expository purposes), we can formulate this condition as follows (cf. Krifka 2006, Roberts 2012):

(23) **The Question-Answer Congruence Condition**

A declarative sentence *A* is *contruent* to a question *Q* iff $\|A\| = \llbracket Q \rrbracket$.

($\|\alpha\|$ is the focus semantic value of α in the sense of Rooth 1985, 1992a)

Thus, each of the sub-answers to a question must be congruent to it.

- For (18), the Q reading, but not the E-type reading, satisfies the QAC condition. Consequently, the latter is precluded.⁸

⁷ In the parlance of Coherence Theory (Hobbs 1979, Kehler 2002, 2011), such cases are said to involve Resemblance relations. See Kehler (2011), Keshet (2013) and Elliott, Nicolae, and Sudo (in preparation) for attempts to formulate coherence relations in terms of Roberts' (2012) Question under Discussion (QuD) model of discourse.

⁸ Note that we follow Roberts 2012 here in assuming that prosodic focus in (18) presupposes an implicit question that the utterance is congruent to.

- (24) a. *Q reading*
 $\| \text{BILL DIDN'T prove two important theorems} \| = [\text{Who proved two important theorems?}]$
 b. *E-type reading*
 $\| \text{BILL DIDN'T prove the two important theorems} \| \neq [\text{Who proved two important theorems?}]$

- In other kinds of discourse configurations, as in (19) and (21), the two clauses are not answers to the same question, and both readings are available (modulo other discourse considerations).
- More broadly, we propose the following generalization:

- (25) **Generalization:** An E-type interpretation of the elliptical clause is unavailable if the clause containing XP_A and the clause containing XP_E are (sub)answers to the same (possibly implicit) question.

This applies to sluicing as well, e.g. (26) (cf. Romero 2003).

- (26) (*Do you know which students like most of the professors?*)

I know which boy likes most of the professors.

But I don't know which GIRL

- | | |
|--|-----------------------|
| a. (t_{wh} like most of the professors) | <i>Q reading</i> |
| b. (* t_{wh} like them/the professors) | <i>E-type reading</i> |

Conclusion: VPE allows for both a Q reading and an E-type reading modulo discourse factors.

2.3 Other Elliptical Constructions

Precluding a more thorough investigation, we show that the Q/E-type ambiguity persists across other elliptical constructions.

- NP-ellipsis (cf. Lobeck 1995)

- (27) I like Kevin's explanation of a problematic example.

It's way better than John's

- | | |
|--|-----------------------|
| a. (explanation of a problematic example) | <i>Q reading</i> |
| b. (explanation of it/the problematic example) | <i>E-type reading</i> |

- Stripping (cf. Merchant 2003)

- (28) Kevin is working on a paper for LAGB,

and his co-author

too.

- | | |
|--|-----------------------|
| a. (is working on a paper for LAGB) | <i>Q reading</i> |
| b. (is working on it/the paper for LAGB) | <i>E-type reading</i> |

- Negative stripping (cf. Merchant 2003)

- (29) Kevin is working on a paper for LAGB,

but not his co-author

- | | |
|--|-----------------------|
| a. (is working on a paper for LAGB) | <i>Q reading</i> |
| b. (is working on it/the paper for LAGB) | <i>E-type reading</i> |

- why-stripping (cf. Weir 2013, Yoshida, Nakao, and Ortega-Santos 2014)

- (30) If Kevin is working on a paper for LAGB,
then why not his co-author ?
- | | |
|--|-----------------------|
| a. (is working on a paper for LAGB) | <i>Q reading</i> |
| b. (is working on it/the paper for LAGB) | <i>E-type reading</i> |

- *Question:* What about pseudogapping, fragment answers, comparative (sub-)deletion/ellipsis, etc.?

3 Consequences for Theories of Sluicing

Claim: The E-type reading is problematic for major theories of sluicing on the market.

