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Concealed Questions and Specificational Subjects*

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1. INTRODUCTION

This paper is concerned with Noun Phrases (NPs, henceforth) occurring in two constructions: concealed question NPs and NP subjects of specificational sentences. The first type of NP is illustrated in (1). The underlined NPs in (1) have been called 'concealed questions' because sentences that embed them typically have the same truth-conditional meaning as the corresponding versions with a full-fledged embedded interrogative clause, as illustrated in (2) (Heim 1979):

(1) a. John knows Bill's telephone number.
b. They revealed / announced the winner of the contest.
c. The temperature of the lake depends on the season.

(2) a. John knows what Bill's telephone number is.
b. They revealed / announced who won the contest.
c. How warm the lake is depends on what season it is.

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The second kind of NP at issue occurs in so-called 'specificational sentences'. Specificational sentences are a type of copular sentence, different from regular predicational copular sentences intuitively and grammatically. On the intuitive side, in predicational sentences the post-verbal XP's denotation is predicated of the subject's denotation, as in (3), whereas in specificational sentences "the Subject in some way delimits a domain and the specificational predicate determines a member of that domain" (Higgins 1973:132), as in (4).[1]

(3) The number of planets is large. PREDICATIONAL

(4) <u>The number of planets</u> is nine. SPECIFICATIONAL

On the grammatical side, specificational sentences show connectivity effects whereas predicational sentences do not. The term 'connectivity' refers to the observation that specificational sentences like (5a), (6a) and (7a) grammatically behave like their unclefted counterparts (5b)-(7b), despite their different syntactic structure, and unlike the predicational sentences (5c)-(7c), with which they share the same surface syntax. Let us see each example in turn. Under a predominant view (Chomsky 1986), anaphors like *himself* are assumed to be licensed when c-commanded by a local co-indexed NP. Since *John* does not c-command *himself* in (5c), the sentence with the anaphor is ungrammatical under the predicational reading. In contrast, *himself* is licensed in the specificational reading of (5a) despite the lack of c-command, correlating with the desired c-command configuration in the unclefted counterpart (5b) (Akmajian 1970, Higgins 1973).

(5) Binding Theory Principle A:

a. Specificational (reading): <u>What $John_1$ is</u> is a nuissance to $himself_1$ / $*him_1$.

b. Unclefted version of (a): $John_1$ is a nuissance to $himself_1$ / $*him_1$.

[1] I will only consider examples of canonical specificational sentences, where the NP at issue –underlined in the examples in the text– precedes the copula. Inverted specificational sentences, like the inverted version of (5a) in (i), are beyond the scope of the present paper.

(i) A nuisance to $himself_1$ is <u>what $John_1$ is</u>.

c. Predicational (reading): What John$_1$ is is a nuissance to *himself$_1$ / him$_1$.

Similarly, to obtain variable binding, a binder must c-command its bindee at Logical Form (see, e.g., Heim-Kratzer 1998). Since quantifiers cannot rise outside an NP-island, *no man* cannot scope outside the Relative Clause to c-command and bind *his* in the predicational (6c). However, a bound variable reading is possible in the specificational version (6a) (Jacobson 1994, Sharvit 1999), as it is in the unclefted version (6b), where the desired c-command obtains.

(6) Variable binding:

a. Specificational: <u>The woman no man$_1$ hates</u> is his$_1$ mother.

b. Unclefted version of (a): No man$_1$ hates his$_1$ mother.

c. Predicational: * The woman no man$_1$ danced with last night was interested in him$_1$.

Finally, in contrast to the predicational (7c), an opaque reading of the post-copular NP *a unicorn* under *look for* is available in the specificational (7a) (Halvorsen 1978), even though the NP is outside the syntactic scope of *look for.* The availability of the opaque reading correlates with the scopal position of the NP in the unclefted counterpart (7b).

(7) Opacity:

a. Specificational: <u>What John is looking for</u> is a unicorn.

b. Unclefted version of (a): John is looking for a unicorn.

c. Predicational: What John is looking for is lying next to a unicorn.

Although deriving connectivity effects is not a concern of the present paper, they will constitute an important tool for distinguishing specificational and predicational sentences.

This paper is concerned with the semantic characterization of concealed question NPs (CQs, henceforth) and specificational subject NPs (SSs). The goal of the paper is twofold:

i. First, it provides an analysis of a yet unexplained ambiguity detected for nested CQs by Heim (1979). The two readings at issue will be called reading A and reading B.

ii. Second, it presents the novel observation that SSs display the same reading A / reading B ambiguity, and it proposes a unified analysis of CQs and SSs.

The following two conclusions will be argued for:

i'. Epistemic *know* is an intensional verb with respect to its complement position, requiring an intensional object as its semantic argument. In the same way that the intensional verb *look for* can draw this intensional object from the intension or from the extension of its complement NP, so can *know* derive that intensional object from the intension or from the extension of the CQ NP, giving rise to the two readings A and B.

ii'. Specificational *be* is an intensional verb with respect to its subject position, requiring an intensional object as its semantic argument. As in the case of *know*, the choice between the intension and the extension of the SS NP derives the A/B-ambiguity.

Let me briefly comment on these two conclusions. Part of the conclusion stated under (i') – that epistemic *know* is an intensional verb requiring an intensional object as its semantic argument– is, I dare say, uncontroversial. The interesting issue is how to derive the truth-conditions for reading A and reading B without also overgenerating unavailable readings. As for conclusion (ii') on the intensionality of *be*, it has been previously claimed that SSs are not referential but descriptive or attributive in Donnellan's (1966) sense.[2] This is not what I mean in (ii'). In fact, contrary to that view, it will be shown that definite SSs, like any other definite NP, can be used to refer. But, in contrast to referential NPs in extensional contexts, a referentially used SS refers to an intensional object, for that is what specificational *be* requires as its external argument. This treatment of specificational *be* as an intensional verb is, to my knowledge, novel in the literature.[3]

[2] See Higgins (1973:268ff) for discussion. See Williams (1983), Heggie (1988) and Moro (1997) for a predicative analysis of SSs, and Heycock and Kroch (1999), Partee (2000) and Mikkelsen (2004) for counterarguments.

[3] Sharvit (2003) considers two strategies to derive "Tense Harmony" in specificational sentences: one in which *be* takes the NP's extension and one in which *be* is temporally intensional. However, the choice between the two strategies is left open and no argument for the intensionaly of *be* is provided in that paper. See Romero (2004b) for an elaboration of Sharvit's account.

As a result, we will obtain a semantic analysis of specificational sentences that offers a compromise between two of the current approaches in the literature, namely the 'as is' account (Jacobson 1994, Sharvit 1999, Cecchetto 2000, Heller 2002) and the 'question plus deletion' account (Ross 1972, den Dikken et al. 2000, Ross 2000, Schlenker 2003).[4] In the 'as is' account, the pre-copular NP –of any type τ– is interpreted like a regular extensional NP, and *be* is taken as the crosscategorial expression of identity ('='), asserting that the pre- and post-copular phrases have the same denotation. This is illustrated in (9) for the example (8). (9b) reproduces Sharvit's exact formulation and (9b') makes the world variables explicit:

(8) What Mary read was *Huck Finn*.

(9) 'As is' account:

a. S-Str / LF: $[_{NP}$ What Mary read] was $[_{NP}$ *Huck Finn*]

b. Semantics: $Max(\lambda x.read(m,x)) = hf$

b'. Semantics: $\lambda w. [\ Max(\lambda x.read(m,x,w)) = hf\ ]$

In the 'question plus deletion' account, the pre-copular pseudocleft *What Mary read* has been claimed to be either syntactically an interrogative clause (Ross 1972, den Dikken et al. 2000, Ross 2000) or syntactically an NP and semantically a question (Schlenker 2003). The post-copular constituent is a partially elided clause that combines its asserted content and implicature to express the (strongly exhaustive) answer to that question. This is summarized in (10):

(10) Question plus deletion account:

a. LF: $[_{CP/NP}$ What Mary read] was $[_{IP}$ ~~Mary read~~ *Huck Finn*].

b. Semantics: $\lambda w\ [\ \lambda w'[\ \lambda x.read(m,x,w') = \lambda x.read(m,x,w)] =$

$\lambda w'\ [read(m,hf,w')\ \&\ \neg\exists y\ [y\neq hf\ \&\ read(m,y,w')]\ ]\ ]$

[4] Although Heycock and Kroch (1999) do not fall within the 'as is' account in their derivation of connectivity, their semantics of specificational sentences can be assimilated to the semantics defended in that account. I will leave unexplored to what extent the semantic analysis proposed in the present paper is compatible with the insights of other accounts of the syntax and information structure of specificational sentences (e.g., Boskovic (1997), Heycock and Kroch (2002), among others).

My proposal will treat SSs syntactically and semantically as NPs, as in the 'as is' approach. But it will assimilate the semantic behavior of SSs with *be* to the intensional pattern of CQs with *know*, hence following the insight of the 'question plus deletion' approach that SSs are not regular (extensional) NPs but are –semantically– somewhat similar to questions.

The paper is organized as follows. Section 2 is devoted to the ambiguity between readings A and B in CQs. Section 3 presents and investigates this ambiguity in SSs. Section 4 briefly presents further similarities between CQs and SSs and discusses some implications of a unified analysis of *know* and *be* for theories of specificational sentences. Section 5 concludes.

2. AMBIGUITIES IN CONCEALED QUESTION NPS WITH *KNOW*

This section starts with some background on the semantics of epistemic *know*, a verb which needs to combine with some intensional object, e.g., a proposition <s,t>, a question meaning <s,<<s,t>,t>> or an individual concept <s,e> (or possibly some other object of intensional type) (§2.1). Heim's (1979) ambiguity is introduced in §2.2. I present my analysis of this ambiguity in §2.3: the semantic argument of *know* can arise from the extension or from the intension of the CQ NP, as happens with other intensional verbs like *look for*. In subsection §2.4, previous attempts at deriving the ambiguity will be considered. The first two attempts try to derive the semantic argument of ⟦*know*⟧ from the extension of the NP (§2.4.1 and §2.4.2), and the third attempt treats it as contextually provided (§2.4.3). All three analyses have in common the fact that they use the concealed question NP only referentially, i.e., only extensionally. It will be shown that the three purely extensional approaches yield inadequate empirical coverage. Finally, subsection §2.5 returns to the correct analysis and briefly adds some considerations.

2.1. Semantic background on *know*

A simplified analysis for *know* with a declarative complement clause assigns it the doxastic semantics exemplified in (11)-(12). The lexical entry for declarative *know* is given in (13):[5]

(11) John knows that Mary is tall.

(12) $\lambda w. \forall w' \in Dox_j(w)$ [$tall(m,w')$]

(13) $[\![know_{decl}]\!] =$ $\lambda p_{<s,t>} \lambda x_e \lambda w. \forall w' \in Dox_x(w)$ [$p(w')=1$]

For *know* combined with an interrogative clause, we will adopt Karttunen's (1977) semantics of questions –where an interrogative clause is a function from worlds to the set of true answers of that interrogative in that world— and Heim's (1994) proposal for the strongly exhaustive use of *know*. This is exemplified in (14)-(17). Roughly, (17) states that John knows who came iff, for all his belief worlds w', the set of true answers to the question in the belief world w' is exactly the same as the set of true answers in the actual world w:[6]

(14) John knows who came.

(15) $[\![$*who came*$]\!]=$ $\lambda w. \{p: p(w) \,\&\, \exists x\, [p=\lambda w''.came(x,w'')]\}$ (Karttunen 1977)

(16) $[\![know_{qu}]\!] =$ $\lambda q_{<s,<<s,t>,t>>} \lambda x_e \lambda w. \forall w' \in Dox_x(w)$ [$q(w') = q(w)$](Heim 1994:(9))

(17) $[\![$*John knows who came*$]\!] =$ $\lambda w. \forall w' \in Dox_j(w)$
$[\ \{p: p(w') \,\&\, \exists x\, [p=\lambda w''.came(x,w'')]\} = \{p: p(w) \,\&\, \exists x\, [p=\lambda w''.came(x,w'')]\}\ ]$

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[5] For simplicity, I am ignoring the factivity of *know* and other considerations about the justification of the subject's belief (see Kratzer 2002 for discussion).

[6] This means that, for everybody who came, John knows that that person came, and for everybody who didn't, John knows that person didn't. Later in the paper, in section 4, we will introduce mention-some readings (as in Beck and Rullmann 1999) and we will consider the possibility of detaching the degree of exhaustivity from the lexical entry for *know*.

