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Abstract

The paper draws on empirical data of concealed questions from Banda Acehese and revives the proposal that CQs are questions in disguise, contra many recent analyses. To show that the proposal works for English CQs, we examine five prominent empirical patterns with them: identity interpretation, Heim's Ambiguity, quantified and indefinite CQs, coordination, and Greenberg's Contrast. They do not pose any real challenge to the question-in-disguise analysis. Towards the end of the paper we discuss a couple of remaining issues.

Concealed Questions from a Cross-linguistic Perspective

Zhiguo Xie*

1 Introduction

The concealed question (CQ) has aroused much interest in the recent semantics (and syntax) literature (Frana, 2006; Harris, 2008; Nathan, 2006; Roelofsen and Aloni, 2008; Romero, 2004, 2005, 2006, 2007; Schwager, 2007). The discussion, however, is often limited to English CQs, a phenomenon where a certain class of verbs (CQ verbs) takes a DP complement that can most conveniently be paraphrased as an overt wh-question:

- (1) John knows the capital city of South Dakota.
=John knows what the capital city of South Dakota is.
≠ John is in acquaintance with the capital city of South Dakota.
- (2) The utility cost depends on the season.
=What/how much the utility cost is depends on what the season is.

Previous approaches to CQs fall into five major groups: the question-in-disguise analysis, the individual concept analysis, the property analysis, the pragmatic analysis and the proposition analysis. Some of the approaches are interrelated, so the classification is more suggestive than categorical. As the very earliest analysis of CQs, C. L. Baker (1968) posited that CQ-DPs denote questions and that the wh-phrase and the copula in the questions are deleted by some process of ellipsis, along the lines of (3). This question-in-disguise analysis provides a very intuitive account of the question interpretation of CQ-DPs, under the assumption that the interpretation process occurs before the ellipsis takes place (Frana, 2006).

- (3) John knows ~~what~~ the capital city of South Dakota ~~is~~.

Heim (1979) proposed and Romero (2005) further developed the idea that CQ-DPs denote an individual concept of type $\langle s, e \rangle$. Under this approach, the semantic interpretation of the CQ-DP *the capital city of South Dakota* in (1) is a function from points of reference (e.g. world-time pairs) to individuals that are the capital cities of South Dakota at the points of reference. For (3) to be true, in the particular point of reference where John stands (usually the utterance time in the actual world), he has to know which city is the capital of South Dakota.

Under Romero's (2005) version of the individual concept analysis, the CQ verb 'know' takes as its internal semantic argument an individual concept, or the intension of an individual concept, or the intension of the intension of an individual concept, etc. Romero's idea is particularly useful in explaining what is often referred to as Heim's Ambiguity, to which we will return in section 3.

- (4) $[[know_{CQ}]] = \lambda y_{\zeta} \lambda x_e \lambda w. \forall w' \in D_{Ox}(w) [y(w') = y(w)]$, $\zeta = \langle s, e \rangle$ or $\langle s, \langle s, e \rangle \rangle$ or ...

As the third attempt, the property analysis (Frana, 2006; also see Schwager, 2007) holds that CQs are ascriptions of *de re* beliefs. CQ-DPs assume two roles at the same time. On one hand, it picks out the *res* argument which the belief is about, i.e. the individual for which the property holds in the actual world. On the other hand, it provides the property ascribed to the *res* argument. A CQ denotes a *de re* belief about a particular individual for which the property provided by the CQ-DP holds in the actual world.

*I am very grateful to Julie Legate, who first drew my attention to the peculiar behavior of *tu-X* in Banda Acehese. I am greatly indebted to my Banda Acehese consultant, Saiful Mahdi, for his native language input. I have benefitted from discussion with Mats Rooth and John Whitman on a previous abstract of the paper. In addition I would like to thank the audience of LSA 2009 and PLC 33, Lance Nathan in particular, for thought-provoking questions. Thanks also go to Masa Gibson for helpful comments as well as for language and editorial help. The usual disclaimers apply, of course.

The two most recent analyses along the pragmatic lines are Schwager (2007) and Roelofsen and Aloni (2008). The former is similar to Frana (2006) in the sense that it holds that CQs denote ascriptions of *de re* belief. However, Schwager's analysis is more pragmatic, as it requires the context to supply a suitable property 'identifier' in addition to the one expressed by the CQ-DP. By contrast, Roelofsen and Aloni share more sympathy with C. L. Baker. They hold that an entity-denoting expression α (a CQ-DP) can be type-shifted into a wh-question asking about what conceptual cover (Aloni 2000) renders α to have a contextually resolved property. Out of space considerations, we refer the reader to their original papers for the rather elaborate analyses.