3.1 Merchant's Account

- **Preliminaries:** Merchant (2001) frames his identity condition in terms of the notion of e-GIVENNESS:

(31) **Focus condition on ellipsis**

An XP α can be deleted only if α is e-GIVEN. (Merchant 2001:38)

(32) **e-GIVENNESS**

An expression E counts as e-GIVEN iff E has a salient antecedent A, and modulo \exists -type shifting,

- (i) A entails F-clo(E), and
- (ii) E entails F-clo(A)

(Merchant 2001:26)

(33) **F Closure**

The F closure of α , written F-clo(α), is the result of replacing F-marked parts of α with \exists -bound variables of the appropriate type (modulo \exists -type shifting). (Merchant 2001:14)

- (34)
$$\frac{\alpha \qquad \beta}{\overline{\text{JOHN}_F \text{ likes } \text{MARY}_F, \text{ and } \text{HARRY}_F \text{ likes } \text{JANE}_F}}$$

 $\text{F-clo}(\alpha) = \text{F-clo}(\beta) = \exists x, y. x \text{ likes } y$

Let's see how e-GIVENNESS works in a simple case of sluicing:

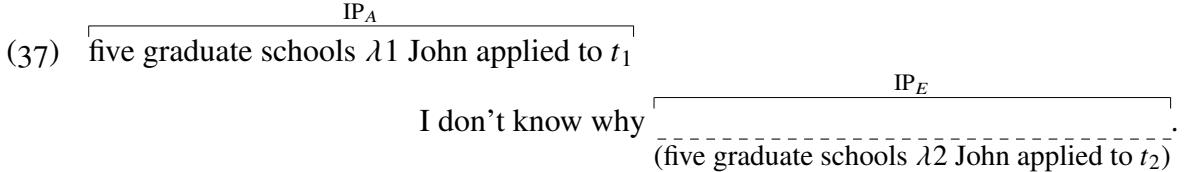
- (35)
$$\frac{\overline{\text{IP}_A}}{\text{John danced with some girl, but I don't recall WHICH girl}} \frac{\overline{\text{IP}_E}}{(\text{John danced with } t_{\text{wh}})}$$

- Merchant (2001:26f,30ff) notes that for the purpose of computation of e-GIVENNESS, the trace of an element extracted from the elided constituent (e.g. t_{wh}) is \exists -bound (\exists -type shifting).

- (36) a. $\text{F-clo}(\text{IP}_E) = \text{F-clo}(\text{IP}_A) = \exists x. \text{John danced with } x$
b. IP_A entails $\text{F-clo}(\text{IP}_E)$
c. IP_E with E-type shifting (= $\exists x. \text{John danced with } x$) entails $\text{F-clo}(\text{IP}_A)$

d. So IP_E is e-GIVEN.

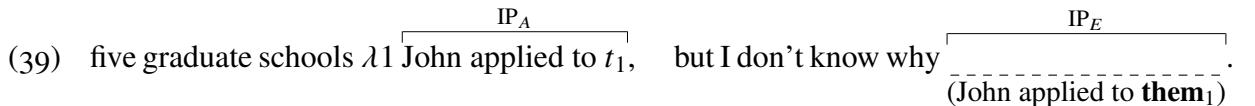
- **Merchant on the Q reading (straightforward):** The Q reading is derived with an antecedent clause that includes the quantifier (which we assume undergoes QR, although this is not crucial in this case):



- (38) a. $\text{IP}_A = \text{IP}_E = \text{F-clo}(\text{IP}_A) = \text{F-clo}(\text{IP}_E) = \text{John applied to five graduate schools.}$
b. IP_A entails $\text{F-clo}(\text{IP}_E)$.
c. IP_E entails $\text{F-clo}(\text{IP}_A)$.
d. So IP_E is e-GIVEN.

- **Merchant on the E-type reading (problematic):** Merchant (2001:§5.2) claims that his Focus condition on ellipsis (31) allows E-type readings in the following manner.

- The antecedent clause contains the trace of the quantifier but not the quantifier itself.
- A trace and a pronoun are semantically identical.
- Just so long as the trace of the quantifier in the antecedent, and the pronoun in the ellipsis site are assigned the same index, e-GIVENNESS will be satisfied.



- (40) a. $\text{IP}_E = \text{IP}_A = \text{F-clo}(\text{IP}_A) = \text{F-clo}(\text{IP}_E) = \text{John applied to } g(1)$.
b. IP_A entails $\text{F-clo}(\text{IP}_E)$.
c. IP_E entails $\text{F-clo}(\text{IP}_A)$.
d. So IP_E is e-GIVEN.

- **Problem 1:** It is not guaranteed that *them* in IP_E refers to the five graduate schools that John applied to.