A parsimonious extension of this analysis to *know* with a concealed question NP contains the following tenets. In sentence (18), the CQ *the capital of Italy* contributes an individual concept, i.e., a function from worlds to individuals. This individual concept is spelled out in (19). The parallelism between Karttunen's question meaning and the individual concept in (19) is obvious. A question maps a world to a possibly non-singleton set of propositions. For example, ⟦$[_{CP}$ *what is the capital of Italy]*⟧ maps the actual world w to the singleton {λw'.capital-of(rome,italy,w')}. An individual concept maps a world to a possibly non-singular individual. For example, the individual concept contributed by *$[_{NP}$ the capital of Italy]* maps the actual world w to the singular individual Rome.

(18) John knows the capital of Italy.

(19) Semantic contribution of the CQ *[the capital of Italy]*:

$\lambda w.\ \iota x_e$ [capital-of-Italy(x,w)]

The concealed question counterpart of interrogative *know* is spelled out in (20) and applied to our example in (21).[7] The idea is that x_e knows $\underline{y}_{<s,e>}$ at w iff x is at w able to identify the value $\underline{y}$(w) that $\underline{y}$ yields when applied to w.[8] This is guaranteed by the formula in (21): for all of John's doxastic alternatives w', the value of the relevant individual concept at w' is exactly what it is in the actual world w:

(20) ⟦$know_{CQNP}$⟧ = $\lambda \underline{y}_{<s,e>} \lambda x_e \lambda w.\ \forall w' \in Dox_x(w)\ [\ \underline{y}(w') = \underline{y}(w)\ ]$

(21) ⟦*John knows the capital of Italy*⟧ =

$\lambda w.\ \forall w' \in Dox_j(w)$ [ιx_e[capital-of-Italy(x,**w'**)] = ιx_e[capital-of-Italy(x,**w**)]]

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[7] The letters *x, y, z…* will be used as individual variables of type e, and their underlined versions *$\underline{x}$, $\underline{y}$, $\underline{z}$…* as variables over intensionalized individuals of type <s,e>, <s,<s,e>>, etc. For simplicity, λ-expressions of type <s,t> will be called 'formulae'.

[8] In Heim's exact words, "roughly characterized, this relation of knowing holds between X and Y at i iff X is at i able to identify the value Y(i) that Y yields when applied to i" (Heim 1979:56).

2.2. Heim's (1979) ambiguity

Heim (1979) describes two readings for sentence (22), which I will call reading A and reading B. Reading A is described in (23) and can be unambiguously paraphrased as 'John knows the same price that Fred knows'. Under this reading, (22) asserts that both John and Fred know the answer to the same price question, e.g., the answer to the question 'How much does the milk cost?':

(22) John knows the price that Fred knows. (Heim 1979)

(23) **Reading A**: 'John knows the same price that Fred knows.'

There are several relevant questions about prices:

'How much does the milk cost?'

'How much does the oil cost?'

'How much does the ham cost?'

Fred knows the answer to exactly one of these questions, e.g., to the first one.

John knows the answer to this question too.

A second reading of (22), reading B, is spelled out in (24) and can be unambiguously paraphrased as 'John knows what price Fred knows':

(24) **Reading B**: 'John knows what price Fred knows.'

There are several relevant questions about prices:

'How much does the milk cost?'

'How much does the oil cost?'

'How much does the ham cost?'

Fred knows the answer to one of these questions, e.g., to 'How much does the milk cost?'.

Then, there is the "meta-question" asking which of these questions is the one whose answer Fred knows.

John knows the answer to the meta-question. That is, John knows that the question about prices whose answer Fred knows is 'How much does the milk cost?'.

Note that, under reading B, John and Fred need not share the answer to the same price question. All that reading B says is that Fred knows the answer to a price question (e.g., to the question 'How much does the milk cost?') and that John knows the answer to a certain higher question or "meta-question" (namely, to the meta-question 'What price does Fred know?'). But John himself does not need to know the answer to the original price question 'How much does the milk cost?'.[9]

According to the background assumptions in §2.1, under both readings, ⟦*know*⟧ must take an object of intensional type as its argument. The question is what this intensional object looks like in each reading and how exactly it is obtained from the syntax-semantics-pragmatics of the sentence.

In the next subsection, §2.3, I show that the ambiguity between readings A and B is straightforwardly derived using the two interpretive dimensions of the concealed question NP: its extension and its intension. Both the extension and the intension of the NP can supply the intensional object argument for ⟦*know*⟧, much like what happens with intensional verbs like *look for*.

In subsection §2.4, I will show that using only the extension of the concealed question NP does not yield the correct empirical result. I will present and refute three analyses of the ambiguity: the evaluation world account, the trace type account (discussed in Heim 1979), and the pragmatic account (Heim 1979).[10]

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[9] Heim (1979:57) argues that readings of increasing "meta-question" complexity can multiply the ambiguity. For example, (i) below has a reading, reading C, according to which the embedded subject Fred knows the answer to a meta-question on prices (namely, to the meta-question 'What price was announced yesterday morning?'), and the matrix subject John knows the answer to the corresponding meta-meta-question 'What price does Fred knows?'. We will not be directly concerned with reading C in this paper. However, the arguments to be presented regarding reading B apply to reading C modulo the higher type of the original question.

(i) John knows the price that Fred knows: the price announced yesterday morning.

[10] The reader interested solely in the ambiguity between readings A and B will probably be satisfied with the presentation of the proposed analysis in 2.3 and can safely skip subsection 2.4. The rejected accounts of *know* in 2.4 and of *be* in §3.3 are important for the reader concerned with the semantics of the copula: to correctly derive the

With purely extensional accounts rejected, we briefly return to the proposed analysis of the ambiguity in subsection §2.5.

2.3. Proposal for concealed questions: using both the extension and the intension of the NP

An intensional verb like *look for* takes an intensional object as its argument (Zimmermann 1993, Moltmann 1997, among many others). This intensional object is often provided directly by the *intension* of its complement NP, as exemplified in (25). But this intensional object can also arise from the *extension* of a higher type NP. This second possibility is illustrated in (26), which has a de dicto reading on the extension of the NP that makes it true in scenario (27):

(25) John is looking for the unicorn with the longest horn.

a. 'In all of John's bouletic alternatives w' in w: John finds in w' the individual that is the unicorn with the longest horn in w' (whichever that may be).'

➪ *look for* takes as its argument the INTENSION of the NP.

(26) John is looking for the unicorn Fred is looking for (: the one with the longest horn.)

a. 'Each x out of John and Fred is such that, in all of x's bouletic alternatives w' in w: x finds in w' the individual that is the unicorn with the longest horn in w' (whichever that may be).'

➪ *look for* takes as its argument the EXTENSION of the NP, which is an intensional object.

(27) Scenario:

John does not have any beliefs as to which unicorn has the longest horn. He wants to catch the unicorn with the longest horn, whichever that may be. Exactly the same holds for Fred.

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ambiguity between reading A and reading B, *know* (unsurprisingly) and *be* (surprisingly) must be treated as intensional verbs, similar to *look for*.

I propose to treat the intensional verb *know* in the same fashion and allow its intensional argument to arise either from the extension of the NP or from its intension. Further, I propose that reading A results when we use the extension of the complement NP and reading B obtains when the intension of the NP is used:

(28) John knows the price that Fred knows.

a. Reading A: ⟦*know*⟧ + EXTENSION of *[$_{NP}$ the price that Fred knows]*.

b. Reading B: ⟦*know*⟧ + INTENSION of *[$_{NP}$ the price that Fred knows]*.[11]

The proposal is spelled out in (29) through (32). The lexical entries in (29) will be needed: *know*$_1$ will be chosen when the argument is of type <s,e>, and *know*$_2$ will be used for <s<s,e>> arguments.

(29) a. $[\![price_1]\!](\underline{x}_{<s,e>})(w) = 1$ iff $\text{price}(\underline{x},w)$

b. $[\![know_1]\!](\underline{x}_{<s,e>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ \underline{x}(w'') = \underline{x}(w)\ ]$

c. $[\![know_2]\!](\underline{x}_{<s,<s,e>>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ \underline{x}(w'') = \underline{x}(w)\ ]$

The tree and semantic computation in (30) construct, step by step, the intension of the NP. Note that *know*$_1$ is used within the relative clause both for reading A and for reading B, since in both cases Fred knows the answer to the same <s,e> question:[12]

[11] The intension of the NP *the price that Fred knows* in (28b) is of type <s,<s,e>>, higher than the <s,e> intension of the NP *the unicorn with the longest horn* in (25). (i), a variant of Zimmermann's (to appear, p. 14) scenario 1, aims at a (marginal) reading where the intension of the NP *what Quine is looking for* is of type <s,<s,e>> as well.

(i) Geach hears that Quine has developed a case of a disease that leads victims to believe in all kinds of weird objects, e.g., gold mountains, mermaids, etc. Rumor has it that this disease makes Quine believe in just one kind of weird object, and that Quine spends his time on a gigantic search in order to prove the existence of that kind of object. To find out whether there is anything to these stories, Geach snitches Quine's diary and scans it for evidence of search preparation: in a sense, *Geach is looking for what/something Quine is looking for.*

[12] Following Heim-Kratzer (1998), the index of the relative pronoun and indices of movement in general act as λ-abstractors, as in (i). ⟦N'⟧ is computed using their Predicate Modification rule.

(30) the price that Fred knows

NP $\lambda w^*.\ \iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]]

r u

$\lambda P_{<<s,e>,<s,t>>} \lambda w^*.$ the N' $\lambda \underline{x}_{<s,e>} \lambda w^*.$ price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]

$\iota \underline{x}_{<s,e>}$ [P($\underline{x}$)(w*)=1] e i

price CP $\lambda \underline{x}_{<s,e>} \lambda w^*.\ \forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]

$\lambda \underline{x}_{<s,e>} \lambda w^*.$ price($\underline{x}$,w*) e i

that$_5$ IP $\lambda w^*.\forall$w''$\in$Dox$_f$(w*) [g(5)(w'') = g(5)(w*)]

e i

Fred VP

e i

knows$_1$ $t_{5\ <s,e>}$

$\lambda \underline{x}_{<s,e>} \lambda z_e \lambda w^*.\ \forall$w''$\in$Dox$_z$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)] g(5)

To obtain reading A, we take the intension built in (30) and we apply it to the actual world w, to generate the NP's extension in (31a). This extension –which is itself an intensional object of type <s,e>– is then used as the argument of the matrix verb. Given that the semantic argument of the matrix verb is of type <s,e>, we must use the lexical entry *know$_1$*. The result is the formula in (31b):

(i) If α has the form α , where (β is a relative pronoun and) i is an index of any type τ,

t y

(β) i γ

then $[\![\alpha]\!]^{s,g}$ = $\lambda x \in D_\tau.\ [\![\gamma]\!]^{gx/i}$

Also, in (30), the formal predicate *price* is a predicate of individual concept - world pairs, which applies truly to a pair <$\underline{x}_{<s,e>}$,w*> iff there is a (type of) object z_e (e.g., milk) in w* such that, for all the w''$\in$W, $\underline{x}$(w'') has the property of being the price of (the counterpart of) z at w''. This predicate is parallel to the formal translations of *know* in (29), which apply to an individual concept and a world (and to the individual provided by the subject NP). The formal translation of the head noun has no impact on the arguments presented in the present paper regarding *know* and the CQ as a whole.

(31) **Reading A**:

a. Extension of the NP in w:

$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = $\underline{x}$(w)]]

b. *Know$_1$* + extension of the NP:

λw. $\forall$w'$\in$Dox$_j$(w)

[$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = $\underline{x}$(w)]] (w') =

$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = $\underline{x}$(w)]] (w)]

To see that (31b) truth-conditionally corresponds to reading A, consider the following. The expression $\iota \underline{x}_{<s,e>}$[…] translates the entire NP and thus represents John's price question, and the expression $\underline{x}$ translates the trace and thus represents Fred's (unique) price question. Both expressions stand for the same price question (since one is an ι-abstraction over the other). We see that all of John's doxastic alternatives w' assign the correct, actual value to $\iota \underline{x}_{<s,e>}$[…], hence assuring that John knows the value of $\iota \underline{x}_{<s,e>}$[…]. We also see that $\underline{x}$(w'') yields the correct value for all of Fred's doxastic alternatives w'', meaning that Fred also knows the answer to the price question $\underline{x}$. In sum, according to (31b), both John and Fred know the answer to the same price question, represented by the expressions $\iota \underline{x}_{<s,e>}$[…] and $\underline{x}$. Hence, the formula in (31b) correctly represents reading A.

Reading B takes the intension computed in (30) and feeds it directly to the matrix verb. Since this intension is of type <s,<s,e>>, the matrix verb will necessarily be *know$_2$*. The result is the formula in (32b), simplified by λ-conversion in (32c):

(32) **Reading B**:

a. Intension of the NP:

λw*. $\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]]

b. *Know$_2$* + intension of the NP:

λw. $\forall$w'$\in$Dox$_j$(w)

[λw*. $\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]] (w') =

λw*. $\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]] (w)]

c. Simplification:

$$\lambda w.\ \forall w' \in Dox_j(w)$$
$$[\quad \iota \underline{x}_{<s,e>}\ [price(\underline{x},w')\ \&\ \forall w'' \in Dox_f(w')\ [\underline{x}(w'') = \underline{x}(w')]] \ = $$
$$\iota \underline{x}_{<s,e>}\ [price(\underline{x},w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]] \quad]$$

(32b,c) correctly capture the truth-conditions of reading B. The λ-expression $\lambda w^*.\iota \underline{x}_{<s,e>}[\ldots]$ in (32b), of type <s,<s,e>>, stands for John's meta-question about prices. John knows the answer to this meta-question, since all his doxastic alternatives w' assign it the correct, actual value. As before, the expression $\underline{x}$, of type <s,e>, translates the trace and represents Fred's (unique) price question. (32c) guarantees that Fred knows the answer to this price question, since all his doxastic alternatives w" map it to the correct value that $\underline{x}$ has in the actual world w. As the reader can further check for herself, (32b,c) match reading B.

2.4. Purely extensional treatments of the concealed question NP

In this subsection, three attempts will be made at deriving the ambiguity at issue using exclusively the extension of the concealed question NP: the evaluation world account (subsection §2.4.1), the trace type ambiguity account (§2.4.2), and the pragmatic account (§2.4.3).

In the first two accounts, we will treat the NP *the price that Fred knows* as an extensional NP whose extension in a given world w' supplies the intensional object that ⟦*know*⟧ takes as argument. This gives us the syntax and compositional semantics in (33). (33) is like (30), except that now we leave open the type τ of the trace and we add an extra $NP_{w'}$ layer at the very top of the NP, to signal that we are computing the extension of the NP at a given world w':[13]

[13] See Farkas (1993) and Percus (2000) on the need for local and non-local world evaluation of NPs. I use free world indexing of the entire NP in the syntactic representation (33) and a Ty2 language for the semantic translation. (We could as well index separately each of the predicates within the NP, namely *price* and embedded *know*. Nothing depends on this choice.) This free world variable w' will be bound by an operator higher up in the structure. See, e.g., Percus (2000) for formal details.

(33) the price that Fred knows

NP$_{w'}$ $\iota \underline{x}_\tau$ [price($\underline{x}$,w') & $\forall$w''$\in$Dox$_f$(w') [$\underline{x}$(w'') = $\underline{x}$(w')]]

g

NP $\lambda w^*.\iota \underline{x}_\tau$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]]

r u

$\lambda P_{<\tau,<s,t>>}\lambda w^*.$ the N' $\lambda \underline{x}_\tau \lambda w^*.$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]]

$\iota \underline{x}_\tau$ [P($\underline{x}$)(w*)=1] e i

price CP $\lambda \underline{x}_\tau \lambda w^*.$ $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = $\underline{x}$(w*)]

$\lambda \underline{x}_\tau \lambda w^*.$ price($\underline{x}$,w*) e i

that $_{5,\tau}$ IP $\lambda w^*.\forall$w''$\in$Dox$_f$(w*) [(g(5))(w'') = (g(5))(w*)]

6

Fred knows $t_{5,\tau}$

In the first account –the evaluation world account–, we will try to derive the two readings A and B by evaluating the extension of the NP with respect to different world variables w', each introduced by a different binder in the final formula.

The second account –the trace type ambiguity account– is originally presented (and dismissed for the wrong reasons) in Heim (1979). Here the semantic type τ of the trace t_1 varies between type <s,e> and type <s,<s,e>>. Note that, given general assumptions about the syntax-semantics of relative clauses and definite NPs (Heim-Kratzer 1998), the type of the trace will determine the type of the extension of entire definite NP: whatever the type τ of the trace is, the type of the relative clause's intension will be <τ,<s,t>> (i.e., a property of objects of type τ), the type of the definite NP's intension (in the Fregean tradition) will be <s,τ >, and the type of the final NP's extension will be τ.

The third account is Heim's (1979) pragmatic approach, in which the extension of the NP is of type e and the desired intensional object is contextually provided as an additional argument of *know*.

All three attempts will fail.

2.4.1. Account 1: computing the NP's extension at different evaluation worlds

The formal predicates *know* and *price* introduce by the NP in (34) can in principle be evaluated with respect to several world variables present in the formula. This open choice is represented in the λ-expression in (35) by using double question marks where the decisive world variables would appear:

(34) John knows the price that Fred knows.

(35) $\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{??})\ \&\ \forall w'' \in Dox_f(\mathbf{??})\ [\underline{x}(w'') = \underline{x}(??)]]\ (w') =$
$\iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{??})\ \&\ \forall w'' \in Dox_f(\mathbf{??})\ [\underline{x}(w'') = \underline{x}(??)]]\ (w)\ ]$

Can we derive the readings A and B of (34) from a different choice of world variable in (35)? There are only two operators introducing world variables in the formula: the top λw, and the lower ∀w' originating from the matrix verb *know*. We consider each possibility in turn.

If we choose the higher binder λw, we obtain the formula in (36). (36) is the same formula as (31b), which we saw correctly captures reading A.

(36) $\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{w})\ \&\ \forall w'' \in Dox_f(\mathbf{w})\ [\underline{x}(w'') = \underline{x}(w)]]\ (w') =$
$\iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{w})\ \&\ \forall w'' \in Dox_f(\mathbf{w})\ [\underline{x}(w'') = \underline{x}(w)]]\ (w)\ ]$

➪ **Reading A**

If we choose the lower variable binder ∀w', we obtain the formula in (37). The question is whether (37) corresponds to reading B:

(37) $\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{w'})\ \&\ \forall w'' \in Dox_f(\mathbf{w'})\ [\underline{x}(w'') = \underline{x}(w')]]\ (w') =$
$\iota \underline{x}_{<s,e>}\ [price(\underline{x},\mathbf{w'})\ \&\ \forall w'' \in Dox_f(\mathbf{w'})\ [\underline{x}(w'') = \underline{x}(w')]]\ (w)\ ]$

➪ **Reading B???**

The answer is 'no': (37) does not have the same truth-conditions as reading B. To see how (37) fails, consider the scenario in (38), where John knows what question $\underline{x}_{<s,e>}$ Fred knows the answer to, but John does not know the answer to question $\underline{x}_{<s,e>}$ itself. Reading B –meaning "John knows what price Fred knows"– is compatible with this scenario. But the truth-conditions in (37) yield FALSE in this scenario. (37) yields FALSE because the equality $\iota\underline{x}_{<s,e>}[\ldots](w') = \iota\underline{x}_{<s,e>}[\ldots](w)$ requires that the actual value $\iota\underline{x}_{<s,e>}[\ldots](w)$ –where $\iota\underline{x}_{<s,e>}[\ldots]$ picks out the question 'How much does the milk cost?'– be also identifiable by John.[14]

(38) Scenario:

John correctly thinks that Fred knows how much the milk costs and that Fred knows no other price. But John himself does not know how much the milk costs.

Since (37) does not correspond to reading B and there is no other possible w-binder in the formula to produce this reading, account 1 is dismissed. The ambiguity does not stem from the choice of world variable in computing the NP's extension.

2.4.2. Account 2: taking the NP's extension and varying the type of the trace

Attempt 2 manipulates the type τ of the trace t_1 within *[$_{NP}$ the price that Fred knows t]* to derive the two readings. The intuition is that in reading A the matrix subject John knows the answer to a simple price question, whereas in reading B he knows the answer to a price "meta-question". In terms of types, according to reading A John is able to identify the actual value $\underline{x}_{<s,e>}(w)$ of a given $\underline{x}_{<s,e>}$; according to reading B John is able to identify the actual value $\underline{x}_{<s,<s,e>>}(w)$ of a

[14] Scenario (38) suffices to prove that (37) does not match reading B. But in fact (37) is even more removed from reading B. (37) says that *any* price question $\underline{x}_{<s,e>}$ that *some* doxastic (/epistemic) alternative w' of John's selects as the unique price question Fred knows is such that $\underline{x}_{<s,e>}$ applied to w' yields the correct value. For example, if John has correctly narrowed down the possible answers of 'What price does Fred know?' to $\underline{x}_{<s,e>}$, $\underline{y}_{<s,e>}$ and $\underline{z}_{<s,e>}$, but does not know which of these three options is the final correct answer, (37) yields TRUE if John is able to identify the actual values of $\underline{x}_{<s,e>}$, $\underline{y}_{<s,e>}$ and $\underline{z}_{<s,e>}$. But reading B yields FALSE, since John should know the final correct answer to 'What price does Fred know?'. I thank Barbara H. Partee for leading me to consider scenarios like this.

given $\underline{x}_{<s,<s,e>>}$. Since the (extensional) type of the entire NP stems from the type of the trace t_1, as we saw in (33), account 2 capitalizes on the type τ of the trace.

(39) John knows [$_{NP,\tau}$ the price that Fred knows t_τ].

According to reading A, John knows the answer to the same price question as Fred does, e.g., the question 'How much does the milk cost?'. Taking the type of the trace to be <s,e>, we arrive at the truth-conditions in (40). (40) is exactly the same formula as (31b) and (36), which we saw matches reading A.

(40) **Reading A**: 'John knows the same price as Fred knows.'

$$\lambda w.\ \forall w' \in Dox_j(w)$$
$$[\ \iota \underline{x}_{<s,e>} [price(\underline{x},w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]]\ (w') =$$
$$\iota \underline{x}_{<s,e>} [price(\underline{x},w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]]\ (w)\ ]$$

To generate this reading, we have only used the lexical entries for the predicates *price* and *know* that we already used in (29a,b), repeated in (41):

(41) a. $[\![price_1]\!]\ (\underline{x}_{<s,e>})(w) = 1$ iff $price(\underline{x},w)$

b. $[\![know_1]\!]\ (\underline{x}_{<s,e>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ \underline{x}(w'') = \underline{x}(w)\ ]$

According to reading B, John knows what price Fred knows, e.g., John knows that Fred knows how much the milk costs. To try to represent this reading, we take John's meta-question $\iota\underline{x}_{<s,<s,e>>}[\ldots]$ to be of type <s,<s,e>>, for it should represent a question ('what price does Fred know?') whose answer at a given world selects a price question of type <s,e> ('How much does the milk cost?'). This is done in (42). The expression $\iota\underline{x}_{<s,<s,e>>}[\ldots]$ that translates the entire NP and the variable $\underline{x}_{<s<s,e>>}$ corresponding to the trace stand for the same meta-question. Crucially, Fred is not said to know the answer to the meta-question $\underline{x}$ ('What price does Fred know?'), but to the simpler price question $\underline{x}(w)$ ('How much does the milk cost?') that the meta-question $\underline{x}$ yields when applied to the actual world w. In other words, while all of John's doxastic alternatives w' must yield the correct value when applied to the meta-question $\iota\underline{x}_{<s,<s,e>>}[\ldots]$ –as encoded in the subformula $\iota \underline{x}_{<s,<s,e>>}[\ldots](w') = \iota \underline{x}_{<s,<s,e>>}[\ldots](w)$–, all of Fred's doxastic alternatives w" must yield the correct value when applied to the simpler question $\underline{x}(w)$ –as guaranteed by the subformula $\underline{x}(w)(w'') = \underline{x}(w)(w)$.

(42) **Reading B**: 'John knows what price Fred knows.'

$$\lambda w.\ \forall w' \in Dox_j(w)$$
$$[\ \iota \underline{x}_{<s,<s,e>>}\ [price(\underline{x}(w),w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w)(w'') = \underline{x}(w)(w)]\ ]\ \ (w') \quad =$$
$$\iota \underline{x}_{<s,<s,e>>}\ [price(\underline{x}(w),w)\ \ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w)(w'') = \underline{x}(w)(w)]\ ]\ (w) \quad]$$

The formula in (42) (roughly) succeeds in capturing the truth-conditions of reading B.[15] For this formula, we need the lexical entry *know₂* in (29c), repeated here as (43b), and the new lexical entries *price₃* and *know₃* specified in (43a,c):

(43) a. $[[price_3]](\underline{x}_{<s,<s,e>>})(w) = 1$ iff $price(\underline{x}(w),w)$

b. $[[know_2]](\underline{x}_{<s,<s,e>>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\underline{x}(w'') = \underline{x}(w)]$

c. $[[know_3]](\underline{x}_{<s,<s,e>>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\underline{x}(w)(w'') = \underline{x}(w)(w)]$

A word about these lexical entries is in order. Although *know₁* in (41) and *know₂* in (43) are listed as separate lexical entries, they perform exactly the same operations and vary only in the type –<s,e> or <s,<s,e>>— of their first argument. In this sense, they are simply crosscategorial variants of each other, comparable to crosscategorial conjunction (Partee and

[15] There is a non-trivial problem about uniqueness in the formula in (42): it presupposes that there is a unique function of type <s,<s,e>> whose value at the actual world w is the individual concept <s,e> known to Fred. But of course there are many <s,<s,e>> functions that meet this characteristic. To solve this problem, perhaps one could contextually constrain the range of possible <s,<s,e>> functions considered. Furthermore, the formula (42) does not guarantee that the unique function of type <s,<s,e>> at issue corresponds to the meta-question 'What price does Fred know?' as opposed to, e.g., 'What price does Sue know?'. That is, under account 2, reading B is not a reading of its own, but a possible interpretation of the vague truth-conditions in (42). For the sake of the argument, I will assume that these two drawbacks can be overcome.