- Satisfaction of the E-type reading relies on the trace t_1 of the quantifier in IP_A being co-indexed with the pronoun in IP_E . Since t_1 comes to be λ -bound over the course of the derivation, the index 1 does not determine the discourse referent of the quantifier (in Heim's 1982 sense).
- Index identity therefore fails to guarantee that the pronoun in the ellipsis site is anaphoric on the quantifier in the antecedent.⁹

- **Problem 2:** A quantifier has to QR out of IP_A for the E-type reading to be available. This (possibly erroneously) predicts that the E-type reading is unavailable when the quantifier cannot QR out of IP_A , e.g. when it is trapped in a scope island:¹⁰

⁹ Although Merchant (2001:207) insinuates that with an appropriate mechanism of donkey anaphora, the desired reading is derived, as far as we can see, mere co-indexation of the trace in IP_A and the free pronoun in IP_E will not be sufficient. It is also not clear what to do with quantifiers other than indefinites. See §4 for discussion.

¹⁰ (41) is in fact four-way ambiguous for some speakers: Alongside the two readings identified, it can also have additional Q- and E-type readings, corresponding to taking the embedded clause alone as the antecedent. In other

	$\overline{\text{IP}_A}$	
(41) John claimed that most students in the room cheated,	$\overline{\text{IP}_E}$	
but I don't know why		Q reading E-type reading

a. (he claimed that **most students** in the room cheated)
b. (he claimed that **they/these students** cheated)

- Since a finite *that*-clause is a scope island (May 1978, Fox 1995, a.o.), *most students* cannot QR out of the embedded clause, evidenced by the fact that (42) is unambiguous:

(42) Someone claimed that most students cheated. $(\exists > \text{most}/*\text{most} > \exists)$

- It follows that the antecedent (for the E-type reading in (41b)) *must* contain both the quantifier and its trace:

- (43) a. $\text{IP}_A = \text{John claimed that most students } \lambda 1 t_1 \text{ cheated.}$
b. $\text{IP}_E = \text{John claimed that they}_1 \text{ cheated.}$
c. $\text{IP}_A \text{ doesn't entail F-clo}(\text{IP}_E).$
d. $\text{IP}_E \text{ doesn't entail F-clo}(\text{IP}_A).$
e. So IP_E is not e-GIVEN.

- **Problem 3:** Merchant assumes that in the computation of e-GIVENNESS for (39), the variable denoted by the trace of the quantifier in IP_A is not \exists -bound. Elsewhere however, Merchant assumes that the variable denoted by the trace of a *wh*-expression *is*. That the trace of the quantifier be unbound for the purposes of e-GIVENNESS is crucial, because otherwise IP_A (=John applied to something) would fail to entail $\text{F-clo}(\text{IP}_E)$ (=John applied to them₁).

Worse, Merchant has to assume that the trace of a *wh*-expression is not existentially bound in cases where a *wh*-expression in the antecedent licenses an E-type reading of the ellipsis site. Allowing existential closure of the trace in these cases overgenerates unattested readings.

(44) I know what John bought at the OUP bookstore,

but i don't know why

- a. (*John bought something at the OUP bookstore)
b. (John bought it at the OUP bookstore)

Q reading

E-type reading

- (45) a. $\text{IP}_A = \text{John bought } t_{\text{wh}} \text{ at the OUP bookstore.}$
b. $\text{IP}_E = \text{John bought something at the OUP bookstore.}$
c. $\text{IP}_A = \exists x. \text{John bought } x \text{ at the OUP bookstore.}$ \exists -type shifting
d. $\text{F-clo}(\text{IP}_A) = \text{F-clo}(\text{IP}_E) = \exists x. \text{John bought } x \text{ at the OUP bookstore.}$

See Appendix A: for an analysis of the E-type reading of sentences with a *wh*-trace in the antecedent.

3.2 Other Theories of Sluicing

- **Romero (2003)** claims that the E-type reading arises as a by-product of focus and domain restriction. However, her analysis also rests on the faulty assumption that quantifiers in

words, (41) can also mean: (i) ...but I don't know why *most students in the room cheated* and (ii) ...but I don't know why *they cheated*.

sluicing always give rise to an E-type interpretation. Consequently she cannot account for ambiguous examples like (6).

- **Chung, Ladusaw, and McCloskey (2011)** erroneously assume that E-type readings are obligatory with sluicing and unavailable with VPE. Their analysis is tailored to derive this incorrect generalization.
- **AnderBois (2011a,b)** postulates a semantic identity condition using the enriched notion of meaning made available in the framework of Inquisitive Semantics (see Ciardelli, Groenendijk, and Roelofsen 2013 and references therein). Roughly put, the condition requires the two CPs (rather than IPs) to (Strawson-)entail each other. Crucially, the *inquisitive content* of the two CPs need to match. The E-type reading, however, poses a fundamental problem. Under the E-type reading, the two CPs necessarily differ in inquisitiveness.
- **Barker (2013)** analyzes sluicing as anaphora to a gapped structure, which he calls a *continuation*. However, this forces total identity between IP_A with a gap and IP_E , and only derives the Q reading.
- The availability of E-type readings under VPE is equally problematic for standard theories of VPE identity, e.g. Rooth (1992b), but for reasons of time, we will not go into the details here.