Rooth 1983).[16] I am more concerned about *know*$_3$ in (43c), for this item is not a pure crosscategorial variant of its partners but introduces an extra layer of world evaluation in the body of the formula. (The same worry can be raised about *price*$_3$ in (43a).) But, for the sake of the argument, let us concede that our lexicon includes all the lexical entries listed in (41) and (43) so that we can generate readings A and B.

The problem with account 2 is the following. We can combine the lexical entries above in several ways. Two possibilities are (i) and (ii), yielding readings A and B respectively:

i. John and Fred know the answer to the exact same question, i.e., we introduce the same number of world variables for John's ɩ<u>x</u>[…] and for Fred's <u>x</u>, using only *know*$_1$. Reading A

ii. John knows a higher meta-question than Fred, i.e., we introduce fewer world variables for John's ɩ<u>x</u>[…] than for Fred's <u>x</u>, using *know*$_2$ for John and *know*$_3$ for Fred. Reading B

Interestingly, possibility (iii) is missing:

iii. Fred knows a higher meta-question than John, i.e., we plug in more world variables for John's ɩ<u>x</u>[…] than for Fred's <u>x</u>, using *know*$_3$ for John and *know*$_2$ for Fred. Reading B'

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[16] The account 2 presented here is discussed in Heim (1979) and dismissed because of the need for multiple lexical entries like *know*$_1$ and *know*$_2$ (although Heim sketches the problem for the predicate *price* rather than for the predicate *know*):

> "I think we would have to introduce a homonym of "price" that denotes properties not just of individual concepts, but of "individual concept concepts", i.e., functions from points of reference [MR: worlds] to functions from points of reference to numbers. But then what about (36)?
>
> (36) John knows the price known to Fred that Bill knows.
>
> If we disregard limitations of performance, examples like this can be constructed to prove that any finite number of homonyms is insufficient." (Heim 1979:57)

However, as pointed out to me by Heim, p.c., the difference between the entries *know*$_1$ and *know*$_2$ and other possible higher type homonyms can be entirely reduced to crosscategorial variation and can be thus deemed a mere artifact of

We know that possibility (iii) is missing because, if available, sentence (39) *John knows the price that Fred knows* would also have the inverse of reading B, namely the reading B' spelled out in (44). Using scenario (45) for illustration, (44) roughly says that the meta-question $\underline{x}_{<s,<s,e>>}$ whose answer is known to Fred (where $\underline{x}_{<s,<s,e>>}$ is 'What price does John know?' in our scenario) is such that its actual answer $\iota\underline{x}_{<s,<s,e>>}[\ldots](w)$ (namely, 'How much does the milk cost?') is a question whose answer is known to John. In other words, (44) yields true if Fred knows what price John knows (and Fred knows nothing else), opposite to reading B. Now, if sentence (39) had this inverse reading B', (39) would be true in scenario (45). But sentence (39) is judged false in scenario (45).

(44) **Reading B'**:

$$\lambda w.\ \forall w' \in Dox_j(w)$$
$$[\ \iota\underline{x}_{<s,<s,e>>}\ [price(\underline{x}(w),w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]\ ]\ (w)(w') =$$
$$\iota\underline{x}_{<s,<s,e>>}\ [price(\underline{x}(w),w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]\ ]\ (w)(w)\ \ ]$$

(45) Scenario:

Fred knows what price John knows –namely, Fred knows that John knows how much the milk costs. Fred does not know how much the milk costs, nor does Fred know any other relevant price meta-question (e.g., Fred does not know what price Sue or other relevant person knows).

Given the lexical entries that we need in this attempt to generate readings A and B, there is no way to rule out the unavailable reading B' compositionally. Once *know*$_2$ and *know*$_3$ are both included in the lexicon, nothing in the grammar can prevent them from appearing in the relative clause and the matrix clause respectively while allowing them to have the opposite distribution. Therefore, account 2 overgenerates and fails.[17]

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type theory. Hence, I do not consider the co-existence of *know*$_1$ and *know*$_2$ to be a problem. This means that account 2 is still in the running and needs to be refuted on other grounds.

[17] English and Catalan allow the type of interpretation under *tell* illustrated in (i)-(ii), perhaps due to ellipsis of *to do*. But Catalan allows it to a larger extent than English, e.g., under *saber* 'know', as (iii)-(iv) show. As a result, Catalan

2.4.3. Account 3: pragmatic account

Heim (1979) tentatively proposes a pragmatic account for simpler CQ examples. In a nutshell, she proposes that *know* has two internal arguments: an individual argument of type e provided by the extension of the complement NP, and a property argument of type <e,<s,t>> contextually provided. For example, (46) is given the truth-conditions in (47), where *P* is a free variable over properties and the subformula $know(j,x_e,P_{<e<s,t>>},w)$ is true iff John knows in w that x has the property P in w. Heim further argues that there is a very strong pragmatic principle that makes the property mentioned in the NP the most salient one (p. 58). Under the influence of this pragmatic bias, (46) means roughly that John knows Rome as being the capital of Italy.

(46) John knows the capital of Italy.

(47) λw. know (j, ιx_e[capital-of-Italy(x,w)], P, w)

---

can, but English cannot, accidentally generate a reading for (v) that resembles reading B'. I thank Martí Quixal for bringing this reading of (v) to my attention.

(i) Melissa did what I told her.
a. 'Melissa did what I told her to do'

(ii) La Gemma va fer el que li vaig dir.
The Gemma PAST do the that to-her I-PAST tell
'Gemma did what I told her (to do).'

(iii) Melissa bought what Paul knows.
a. * 'Melissa bought what Paul knows she bought.'

(iv) La Gemma va comprar el que sap el Pau.
The Gemma PAST buy the that knows the Pau
'Gemma bought what Pau knows (she bought).'

(v) El Joan sap el preu que el Pere sap.
The Joan knows the price that the Pere knows.
'Joan knows the price that Pere knows (she bought).'

A virtue of this approach is that the pragmatic bias is not mandatory, as there are examples in which the subject can be understood to know an individual x under some description other than the one provided by the NP. For example, there is a reading of (48) that makes the sentence true in scenario (49): John knows $1.79 as the price of milk, and this price happens to be ridiculous in the opinion of the speaker. (Note that the addition of the colon and appositive *the price of milk* is not needed.)

(48) John only knows the most ridiculous price of the store (: the price of milk).

(49) Scenario:
John knows how much the milk costs at the store and he knows no other price. As it turns out, the most ridiculously priced object in the store is the milk. John is not aware of the ridiculous character of this pricing.

However, there are some drawbacks to this pragmatic account. First, if all that *know* really needs from its direct object is its extension and if property P can sometimes not arise from the NP but from some other contextual source, we would expect that (50) has an epistemic reading 'John knows Rome as P' for some contextually relevant P. But this reading is not available. (50) can only mean that John is acquainted with Rome:[18]

(50) # John knows Rome.

Second, and more important for us, it is not clear how the choice of value for P could help us derive the ambiguity at issue. The analysis will produce the formula in (52):

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[18] In languages that distinguish epistemic and acquaintance 'know' lexically, the epistemic version of (50) is simply ungrammatical:

(i) * El Joan sap Roma. (Catalan)
The Joan knows$_{Epi}$ Rome
'Joan knows Rome.'

(ii) * Juan sabe Roma. (Spanish)
Juan knows$_{Epi}$ Rome
'Juan knows Rome.'

(51) John knows the price that Fred knows.

(52) $\lambda w.\ know\ (j, \iota x_e[price(x,w) \wedge know(f,x,Q,w)], P, w)$

Let us assume that Fred knows how much the milk costs and that the milk costs $1.79. From this formula, reading A can certainly be derived: John knows $1.79 as P and Fred knows $1.79 as Q, where both P and Q happen to pick out the property 'being the price of milk'. Hence, John and Fred know exactly the same thing: how much the milk costs.

As for reading B, the closest that this formula will take us is the following: John knows $1.79 as P and Fred knows $1.79 as Q, where P is the property 'being the answer to the price question that Fred knows the answer to', and Q is the property 'being the price of milk'. But this is not reading B. This asserts that John knows $1.79 as having the property 'being the answer to the price question that Fred knows the answer to'. In other words, John may not know what price question Fred knows the answer to; John may simply know that, whatever that price question may be, its answer is $1.79. This is paraphrased in (53a). Reading B, instead, requires that John know what price Fred knows, regardless of whether John also knows that the answer to the simpler price question is $1.79. This is paraphrased in (53b). Hence, the knowledge attributed to John according to (52)/(53a) –knowledge of $1.79 as the answer to some question but not necessarily knowledge of what price Fred knows– does not coincide with the knowledge attributed to John in reading B/(53b) –knowledge of what price Fred knows, but not necessarily knowledge of $1.79 as the answer to any question. In fact, the paraphrase of (51) that we would need to obtain in order to match reading B is (53c). However, following the compositional assumptions about extensional NPs at the beginning of §2.4, the type of the trace functioning as an argument of the embedded *know* –x in (52)– will determine the extensional type of the argument of the matrix *know* –$\iota x_e[\ldots]$ in (52)–, and hence a paraphrase where $\iota x_e[\ldots]$ and x stand for different objects, as in (53c), cannot be generated.

(53) a. According to (52): John knows $1.79 as P, where P is the property 'being the answer to the price question that Fred knows the answer to'.

b. Reading B: John knows the question 'How much does the milk cost?' as P, where P is the property 'being the price question that Fred knows the answer to'.
c. John knows the question 'How much does the milk cost?' as P and Fred knows \$1.79 as Q, where P is the property 'being the price question that Fred knows the answer to' and Q is the property 'being the price of milk'.

In sum, this pragmatic approach cannot generate reading B. Hence, the third and final attempt at producing the observed ambiguity using only the NP's extension fails.

2.5. Back to the proposed intensional analysis of *know*

With purely extensional analyses of the NP dismissed, we return now to the analysis put forward in the present paper: both the extension and the intension of the NP can provide the semantic argument of *know*.

Unlike accounts 1 and 3, the proposed analysis generates the correct truth-conditions not only for reading A but also for reading B. The correct reading B is repeated below from (32c):[19]

(54) Correct truth-conditions for reading B:

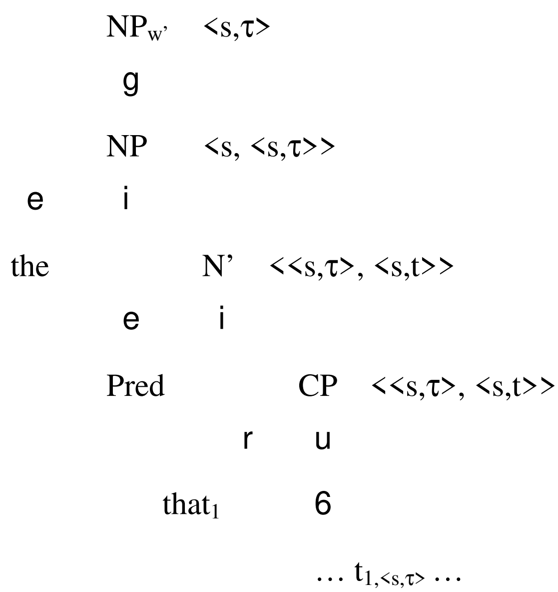
$$\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota \underline{x}_{<s,e>}\ [price(\underline{x},w')\ \&\ \forall w'' \in Dox_f(w')\ [\underline{x}(w'') = \underline{x}(w')]] = \iota \underline{x}_{<s,e>}\ [price(\underline{x},w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w'') = \underline{x}(w)]]\ ]$$

Furthermore, unlike account 2, the proposed analysis does not generate spurious readings. First of all, note that there is no lexical entry *know$_3$* in the proposed account, and thus the unavailable reading B' cannot be generated. As for *know$_1$* and *know$_2$*, we cannot possibly switch their positions to obtain other spurious readings because *know$_1$* and *know$_2$* take arguments of different types and thus their distribution is entirely determined by the semantic type of their syntactic sister. Could we then switch the type of the arguments of the matrix and embedded

[19] (54) also lacks the problems of uniqueness and meta-question content noted in footnote 15 for reading B in account 2.

verb, so that *know*$_1$ and *know*$_2$ switch as well? In other words, could the trace *t* have a higher type <s,τ> and the host NP *[the price that Fred knows t]* have the lower type τ?[20] The answer is 'no'. Recall from section §2.4 that the type of the trace determines the type of the NP: if the trace has type <s,τ>, the relative clause will have an intension of type <<s,τ>,<s,t>> (i.e., a property of objects of type <s,τ>) and the host NP will have an intension of type <s,<s,τ>> and an extension of type <s,τ>. That is, the entire NP in (55) has an extension of the same type as the trace and an intension of higher type; the host NP cannot possibly retrieve a semantic object of a lower type than the trace itself.

(55)



To summarize section 2, readings A and B straightforwardly result if we assume that, as happens with intensional verbs like *look for*, ⟦*know*⟧ takes an argument of intensional type derived either from the extension of the complement NP or from its intension. Using only the NP's extension –unambiguously of type <s,e> in account 1, ambiguously of type <s,e> and <s,<s,e>> in account 2, and unambiguously of type e in account 3– cannot produce the correct two sets of truth-conditions without also generating unwanted readings.[21]

[20] I thank Line Mikkelsen for raising this question.

[21] An appendix at the end of this paper tackles the question whether extensional verbs, e.g., *kill*, also enjoy the freedom to use the NP's intension or extension.

3. AMBIGUITIES IN SPECIFICATIONAL SUBJECT NPS

3.1. Ambiguities for specificational subjects with *be*

Interestingly, specificational *be* displays readings parallel to reading A and reading B for *know*. In the same way that the complement of *know* can contribute a question or a meta-question, so can the subject of specificational *be* –e.g., *[$_{NP}$ the price that Fred thought was $1.29]*– ambiguously contribute a question or a meta-question. After the copula, the answer to that question or meta-question is enunciated, and this naturally disambiguates the reading of the SS. The example and paraphrase in (56)-(57) illustrate reading A and (58)-(59) exemplify reading B:

(56) The price that Fred thought was $1.29 was (actually) $1.79.

(57) **Reading A**: 'The question whose answer Fred thought was '$1.29' has as its real answer '$1.79'.'

There are several relevant questions about prices: 'How much does the milk cost?'
'How much does the oil cost?'
'How much does the ham cost?'

For one of these questions –e.g., the first one—, Fred thought the answer was '$1.29'. But the actual answer to this question is '$1.79'.

(58) The price that Fred thought was $1.29 was the price of milk.

(59) **Reading B**: 'The question the answer to which Fred thought was '$1.29' is 'How much does the milk cost?'.'

There are several relevant questions about prices: 'How much does the milk cost?'
'How much does the oil cost?'
'How much does the ham cost?'

For one of these questions, Fred thought the answer was '$1.29'.

Then, there is the "meta-question" asking which of these questions is the one whose answer Fred thought was $1.29.
The answer to the meta-question is 'How much does the milk cost?'.
That is, Fred thought that the price of milk is $1.29.

Are the sentences (56) and (58) specificational as opposed to predicational? That (56) is a specificational sentence is hardly questionable: it is like the sentence *The price of milk is $1.79* except for the choice of definite description. As for (58), the intended meaning involves a de dicto reading of the post-copular phrase *the price of milk* under *thought*. That is, Fred thought: "The price of milk is $1.29". This is an instance of opacity connectivity, a trait of specificational but not of predicational sentences, as we saw in section 1. Note that, although definite descriptions like *the price of milk* can in principle be used predicatively after predicational *be*, e.g., *the nicest person I ever met* in (60), they cannot be used predicatively and at the same time display opacity connectivity. This is shown in (61). Given the potential principle C configuration between he_1 and $John_1$, sentence (61) is grammatical only under its predicative reading. Crucially, the post-copular phrase *the interesting books about John* in (61) cannot be understood de dicto under *thinks*. This means that, when a post-copular phrase has a de dicto interpretation in this type of configuration, like *the price of milk* in (58), we can be sure that this phrase is not being used predicatively in a predicational copular sentence; the sentence has to be specificational.[22]

(60) Martin is (handsome and) the nicest person I ever met.

(61) The books that he_1 thinks I wrote are the interesting books about $John_1$.

To further test the specificational nature of sentences with readings A and B, let us use examples with bound variable connectivity. Consider scenario (62) and the examples (63) and (64). Example (63) expresses reading A and example (64) has reading B. As bound variable

[22] I thank a reviewer for urging me to rule out the possibility that *the price of milk* in (58) is the main predicate in a predicational copular sentence.

connectivity into the post-copular phrase is a property of specificational but not of predicational sentences, sentences (63) and (64) cannot be predicational:

(62) Scenario for (63)-(64):
A group of 3-year old girls from the Ukraine were given in adoption to several families in Barcelona. The director of the adoption program encouraged the biological relatives of each girl to keep in touch with her by writing letters, telling them though that they should not identify themselves using their name, family relationship or address. After a couple of years, the girls have developed some hypotheses about who every secret writer may or may not be. For example, no girl thinks that the one who writes to her the least can possibly be her mother. In fact, they are all right about that, since, for every girl, the one who writes to her the least is her uncle.

(63) Reading A:
The anonymous writer that no $girl_1$ thinks can possibly be her_1 mother is (in fact) her_1 uncle.

(64) Reading B:
The anonymous writer that no $girl_1$ thinks can possibly be her_1 mother is the one who writes to her_1 the least.

In the following subsection, §3.2, I extend the proposed intensional analysis of *know*+CQ to *be*+SS. Subsection §3.3 applies to specificational *be* the three purely extensional accounts and shows that these extensional accounts fail.

3.2. Proposal for specificational subjects: using both the extension and the intension of the NP

The analysis proposed for *know* in section §2.3 also yields the desired results for specification *be*. Under this analysis, specificational *be* is an intensional verb whose second semantic argument must be of an intensional type. As in the case of *look for* and *know*, this intensional semantic object can be retrieved either from the extension or from the intension of its subject NP. The gist of the account is summarized in (65). The intension of the subject NP is computed in (66) and the lexical entries needed are spelled out in (67):

(65) The price that Fred thought was \$1.29 was …

a. Reading A: EXTENSION of *[$_{NP}$ the price that Fred thought was \$1.29]* + ⟦*be* …⟧

b. Reading B: INTENSION of *[$_{NP}$ the price that Fred thought was \$1.29]* + ⟦*be* …⟧

(66) the price that Fred thought was \$1.29

NP $\lambda w^*.\ \iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall w'' \in Dox_f(w^*)$ [$\underline{x}$(w'') = \$1.29]]

r u

$\lambda P_{<<s,e>,<s,t>>} \lambda w^*.$ the N' $\lambda \underline{x}_{<s,e>} \lambda w^*.$ price($\underline{x}$,w*) & $\forall w'' \in Dox_f(w^*)$[$\underline{x}$(w'') = \$1.29]

$\iota \underline{x}_{<s,e>}$ [P($\underline{x}$)(w*)=1] e i

price CP $\lambda \underline{x}_{<s,e>} \lambda w^*. \forall w'' \in Dox_f(w^*)$ [$\underline{x}$(w'') = \$1.29]

$\lambda \underline{x}_{<s,e>} \lambda w^*.$price($\underline{x}$,w*) e i

that$_5$ IP $\lambda w^*. \forall w'' \in Dox_f(w^*)$ [g(5)(w'') = \$1.29]

e i

Fred VP

e i

thought CP $\lambda w.$ g(5)(w) = \$1.29

$\lambda p_{<s,t>} \lambda z_e \lambda w^*.\ \forall w'' \in Dox_z(w^*)$ [p(w'')=1] 6

$t_{5\ <s,e>}$ was$_{1,spec}$ \$1.29

(67) a. ⟦*Be*$_{1,spec}$⟧ = $\lambda x_e \lambda \underline{y}_{<s,e>} \lambda w_s.\ \underline{y}(w) = x$

b. ⟦*Be*$_{2,spec}$⟧ = $\lambda \underline{x}_{<s,e>} \lambda \underline{y}_{<s<s,e>>} \lambda w_s.\ \underline{y}(w) = \underline{x}$

Reading A obtains when the extension of the NP in (66) is used as the argument of matrix *be*$_1$:

(68) **Reading A**:

a. Extension of the NP in w:

$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = \$1.29]]

b. Extension of the NP + ⟦*be*$_1$ …⟧

λw. $\iota \underline{x}_{<s,e>}$[price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = \$1.29]] (w) = \$1.79

Reading B results if the NP's intension is taken as the semantic argument of matrix *be*$_2$:

(69) **Reading B**:

a. Intension of the NP:

λw*. $\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = \$1.29]]

b. Intension of the NP + ⟦*be*$_2$ …⟧

λw. [λw*. $\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w*) & $\forall$w''$\in$Dox$_f$(w*) [$\underline{x}$(w'') = \$1.29]] (w) =

λw'.ιx_e [price-of-milk(x,w')]]

c. Simplification:

λw. [$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,w) & $\forall$w''$\in$Dox$_f$(w) [$\underline{x}$(w'') = \$1.29]] =

λw'.ιx_e [price-of-milk(x,w')]]

3.3. Purely extensional treatments of the specificational subject NP

3.3.1. Account 1: computing the NP's extension at different evaluation worlds

Account 1 is not applicable because there is only one operator in the formula (70), namely λw, that could possibly bind the world variable at which the formal predicates *price* and *thought* are evaluated. Thus, the ambiguity of the SS cannot be built on the choice of world variable.

(70) The price that Fred thought was \$1.29 was …

λw. [$\iota \underline{x}_{<s,e>}$ [price($\underline{x}$,**??**) & $\forall$w''$\in$Dox$_f$(**??**) [$\underline{x}$(w'') = \$1.29]] (w) = …]

3.3.2. Account 2: taking the NP's extension and varying the type of the trace

Account 2 is applicable but it runs into the same overgeneration problem as before. To produce reading A in (72), we need the lexical entry $be_{1,spec}$ in (71a). Reading B in (73) requires the lexical entries $be_{2,spec}$ (for matrix *be*) and $be_{3,spec}$ (for embedded *be*) in (71b,c):

(71) a. $[\![Be_{1,\text{spec}}]\!] \quad = \quad \lambda x_e \lambda \underline{y}_{<s,e>} \lambda w_s.\ \underline{y}(w) = x$

b. $[\![Be_{2,\text{spec}}]\!] \quad = \quad \lambda \underline{x}_{<s,e>} \lambda \underline{y}_{<s,<s,e>>} \lambda w_s.\ \underline{y}(w) = \underline{x}$

c. $[\![Be_{3,\text{spec}}]\!] \quad = \quad \lambda \underline{x}_{<s,e>} \lambda \underline{y}_{<s,<s,e>>} \lambda w_s.\ \underline{y}(w)(w) = \underline{x}$

(72) **Reading A:** The price that Fred thought was \$1.29 was (actually) \$1.79.

$\lambda w.\ \iota \underline{x}_{\mathbf{<s,e>}}\ [\text{price}(\underline{x},w)\ \&\ \forall w\text{''} \in Dox_f(w)\ [\underline{x}(w\text{''}) = \$1.29\ ]\ ]\ (w) \quad = \quad \$1.79$

(73) **Reading B:** The price that Fred thought was \$1.29 was the price of milk.

$\lambda w.\ \iota \underline{x}_{\mathbf{<s,<s,e>>}}\ [\text{price}(\underline{x}(w),w)\ \&\ \forall w\text{''} \in Dox_f(w)\ [\underline{x}(w)(w\text{''}) = \$1.29\ ]\ ]\ (w) \quad =$

$\lambda w'.\iota x_e\ [\text{price-of-milk}(x,w')]$

But, if we admit $be_{3,spec}$ into the lexicon, then we would also generate the unavailable reading B' for sentence (74). (74) can be used to mean that the price of milk, which happens to be the price that Fred knows, is \$1.79. But (74) cannot be used with reading B', meaning roughly that the price meta-question $\iota \underline{x}_{<s,<s,e>>}[\ldots]$ –e.g., 'What price does John know?'– has as its answer a question whose answer in turn is \$1.79. This is not a possible reading for sentence (74), as the sentence is false in scenario (76).

(74) The price that Fred knows is \$1.79.

(75) **Reading B':**

$\lambda w.\ \iota \underline{x}_{\mathbf{<s,<s,e>>}}\ [\text{price}(\underline{x}(w),w)\ \&\ \forall w\text{''} \in Dox_f(w)\ [\underline{x}(w\text{''}) = \underline{x}(w)\ ]\ ]\ (w)\ (w) \quad = \quad \$1.79$

(76) Scenario:

Fred knows what price John knows –namely, Fred knows that John knows how much the milk costs— and Fred knows nothing else about prices. Among other things, Fred does not know how much the milk costs. The milk actually costs $1.79.