4 Towards an Analysis of E-type readings

- Under the E-type reading for sluicing, there is an obligatory anaphoric relation between the overt quantifier in IP_A and the hidden definite in IP_E . This suggests that *the identity condition should be at least partly semantic*.
- We propose a new semantic identity condition that licenses the E-type reading, in terms of **mutual dynamic entailment** (instead of mutual static entailment like Merchant 2001).

(46) **Identity Condition:** IP_A and IP_E must dynamically entail each other.

- Let us take the E-type reading of (6) as an example.

- (47) a. IP_A : John applied to five graduate schools
 b. IP_E : John applied to the five graduate schools
- Assumption: under the E-type reading, IP_E contains a definite description that is anaphoric to the quantifier in IP_A .¹¹
 - The standard (static) notion of entailment holds only one way: (47b) entails (47a), but not vice versa (because they might be about different sets of five graduate schools).
 - Using a dynamic notion of entailment, we can have (47a) entail (47b) and also guarantee the anaphoric link. (see Merchant 1999 for a related idea).
- To illustrate, we adopt Heim's (1982) File Change Semantics.

¹¹ With a pronoun, the dynamic entailment from IP_E to IP_A fails unless there's a hidden description; not shown here for reasons of time.

- Declarative sentences denote File Change Potentials (i.e. functions from files to files).
- A file F is a set of pairs consisting of a possible world w and an assignment a from file cards x_i to individuals.
- Indefinites and definites are very similar in meaning. Their only difference is the Novelty-Familiarity Condition:^{12,13}

(48) **Novelty-Familiarity Condition:** Indefinites are variables referring to novel file cards; definites refer to old file cards.

- Following Heim (1991), we assume that the Novelty Condition on indefinites is pragmatically derived (see also Percus 2006, Sauerland 2008, Singh 2011, Schlenker 2012), while the Familiarity Condition on definites is a presupposition.

(49) $F + \text{John applied to [five graduate schools]}_1$

$$= \left\{ \langle w, a \rangle \in F \mid \begin{array}{l} a(x_1) \text{ consists of five graduate schools in } w \\ \text{and John applied to (each atomic part of) } a(x_1) \text{ in } w \end{array} \right\}$$

(50) $F + \text{John applied to [the five graduate schools]}_1$

- a. is defined only if for each $\langle w, a \rangle \in F$, x_1 is an old file card such that $a(x_1)$ consists of five graduate schools in w .
- b. whenever defined, $= \{ \langle w, a \rangle \in F \mid \text{John applied to } a(x_1) \text{ in } w \}$.

- The standard definition of entailment in dynamic semantics ensures coreference.

(51) ϕ dynamically entails ψ iff whenever there is a non-empty file F' such that $F + \phi = F'$, there is a non-empty file F'' such that $F' + \psi = F''$.

- (52) a. John applied to [five graduate schools]₁
 b. John applied to [the five graduate schools]₁

- (52a) dynamically entails (52b), because whenever there's a non-empty file F' such that $F + (52a) = F'$, $F' + (52b) = F'$.
- Notice that if the DPs are not co-indexed, the dynamic entailment fails to hold. In other words, the anaphora is crucial.
- Furthermore, (52b) dynamically entails (52a) (it statically entails it too).

- Notice that mutual dynamic entailment is a symmetric relation, but the licensing is actually asymmetric, i.e. IP_A containing a definite description should not license an ellipsis of IP_E containing an indefinite:

(53) (I show you a list of [five graduate schools]₁.)

John applied to [the(se) five graduate schools]₁.

Do you know why ----- ?
 a. (John applied to **them**₁)
 b. (*John applied to [five graduate schools]₁)

¹² Definition: x_i is a novel card in a file F if for every pair of sequences a and b that are only different in that $a(x_i) \neq b(x_i)$, $\langle w, a \rangle \in F$ iff $\langle w, b \rangle \in F$ for any world $w \in W(F)$; otherwise it is an old card. (where $W(F) := \{ w \mid \exists a[\langle w, a \rangle \in F] \}$)

¹³ Heim (1982, 1991) discusses a potential problem of treating definite descriptions as variables, which has to do with quantification into definite descriptions. Fortunately, this problem is largely orthogonal to our proposal. For expository purposes we will stick Heim (1982).