Thus, account 2 of specificational *be* overgenerates and fails.[23]

3.3.3. Account 3: pragmatic account

Account 3 treats the SS as being of type e and it adds an intensional argument P that is contextually determined. It maps sentence (77) to the formula in (78), which is true in a world w iff the capital of Italy at w equals Rome under some description P (e.g., 'being the capital of Italy') in w. This seems correct. However, by a similar derivation, (79) would yield the formula (80), which is true in w iff Rome is Rome under some description P in w, or, simplifying, iff Rome has property P in w. But then the sentence (79) would be expected to have the reading "Rome has property P" for some salient P. No matter how we manipulate the context, this expectation is not borne out.

(77) The capital of Italy is Rome.

[23] If we translate specificational *be* simply as the crosscategorial identity '=' predicate between two objects of the same type, as in (i), taking the extension of the SS as the only source of *be*'s argument leads exactly to the same problem as the lexical entries in (71). To generate reading B, we would need semantic rules that allow us to combine the extension of the matrix subject $-\iota \underline{x}_{<s,<s,e>>}[\ldots]-$ with one world variable and the denotation of the embedded subject $-\underline{x}_{<s,<s,e>>}$, or g(5)– with two world variables, as shown in (ii)-(iii) below. But once the semantic rules allow us to combine an NP's extension with one or two world variables before combining it with its verb, there are no means to block reading B'.

(i) $[\![be_{spec}]\!] = \lambda y_\tau \lambda x_\tau.\ x=y$

(ii) $[\![t_{5<s<s,e>>} \textit{ was \$1.29}]\!]^g = g(5)(w)(w') = \$1.29$

$= \lambda w'.\ g(5)(w)(w') = \$1.29$ [λ-binding of variable w']

(iii) $[\![\textit{The price that Fred thought } t_{5<s<s,e>>} \textit{ was \$1.29 was the price of milk}]\!]^g$

$= \iota \underline{x}_{<s,<s,e>>} [\text{price}(\underline{x}(w),w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w)(w'') = \$1.29\ ]\ ]\ (w) = \lambda w'.\iota x_e[\text{price-of-milk}(x,w')]$

$= \lambda w.\ \iota \underline{x}_{<s,<s,e>>}[\text{price}(\underline{x}(w),w)\ \&\ \forall w'' \in Dox_f(w)\ [\underline{x}(w)(w'') = \$1.29\ ]\ ]\ (w) = \lambda w'.\iota x_e[\text{price-of-milk}(x,w')]$

[λ-binding of variable w]

(78) λw. be (ιx_e[capital-of-Italy(x,w)], P, rome, w)

(79) Rome is Rome.

(80) λw. be (rome, P, rome, w)

As for the ambiguity of the SS *[$_{NP}$ the price that Fred thought was $1.29]*, account 3 does not help us derive the reading B of (81). The closest that it will get us is (82). (82) says that there is a particular object/number x_e of which Fred believes in a de re fashion that x equals $1.29 under some description Q. More simply (and assuming Fred's beliefs are consistent): Fred thinks $1.29 has some salient property Q. Further, this object x_e equals the number that the price of milk amounts to in the actual world w under some salient description P. That is, x_e, i.e., $1.29, has some salient property P in the actual world w. This boils down to saying that $1.29 has some salient property Q in Fred's belief alternatives w' and some salient property P in the actual w, as stated in (83a). But this is not reading B. The correct paraphrase for reading B would be (83b). This paraphrase cannot be generated using exclusively the NP's extension and taking it as type e, for the reasons we saw in §2.4.

(81) The price that Fred thought was $1.29 was the price of milk.

(82) λw.be (ιx_e[price(x,w) $\wedge$ $\forall$w"$\in$Dox$_f$(w)[be(x,Q,\$1,29,w")]], P, ιx_e[price-of-milk(x,w)],w)

(83) a. $1.29 has some salient property Q in Fred's belief alternatives w' and some salient property P in the actual w.

b. $1.29 has some salient property Q (e.g., 'being the price of milk') in Fred's belief alternatives w', and the question 'How much does the milk cost?' has some salient property P (e.g., 'being the question that Fred thought has '$1.29' as answer') in the actual w.

To conclude section 3, attempts centering solely on the extension of the specificational subject NP fail. To derive the correct empirical pattern, we must allow specificational *be* to combine with the extension and with the intension of the SS NP. Hence, the same analysis proposed for *know* arises for *be*. Specificational *be* is an intensional verb with respect to its subject position. Its subject NP can be used referentially (i.e., extensionally) or intensionally, like any other NP combining with intensional verbs. When the NP is used to refer, it must refer to an intensional object, for that is what specificational *be* semantically requires. When the NP is used intensionally, it directly contributes its intension as the argument of *be*.[24]

4. Implications of a unified analysis of CQs and SS

The previous sections have addressed the two main goals of the present paper:

i. Section 2 provided an analysis of the reading A / reading B ambiguity in CQ NPs: reading A arises when intensional *know* combines with the NP's extension, and reading B obtains when *know* combines with the NP's intension.

ii. Section 3 showed that SSs display the same ambiguity between reading A and reading B, and it extended the intensional analysis of *know* to specificational *be*.

The result is a unified semantic analysis of CQs with *know* and SSs with *be*. This unified approach has interesting further implications. First, it raises the question whether CQs and SSs share, besides the ambiguity at hand, some other grammatical features that group them together and differentiate them from other NPs. This question is addressed in §4.1. Second, the proposed analysis of specificational *be* occupies the middle ground between the two main competing semantic analyses of specificational sentences in the literature, the 'as is' account and the 'question plus deletion' account. The question then arises whether the new semantics has any impact on connectivity, forcing us to derive it as in the former account or as in the latter. In §4.2, I will show that the proposed intensional analysis of *be* does not decide the connectivity question. I will briefly sketch two possible implementations of the present analysis of *be*, one for each approach to connectivity, and I will leave the choice between the two undecided.

[24] See appendix to rule out a variant of the proposed analysis where *be* is not intensional but merely the identity predicate '=' taking two arguments of the same type τ.

4.1. Further similarities between CQs and SSs

CQs and SSs exhibit other grammatical properties that group them together and set them apart from other types of NPs. Here I will briefly discuss two such properties: pronominalization in referentially based gender languages (Romero 2004a), and mention-some readings in Spanish (Romero, to appear).

Gender marking in English is based on the referential properties of the NP. If the referent is a human female, the pronoun will appear in the feminine. If the referent is a human male, the pronoun will have masculine form. And in (roughly) all other cases the pronoun will have neuter form. This is illustrated in (84), where the boldface pronoun and the NP in the preceding clause are intended as co-referential:

(84) The winner of the Oscar for best actress walked in. **She / *it** was wearing a red dress.

It has been observed that pronominalization of English SSs differs in this respect (Higgins 1973, Heycock and Kroch 1999; see also Büring 1998 for German, Mikkelsen 2004 for Danish). To refer to the semantic value of a given SS, the neuter form of the pronoun must be used, disregarding the gender that the full-fledged version of the NP is usually linked to. This is illustrated in (85):

(85) The girl who caused the trouble wasn't Mary. **It / *She** was Jane.

Interestingly, Romero (2004a) notes that the same constraint that requires neuter pronominalization of SSs holds for CQs:

(86) John guessed the winner of the Oscar for best actress before I guessed **it / *her**.

The same pattern obtains in Finnish. Pronouns functioning as regular NPs must match the gender (human *hän* 'he/she' or non-human *se* 'it') of the referent, as in (87). But pronouns functioning as SSs and CQs must appear in the non-human form *se* 'it', as in (88) and (89):

(87) Naispääosa-Oscarin voittaja astui sisään.
Female-lead-Oscar-GEN winner-NOM stepped in.
Hän oli pukeutunut punaiseen pukuun.
She/he-NOM was dressed red-ILLATIVE evening-dress-ILLATIVE
'The winner of the Oscar for best actress walked in. **She** was wearing a red dress.'

(88) Tyttö joka aiheutti tämän ongelman ei ollut Mari.
Girl-NOM who caused this-ACC problem neg was Mari-NOM.
Se / # hän oli Liisa.
It-NOM **/ # she/he** was Liisa-NOM
'The girl who caused this problem was not Mari. **It / #she** was Liisa.'[25]

(89) Jussi arvasi naispääosa-Oscarin voittajan ennen kuin
Jussi-NOM guessed female-lead-Oscar-GEN winner-ACC before(2words)
Maria arvasi **sen**.
Maria-NOM guessed **it**-ACC
'Jussi guessed the winner of the best lead actress Oscar before Maria guessed **it**.'

A second common feature of CQs and SSs are existential-like readings. Definite CQs and SSs in Spanish differ from other definite NPs in allowing certain existential-like readings in contexts where regular NPs do not. Consider the dialog in (90), in particular the first predicational sentence in (90B). The free relative *lo que también llevaba* 'what he was also wearing' refers to the sum of (roughly) all the garments that Carlos was wearing other than the hat. Of this sum, it is predicated that it was out of style. That is, if besides the hat Carlos was wearing pants, a shirt, a vest and shoes, (roughly) all these elements were out of style.[26]

[25] My informant reports that *hän* 'she' can be used in some variants of (88) in which the speaker wants to refer to the actual person who caused the trouble. That would be the case in mistaken identity scenarios, for example if the girl who caused the trouble is standing next to the speaker but it is not obvious whether that particular girl is Mari or Liisa. The same holds for the English version (85). In specificational sentences, though, *she / hän* is disallowed.

[26] The sum reading in (90B) allowing for possible exceptions can be derived using, e.g., ill-fitting covers (Brisson 1998). Still, (90B) has an almost universal reading of the NP, in contrast with the much weaker, existential-like

(90) Subject of a predicational sentence:

A: He oído que Carlos ayer llevaba un sombrero de ala ancha
Have-1s heard that Carlos yesterday was-wearing a hat of brim wide
que causó la admiración de todos los presentes.
that caused the admiration of all the those-present
'I heard that Carlos was wearing a wide-brimmed hat yesterday that everybody admired.'

B: (??) <u>Lo que también llevaba</u> estaba pasado de moda.
The that also was-wearing-3s was passed of style
Y, además, no le sentaba nada bien.
And, on-top-of-that, not to-him suited-3s at-all well
'<u>What he was also wearing</u> was out of style. And, on top of that, it didn't suit him at all.'

In contrast, *saber* 'know' plus the CQ *lo que también llevaba* 'what he was also wearing' has a much weaker reading in (91). For speaker B to have the property [[*saber lo que también llevaba*]] 'to know what he was also wearing' in (91), it suffices that B knows *something* that Carlos was wearing besides the hat. That is, if Carlos was wearing pants, a shirt, a vest and shoes besides the hat, B counts as knowing what Carlos was (also) wearing in (91) if B knows that Carlos was wearing tight orange pants even if B has no belief about a shirt, a vest and shoes. In fact, the reading at issue is exactly the same as in the interrogative counterpart in (92). This reading is commonly referred to as the "mention-some" reading (Groenendijk and Stokhof 1984, Beck and Rullmann 1999).

(91) Concealed Question:

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reading to be discussed for (91) and (93). Existential readings of free relatives in predicational sentences have been observed in certain configurations too, like the locative adjunct in (i) (Caponigro 2004). The examples (90), (91) and (93) in the text are construed as a minimal triple to factor out those configurations.

(i) John has been where no one has been before.

a. Existential reading: 'John has been in *some* place where no one has been before.'

B: Sabes lo que también llevaba? Unos pantalones naranjas estrechos
Know-2s the that also was-wearing-3s? Some pants orange tight
que estaban pasados de moda. Y, además, no le sentaban nada bien.
that were passed of style . And, on-top-of-that, not to-him suited at-all well
'Do you know what he was also wearing? A pair of tight orange pants that were out of style. And, on top of that, they didn't suit him at all.'

(92) Interrogative Clause:
B: Sabes qué llevaba también? Unos pantalones naranjas estrechos
Know-2s what was-wearing-3s also? Some pants orange tight
que estaban pasados de moda. Y, además, no le sentaban nada bien.
that were passed of style . And, on-top-of-that, not to-him suited at-all well
'Do you know what he was also wearing? A pair of tight orange pants that were out of style. And, on top of that, they didn't suit him at all.'

Interestingly, SSs pattern like CQs and unlike regular NPs in allowing this type of mention-some reading, witness (93). (93) is true if Carlos was wearing tight orange pants besides the hat regardless of whether he was wearing any other garments or not. That is, the truth-conditions of (93) are parallel to those of the existential paraphrase "*Something* he was wearing besides the hat was a pair of tight orange pants".[27]

(93) Specificational Subject:
B: Lo que también llevaba eran unos pantalones naranjas estrechos
The that also was-wearing-3s were some pants orange tight

[27] Mention-some readings of CQs and SSs are more easily –though not exclusively– available using the particle *también* 'also' within the relative clause. In fact, the particle *también* 'also' allows us to detect a slight grammaticality contrast between regular NPs on the one hand and CQs and SSs on the other: *también* 'also' makes the predicational sentence in (90) slightly deviant (signaled as ??), whereas it is perfectly fine in the CQ in (91) and in the SS in (93). The grammaticality contrast in Spanish is parallel to the judgement hinted at in Higgins (1973:10): "[i] has the specificational reading, [ii] the predicational reading".

(i) What he is also pointing at is a kangaroo.

(ii) What he is pointing at is also a kangaroo.

que estaban pasados de moda. Y, además, no le sentaban nada bien.
that were passed of style . And, on-top-of-that, not to-him suited at-all well
'What he was also wearing was a pair tight orange pants that were out of style. And, on top of that, they didn't suit him at all.'

In sum, besides the ambiguity between reading A and reading B, CQs and SSs share at least two other properties that distinguish them from regular NPs in predicational sentences: gender in pronominalization and mention-some readings.

4.2. On previous approaches to specificational *be* and connectivity

The proposed analysis of specificational *be* shares some properties with the 'as is' account and some insights with the 'question plus deletion' account. But it equals neither. In fact, this paper has argued that a hybrid semantic analysis which further adds one novel feature –namely, the intensionality of *be*– is correct.

With the 'as is' account, the proposed analysis shares the treatment of specificational subject NPs as syntactic and semantic NPs. But it differs in one important respect. Under the 'as is' account, the pre-copular NP in (94) is interpreted as an extensional NP and *be* is taken as the identity relation, asserting that the pre- and post-copular phrases have the same denotation, as illustrated in the first line in (95b). This procedure will not do for the example of reading A in (96), as shown in (97). The denotation (i.e., extension) of the NP *[$_{NP}$ The price that Fred thought was $1.29]* in (96) is an individual concept, e.g., the individual concept 'the price of milk', and this individual concept does not equal the denotation of the name in *[$_{NP}$ $1.79]*. In contrast, the proposed analysis of *be* as a verb taking an intensional object correctly captures this example.[28]

(94) What Mary read was *Huck Finn*.

(95) 'As is' account:

[28] For variants of account 2 and of the final proposal treating specificational *be* simply as the identity relation '=' between two objects of the same type τ, see footnote 23 and the appendix. Both variants present problems.

a. S-Str / LF: [$_{NP}$ What Mary read] was [$_{NP}$ *Huck Finn*]

b. Semantics: $\lambda w.\ [[\![\textit{What Mary read}]\!](w) = [\![\textit{Huck Finn}]\!](w)\ ]$

$\lambda w.\ [\ \mathrm{Max}\ (\lambda x.\mathrm{read}(m,x,w)) = hf\ ]$

(96) The price that Fred thought was \$1.29 was (actually) \$1.79.

(97) ‘As is’ account:

a. S-Str / LF: [$_{NP}$ The price that Fred thought was \$1.29] was [$_{NP}$ \$1.79]

b. Semantics: $\lambda w.\ [\ [\![\textit{The price that Fred thought was \$1.29}]\!](w) = [\![\textit{\$1.29}]\!](w)\ ]$

$\lambda w.\ [\ \mathrm{Max}\ (\lambda \underline{x}_{<s,e>}.\mathrm{price}(\underline{x},w)\ \&\ \forall w'\in \mathrm{Dox}_f(w)[\underline{x}(w')=\$1.29]) = \$1.29]$

The ‘question plus deletion’ account is recalled under (98). A question meaning (of type <s,<s,t>>, following Groenendijk and Stokhof 1984) arises from the SS, regardless of whether the SS is taken syntactically as a NP or as an interrogative clause. The value of this question meaning at a given world w, and not the question meaning itself, is the external argument of *be*. The other argument of *be* is a proposition obtained from the partially elided post-verbal clause plus the exhaustivity implicature derived from focus on *Huck Finn*. Finally, *be* is taken to simply denote the identity relation between its two arguments:

(98) Question plus deletion account:

a. LF: [$_{CP/NP}$ What Mary read] was [$_{IP}$ ~~Mary read~~ *Huck Finn*$_{FOCUS}$].

b. Semantics:

$[\![[_{CP/NP}\ \textit{What Mary read}]]\!]^g(w) = \lambda w'[\ \lambda x.\mathrm{read}(m,x,w') = \lambda x.\mathrm{read}(m,x,w)]$

$[\![[_{IP}$ ~~*Mary read*~~ $\textit{Huck Finn}_{Foc}]]\!]^g$ (plus implicatures) =

$\lambda w'[\mathrm{read}(m,hf,w')\ \&\ \neg\exists y[y\neq hf\ \&\ \mathrm{read}(m,y,w')]]$

$[\![[_{CP/NP}\ \textit{What Mary read}]\ \textit{was}\ [_{IP}$ ~~*Mary read*~~ $\textit{Huck Finn}_{FOCUS}]]\!]^g$

= $\lambda w.\ [\![[_{CP/NP}\ \textit{What Mary read}]]\!]^g(w) = [\![[_{IP}$ ~~*Mary read*~~ $\textit{Huck Finn}_{FOCUS}]]\!]^g$ (plus impl.)

= $\lambda w\ [\ \lambda w'[\ \lambda x.\mathrm{read}(m,x,w') = \lambda x.\mathrm{read}(m,x,w)] =$

$\lambda w'\ [\mathrm{read}(m,hf,w')\ \&\ \neg\exists y\ [y\neq hf\ \&\ \mathrm{read}(m,y,w')]\ ]\ ]$

With the 'question plus deletion' approach, the present analysis shares the idea that a SS is not a regular NP but is in some way similar to a question. Indeed, we have seen that SSs pattern like CQs and unlike regular NPs with respect to the reading A / reading B ambiguity, gender in pronominalization and mention-some readings. But, leaving aside the format differences between an individual concept and a (Karttunen-style) question meaning, the two approaches differ with respect to intensionality. Whereas the present analysis treats *be* as an intensional verb, the 'question plus deletion' approach treats *be* as the identity relation '=' and feeds it the question's extension. This means that it is not clear how to generate reading A in (96). The semantic rules that in the 'question plus deletion' account map the NP *[?x the capital of Italy (x)]* to the (predicational) question meaning 'What is the capital of Italy?' will map *[?x the price that Fred thought was $1.29 (x)]* in (96) to the question meaning 'What is the price that Fred thought was $1.29?' (see Schlenker 2003:196ff). But, then, the value in w of this question meaning –e.g., the proposition 'Fred thought the price of milk was $1.29 and he thought so of nothing else'– will be wrongly equated with the proposition 'Fred thought $1.79 was $1.29 and he thought so of nothing else', as sketched in (99).[29]

[29] A reviewer suggests that perhaps reading A can be derived within the 'question plus deletion' account if we treat *[the price that Fred thought was $1.29]* in (96) as a garden-variety definite description. We could say that *[the price that Fred thought was $1.29]* is used here to refer to the individual concept 'the price of milk'. Then, the structure *[?x the price that Fred thought was $1.29 (x)]* is mapped to the (predicational) question meaning 'What is the price of milk?' rather than to 'What is the price that Fred thought was $1.29?'. In fact, this procedure is parallel to the implementation (ii) introduced below in (108): $\underline{y}_{<s,e>}$ may correspond to the extension of the NP *[the price that Fred thought was $1.29]*, and ANS_{STR} does the job that *?x* does in Schlenker (2003). However, the difference in intensionality between the two approaches remains. Under the version of the 'question plus deletion' account in Schlenker (2003), *be* takes the extension of that question meaning, i.e., $[\text{ANS}_{\text{STR}}(\underline{y})(w)]_{<s,t>}$ for some w, whereas in the intensional approach *be* takes $[\text{ANS}_{\text{STR}}(\underline{y})]_{<s,<s,t>>}$. Note that, generalizing from examples with *know* with an interrogative clause, the latter avenue seems to be correct. To see this, consider (i). If *know* was allowed to combine with the extension $[\text{ANS}_{\text{STR}}([\![\text{CP}]\!])(w)]_{<s,t>}$ for some w, we would be able to derive the reading in (ii), in which the entire complement of *know* is taken de re with respect to *believe*. Then, the sentence would have a reading that is true in scenario (iii), where Mary claimed John knows who came but she doesn't have the correct answer in mind. But the sentence is judged false in this scenario. In sum, to exclude readings like (ii), *know* –and, generalizing, *be*– should take $[\text{ANS}_{\text{STR}}(\underline{y})]_{<s,<s,t>>}$.

(i) Mary didn't claim that John knows who came to the party.

(ii) 'There is a proposition p in w such that:

$$p = \text{ANS}_{\text{STR}}([\![\textit{who came to the party}]\!])(w)$$

(99) ‘Question plus deletion’ account:

a. LF: $[_{CP/NP}$ The price that Fred thought was \$1.29] was $[_{IP}$ ~~Fred thought~~ \$1.79 ~~was \$1.29~~]

b. Semantics:

λw. ⟦*The price that Fred thought was \$1.29*⟧^{g} (w) =

⟦~~*Fred thought*~~ *\$1.79*$_{FOCUS}$ ~~*was \$1.29*~~⟧^{g}

$\lambda w.\ [\ \lambda w'\ [\ \lambda \underline{x}_{<s,e>}.price(\underline{x},w')\ \&\ \forall w'' \in Dox_f(w')[\underline{x}(w'')=\$1.29] =$

$\lambda \underline{x}_{<s,e>}.price(\underline{x},w)\ \&\ \forall w'' \in Dox_f(w)[\underline{x}(w'')=\$1.29]\ \ ]\ \ =$

$\lambda w'\ [\forall w'' \in Dox_f(w')[\$1.79=\$1.29]\ \&\ \neg\exists y[y \neq \$1.79\ \&\ \forall w'' \in Dox_f(w')[y=\$1.29]]]\ ]$

Admittedly, the present proposal does not decide upon the perhaps most notable difference between the ‘as is’ account and the ‘question plus deletion’ account, namely the derivation of connectivity effects. In the ‘as is’ account, the post-verbal constituent is fully overt and connectivity is derived through semantic mechanisms and economy considerations. In the ‘question plus deletion’ approach, the post-copular constituent is a partially elided clause and connectivity arises from the syntax of this clause. The intensionality of specificational *be* can, in fact, be implemented assuming the post-copular syntax of either connectivity account. In the remainder of this section, I briefly sketch two such implementations. In implementation (i), the degree of exhaustivity –strong exhaustivity vs. the mention-some reading– is built into the lexical meaning of *know* and *be*, and the post-copular phrase is an NP, as in the ‘as is’ account. In implementation (ii), the degree of exhaustivity is introduced by a separate operator ANS, and

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=e.g. ‘that Pat, Sue and nobody else came to the party’

and it is not the case that Mary claimed of this particular proposition p that John knows it.’

(iii) Scenario: Pat and Sue are the only ones that came to the party in the actual world w, but Mary wrongly believes that it was Mark and Paul. Mary claimed that John knows who came to the party. Mary made no other claim, in particular, she made no claim that the proposition ‘that Pat, Sue and nobody else came to the party’ is known to John.

the post-copular constituent is a partially elided clause, as in the 'question plus deletion' account.[30]

In implementation (i), we have a lexical entry for strongly exhaustive *know*$_{CQ}$, given in (100) (=(20)) and another entry for mention-some *know*$_{CQ}$, in (101):[31]

(100) $[\![know_{CQ,STR}]\!] = \lambda \underline{y}_{<s,e>}\lambda x_e \lambda w.\ \forall w' \in Dox_x(w)\ [\ \underline{y}(w') = \underline{y}(w)]$ STRONGLY EXH.

(101) $[\![know_{CQ,SOME}]\!] = \lambda \underline{y}_{<s,e>}\lambda x_e \lambda w.\ \exists z_e\ [\ \underline{y}(w) \geq z\ \ \&\ \ \forall w' \in Dox_x(w)\ [\underline{y}(w') \geq z]\ ]$

MENTION-SOME

This derives two different degrees of exhaustivity for the Spanish sentence (102). Here I will only spell out the strongly exhaustive reading, in (103). For the sake of illustration, assume that Pat and Sue are the persons that came in the actual world w.

(102) Juan sabe las personas que (también) vinieron.
Juan knows the persons that (also) came
'Juan knows what persons (also) came.'

(103) [[*John know*$_{CQ,STR}$ *the persons that came*]]
$= \lambda w.\ \forall w' \in Dox_{john}(w)\ [\sigma x{:}came(x,w') = \sigma x{:}came(x,w)\ ]$
$=1$ e.g. in w iff $\forall w' \in Dox_{john}(w)\ [\sigma x{:}came(x,w') = pat{+}sue\ ]$

Parallel verbal meanings can be provided for specificational *be*:

(104) $[\![be_{SS,STR}]\!] = \lambda x_e \lambda \underline{y}_{<s,e>}\lambda w.\ [\ \underline{y}(w) = x]$ STRONGLY EXH.