- Our symmetric licensing condition does not rule this out.
 - But (53) is ruled out independently by the Novelty Condition on the indefinite (which we assume is pragmatically derived, as mentioned above).
 - The Novelty Condition will not be violated with contra-indexation (which is what happens without sluicing), but IP_E won't dynamically entail IP_A , so IP_E cannot elide.
 - Incidentally, the Q reading is ruled in with contra-indexation (the co-indexation parse is ruled out by the Novelty Condition). (54a) and (54b) dynamically (and statically) entail each other.
- (54) a. John applied to [five graduate schools]₁.
 b. John applied to [five graduate schools]₂.
- Traces need to be analyzed as definite descriptions, rather than just variables (as previously suggested by Fox 1999, 2000, Sauerland 1998, 2004, among others, on independent grounds).
- (55) A student applied to five graduate schools, but I don't know which student.
 a. IP_A : [A student]₁ applied to [five graduate schools]₂.
 b. IP_E : [(the student)]₁ applied to [the five graduate schools]₂.
- Remaining problem: Sprouting
- (56) John fixed my laptop, but I don't know how.

5 Conclusion

- **Observation:** Across elliptical constructions, a quantifier in XP_A gives rise to Q and E-type readings of XP_E (unless they are excluded by independent pragmatic conditions).
- **Theoretical implications:**
 - E-type readings pose problems for existenting theories of sluicing (and of ellipsis identity more generally).
 - XP_A and XP_E are not identical.
- **Possible directions:**
 - Since the E-type reading involves an obligatory anaphoric link, the identity condition should be partly semantic.
 - We sketched a dynamic semantic approach, which allows us to ensure the anaphoric link.

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Appendix A: E-type Readings with Wh-antecedents

- Wh-antecedents

Merchant (1999, 2001) notes that the trace of a *wh*-expression in the antecedent may license a definite in the ellipsis site.

- (57) Though Abby eventually told us who she saw that night,
she never revealed where

(she saw **them** that night)

(adapted from Merchant 1999:(5h))

We can capture the E-type reading of examples such as (57) by following Heim (1982) in assuming that traces are [+DEFINITE], and therefore subject to the Familiarity Condition. IP_A and IP_E in (57) will dynamically entail each other just in case the trace of *who* in IP_A is co-indexed with the pronoun in IP_E . This correctly derives the fact that the E-type reading involves a definite in the ellipsis site that is necessarily anaphoric on the *wh*-expression in the antecedent.

The question arises whether or not *wh*-expressions in IP_A give rise to a similar ambiguity as QuNPs do. We observe that (57) doesn't have a reading corresponding to an identical *wh*-expression in the antecedent.

- (58) Though Abby eventually told us who she saw that night, she never revealed where
(*she saw **who** that night)

One possible explanation for the badness of (58) is that the embedded question violates superiority. We can control for this possibility however:

- (59) I know where Abby ate, but i don't know what exactly (she ate **there**)/(*she ate **where**).

We speculate that the unavailability of a reading involving an identical *wh*-expression in the ellipsis site is related to the idea that *wh*-expressions are inherently focused. Focused material cannot generally be elided, since it is non-recoverable.

Appendix B: Negative Quantifiers

Consider (60):

- (60) None of the boys read *War and Peace*.

I could never figure out why not

- | | |
|---|-----------------------|
| a. (* none of the boys read <i>War and Peace</i>) | <i>Q reading</i> |
| b. (some of the boys read <i>War and Peace</i>) | <i>E-type reading</i> |

(60) is prima facie problematic for our proposed identity condition, *mutual dynamic entailment*, and indeed other proposed identity conditions. This is because IP_A , *none of the boys read War and Peace*, clearly fails to entail IP_E , *some of the boys read War and Peace*, either dynamically or statically. Consider the following however:

- (61) Someone likes none of the boys. *I can't figure out why not.

Generally, the *why not* construction seems to require a negative antecedent:

- (62) a. John didn't leave, but I could never figure out why not.
 b. *John left, but I could never figure out why not.

We speculate that sentences involving a negative indefinite actually involve a negative operator taking sentential scope, with an indefinite in the scope of the negative operator. The attested reading of (60) is in fact a Q reading, where IP_A contains the indefinite part of the negative indefinite but not the negative operator. IP_E has an indefinite in a parallel position.