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[30] These two strategies to build exhaustivity are parallel to those considered for *know* plus interrogative clauses in Beck and Rullmann (1999), who in turn build on Heim (1994). I spell out the two implementations in detail in Romero (to appear).

[31] The symbol '≤' stands for the part-of relation among singular and plural individuals (Link 1983). The notation 'pat+sue' in the text below stands for the plural individual consisting exactly of Pat and Sue.

(105) $[\![be_{SS,SOME}]\!]$ = $\lambda x_e \lambda \underline{y}_{<s,e>} \lambda w.\ \exists z_e\ [\ \underline{y}(w) \geq z\ \&\ z = x\ ]$ MENTION-SOME

To illustrate one case, (104) yields the strongly exhaustive reading (107) for the sentence (106):

(106) Las personas que (también) vinieron fueron Patricia y Susana.
The person that (also) came were Patricia and Susana
'The persons that (also) came were Patricia and Susana.'

(107) $[\![$*The persons that came were$_{STR}$ Pat and Sue*$]\!]$
= $\lambda w.\ [\sigma x{:}came(x,w)\ =\ pat{+}sue\ ]$

Under implementation (i), the post-copular phrase in (107) is simply the NP *[$_{NP}$ Pat and Sue]*. Thus, connectivity can in principle be derived as in the 'as is' approach.

In implementation (ii), each degree of exhaustivity is introduced by an operator ANS separate from the verb. The ANS operators apply to the individual concept contributed by the NP to yield a propositional concept (or a generalized quantifier over propositional concepts). The operators are defined in (108)-(109):

(108) $ANS_{STR}\ (\underline{y}_{<s,e>})$ = $\lambda w \lambda w'.\ \underline{y}(w') = \underline{y}(w)$ STRONGLY EXH.

(109) $ANS_{SOME}\ (\underline{y}_{<s,e>})$ = $\lambda P_{<<s,<s,t>>,<s,t>>} \lambda w. \exists z_e [\ \underline{y}(w) \geq z\ \&\ P(\lambda w \lambda w'.\underline{y}(w') \geq z)(w)]$
MENTION-SOME

When applied to the NP in (110), ANS_{STR} gives us (111):

(110) $[\![$*[the persons that came]$_{NP}$*$]\!]$ = $\lambda w''.\ \sigma x{:}\ came(x,w'')$
=e.g. w is mapped to pat+sue

(111) ANS_{STR} ($[\![$*the persons that came*$]\!]$) = $\lambda w \lambda w'.[\sigma x{:}came(x,w') = \sigma x{:}came(x,w)\ ]$

In the case of CQs, the complex ANS(⟦NP⟧) then combines with *know*. The definition of *know* is (112). Assuming for the sake of illustration that the individual concept in (110) maps the actual world w to the sum pat+sue, the following truth-conditions result for the strongly exhaustive reading of example (102):

(112) ⟦*know*⟧ = $\lambda p_{<s,<s,t>>}\lambda x_e \lambda w.\ \forall w' \in Dox_x(w)\ [p(w)(w')=1]$

(113) ⟦*John knows* ANS_{STR} *the persons that came*⟧

= $\lambda w.\ \forall w' \in Dox_j(w)\ [\sigma x{:}came(x,w') = \sigma x{:}came(x,w)\ ]$

=1 e.g. in w iff $\forall w' \in Dox_j(w)\ [\sigma x{:}came(x,w') = pat{+}sue\ ]$

In the case of SSs, a propositional version of *be* is needed that takes the propositional concept ANS(⟦SS⟧) as its external argument. Since the degree of exhaustivity is encoded as part of the informativeness of a proposition (a more exhaustive proposition is a subset of a corresponding less exhaustive proposition), and since the exhaustivity is built into the external argument of *be*, this argument must be of some propositional type, in particular type <s,<s,t>>. The post-copular argument of *be* must be propositional too, namely <s,t>. That is, the post-copular constituent in (114) must be taken as the partially elided clause *[$_{IP}$ Pat and Sue ~~came~~]* rather than just as the NP *[$_{NP}$ Pat and Sue]*. This gives us the lexical entry for *be* in (115) and the strongly exhaustive truth-conditions in (116):

(114) Who / The persons that (also) came were [$_{IP}$ Pat and Sue ~~came~~]

(115) ⟦*be*⟧ = $\lambda q_{<s,t>}\lambda p_{<s,<s,t>>}\lambda w.\ p(w) = q$

(116) ⟦ANS_{STR} *The persons that came were Pat and Sue* ~~*came*~~⟧

= $\lambda w\ [\ \lambda w'[\sigma x{:}came(x,w') = \sigma x{:}came(x,w)] = \lambda w'[came(pat{+}sue,w')$ & nobody else came in $w']\ ]$

Hence, under implementation (ii), the post-copular phrase is treated as in the 'question plus deletion' account, as the clause *[$_{IP}$ Pat and Sue ~~came~~]*. Connectivity can, hence, be derived applying the standard tests on the partially elided post-copular clause.

The arguments presented in this paper on the intensionality of specificational *be* do not favor one approach to connectivity over the other. Under either implementation, the insight of the proposed analysis of reading A and reading B is maintained. First, the interpretation of the CQ and the SS is compositionally derived as that of any NP. Then, the CQ or SS contributes its intension or its extension, this choice being the source of the ambiguity. Finally, the NP's contribution serves as the direct argument of the verb (implementation (i)) or as the argument of the operators ANS, which then combines with the verb (implementation (ii)). Therefore, I leave the choice between the two implementations open in the present paper.[32]

5. CONCLUSIONS

This paper has argued for the following conclusions:

i. Epistemic *know* is an intensional verb with respect its object position. NPs in the object position of *know* are interpreted as contributing an intensional object. This intensional object corresponds to the extension of the NP (reading A) or to its intension (reading B).

ii. Specificational *be* is an intensional verb with respect to its subject position. Its NP subject constributes an intensional object, obtained from the extension (reading A) or from the intension (reading B) of the NP.

[32] I explore the consequences of these two implementations for connectivity in Romero (to appear).

iii. Besides the ambiguity between reading A and reading B, *know* and *be* share other characteristics that set them apart from regular NPs: gender in referentially based pronominalization and mention-some readings.

This paper has, thus, argued for a unified semantic analysis of epistemic *know* and specificational *be*.[33] I take the main contribution of the paper to be the discovery that CQs and SSs are, from a semantic point of view, exactly the same thing. They are –syntactically and semantically– Noun Phrases which happen to occur in a configuration with certain semantic characteristics, namely a configuration where they are (directly or indirectly) arguments of an intensional verb and where, furthermore, their referent is considered neuter and different degrees of exhaustivity are available. In other words, the term 'concealed question', as the term 'specificational subject', does not name an NP of a higher semantic type (e.g., of question type <s,<<s,t>,t>>).[34] Instead, I take the terms 'concealed question' and 'specificational subject' to name a simple NP occurring in a particular configuration of special semantic features.[35]

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[33] Caponigro and Heller (2003) present data from some languages where SSs are widely productive whereas CQs are more limited (e.g., English) or nonexistent (e.g., Macedonian). I do not take these data to challenge a unified semantic account of CQs and SSs. The fact that a given construction cannot occur in an environment X in a given language does not imply that it cannot occur in another environment Y in the same language (see Schlenker 2003:191 for discussion). The real question, I think, is why a language like English, having the grammatical tools to generate concealed question NPs with *know* or *tell*, only uses these tools to an intermediate degree of productivity, generating the CQ in (i) but barring the CQ in (ii). Partial productivity is probably a question about competition between grammars rather than about the design of one grammar in itself. The question why Macedonian uses the proposed semantic tools with *be* but not with *know* is exactly of the same nature.

(i) Tell me the candy Jill wants to buy. (Caponigro and Heller 2003)

(ii) */?? Tell me the boy who ran over my pet snake. (Caponigro and Heller 2003)

[34] I thank P. Jacobson for urging me to clarify that I do not consider the so-called concealed question NPs semantically as functions of type <s,<<s,t>,t>>, that is, as questions.

[35] Higgins (1973:268-276) argues that specificational subjects are 'superscriptional', noting that superscriptional readings are not to be identified with Donnellan's (1966) attributive use. The special semantic features of SSs (and CQs) observed in the present paper and the proposed intensional analysis of *be* can be taken as a step towards a formal characterization of Higgins' superscriptional use of (simple) NPs.

APPENDIX

The freedom to use the intension or the extension of the NP is a property of intensional verbs and it does not seem to be readily available for extensional verbs like *kill*. For intensional verbs like *know*, we concluded in section 2 that the NP may contribute its extension or its intension; either way, ⟦*know*⟧ combines with the object contributed by the NP. To see that extensional verbs do not enjoy the same freedom, consider the following hypothetical compositional procedure: the direct object NP of *kill* may contribute its extension or its intension; either way, ⟦*kill*⟧ –a function taking an object of type e– combines with the result of applying the NP's contribution to the local evaluation world w (and, if $[\![NP]\!]^{ext/int}(w)$ is not of type e, the computation crashes). Using situations instead of worlds, if *kill* could combine with $[\![NP]\!]^{ext}(s)$, we would wrongly predict the infelicitous (117) to have the coherent reading (117b), making the sentence true in scenario (117a). The truth-conditions in (117b) roughly say that around 330 B.C. Alexander the Great had a de dicto attitude towards, e.g., the whitest unicorn, and that yesterday John killed the unicorn that happened to be whitest yesterday, where the two relevant unicorns may be different actual physical objects. But this is not a possible reading for the sentence.

(117) # John killed (yesterday) what Alexander the Great was looking for in his conquests.

a. Scenario: Alexander the Great was in s' in a de dicto search for the whitest unicorn. John killed in s the whitest unicorn. The whitest unicorn at s' is a different physical object from the whitest unicorn at s.

b. *Kill* combining with $[\![NP]\!]^{ext}(s)$:

$\lambda s_0.\ \exists s\ [\ s \leq s_0\ \ \&\ \ s \leq yesterday\ \ \&\ kill\ (j,\ \iota \underline{x}_{<s,e>}[\exists s'[\ s' \text{ matches exactly the time of Alexander's conquests } \&\ unicorn(\underline{x},s')\ \&\ seek(a,\underline{x},s')]\ ]\ (s),\ s)\ \ ]$

Note that, if the value of the individual concept $\underline{x}_{<s,e>}$ in s' and the individual killed by John happen to converge on the same physical object x_e, as in scenario (118a), the sentence is deemed acceptable.[36] But, given the need of this physical convergence, the acceptability of (118) in scenario (118a) seems to stem from a way of speaking loosely about Fred's de dicto attitude in a de re fashion: John killed the physical object x_e that Fred would be looking for in a de re fashion

[36] I thank Alexander Williams, p.c., for this observation.

if Fred knew that x_e matches his actual de dicto search. That is, the grammar does not allow [[*kill*]] to combine with $[[NP]]^{ext}(s)$ and the truth-conditions in (117b) and (118b) are not generated.

(118) John killed what Fred was looking for.

a. Scenario: Fred was in s in a de dicto search for the whitest unicorn. John killed in s' the whitest unicorn. The whitest unicorn in s is the same physical object as the whitest unicorn at s'.

b. *Kill* combining with $[[NP]]^{ext}(s)$:

$\lambda s_0.\ \exists s$ [$s \leq s_0$ & s is in the past & kill (j, $\iota \underline{x}_{<s,e>}$[$\exists$s'[s' is in the past & unicorn($\underline{x}$,s') & seek(f,$\underline{x}$,s')]] (s), s)]

Intensional verbs like *look for* or *know*, instead, can combine with $[[NP]]^{ext}$ regardless of whether the relevant individual concept and individual converge on the same physical object or not, as in (119)-(120). This means that intensional verbs truly have the freedom to combine with the NP's intension or extension.

(119) John is looking for what Alexander the Great was looking for in his conquests.

✔Reading A

Scenario: Both John's and Alexander the Great's searches were de dicto searches for the whitest unicorn.

(120) This week John knows the price that Fred knew last week.

✔Reading A

Scenario: Prices change every week.

As for specificational *be*, if we allow for the NP to contribute its extension or its intension but translate specificational *be* simply as the identity predicate '=' between two objects of the same type, the job that matrix *be* does in the proposed intensional analysis –namely, plugging a world variable into the extension or intension of the subject NP– would have to be done by the semantic rules. That is, we would have to adhere to the hypothetical procedure described above for extensional verbs. But we saw that this procedure leads to unwelcome results. Note, furthermore, that specificational *be* behaves like the intensional verbs *look for* and *know*, and unlike extensional verbs like *kill*, in its ability to combine with the NP's extension independently of physical convergence.

(121) Scenario: Speaker is updating the list of official prices.
The price that yesterday's news said was $1.29 is now $1.79.

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