Lastly, under the proposition analysis CQs are a set of propositions $\langle\langle s, t \rangle, t \rangle$ or a propositional concept $\langle s, \langle s, t \rangle \rangle$. The former type is obtainable via applying an operator (5a) to the basic intension of a relational noun (e.g. *capital*, *price*, *president*) in the CQ-DP (Nathan, 2006). The latter is obtainable via applying an operator of appropriate exhaustivity (e.g. 5b) to the individual concept denoted by the CQ-DP (Romero, 2007).

- (5) a. $\langle s, \langle e, et \rangle \rangle \rightarrow \langle (e), \langle \langle s, t \rangle, t \rangle \rangle: \lambda P_{\langle s, \langle e, et \rangle \rangle} \lambda y_e \lambda p_{\langle s, t \rangle} \exists x_e [p = \lambda w_1. P(w_1)(y)(x)]$
 b. $\text{ANS}_{\text{STR}} = \lambda y_{\langle s, e \rangle} \lambda w \lambda w'. y(w') = y(w)$ (STR = strong exhaustivity)

Each of the above analysis has its own strengths, limitations and problems, of which we will not provide a detailed review. The interested reader should refer to Nathan (2006), Romero (2006), and Xie (2009) for such a review. Drawing on data from Banda Acehese, an Austronesian language spoken on the Island of Sumatra in Indonesia, this paper aims to revive C. L. Baker's (1968) analysis of CQs as questions in disguise and to show how to explain away (some of) the problems often claimed to be fatal to Baker's original idea. In section 2, we present some Banda Acehese data on wh-questions and CQs involving the use of *tu* 'know', and based on the data we posit that CQs are interpreted as wh-questions. In section 3 we illustrate how to dismiss some criticism against the question-in-disguise analysis and to fit English CQs into the proposal. In the last section, we discuss some remaining issues for our analysis and conclude the paper.

2 Banda Acehese Data and Implications

The empirical data presented in this section were all collected from an in-class fieldwork with a native speaker of Banda Acehese at Cornell University in spring 2007. Specifically all the data have to do with the use of the Banda Acehese verb *tu* 'know'. This verb has the peculiar property that it cannot stand alone and obligatorily combines with a wh-element X. When *tu-X* takes a wh-clause, the X is either the default *peue* 'what' or identical to the 'core' component of the (surface highest) wh-element in the embedded wh-clause.¹ In (6-7), for example, the overt wh-questions embedded by *tu-X* ask about the identity of the person(s) Hasan likes or about the identity of the person(s) Fatimah beat; the wh-element after *tu* is *soe* 'who' or the default *peue* 'what'. In (8), the embedded wh-question asks about the amount of water that Fatimah drank, and the X element is *-dum*, the core part of *padum* 'how many/how much'.

- (6) Ibrahim geu tu-soe/peue soe yang Hasan galaq. (wh-movement)
 Ibrahim 3HON know-who/what who REL Hasan like
 'Ibrahim knows who Hasan likes.'
 (7) Ibrahim geu tu-soe/peue yang Fatimah boh soe. (wh-in-situ)
 Ibrahim 3HON know-who/what REL Fatimah beat who
 'Ibrahim knows who Fatimah beat.'

¹There are certain exceptions to this generalization, however. For example, the optional sensitivity does not apply to the manner interrogative *cara* and *patiban* 'how'. As the sentences in (i) show, *tu'oh* is used in place of the anticipated *tura* or *tucara*.

- (i) a. Ibrahim geu tupeue cara Fatimah geu poh asee nyan.
 Ibrahim 3POL know-what how Fatimah 3POL hit dog DEM
 'Ibrahim knows how Fatimah hit the dog.'
 b. Ibrahim geu tu'oh/*tucara/*tura cara Fatimah geu poh asee nyan.

- (8) Ibrahim geu tudum padum lë ie Fatimah jép. (wh-adjunct)
 Ibrahim 3POL know-how many how many much water Fatimah drink
 ‘Ibrahim knows how much water Fatimah drank.’

When *tu-X* takes a CQ-DP, it shows similar sensitivity to the propositions expressed by the CQ. In (9), the CQ-DP is *yum boh-mamplam* ‘the price of mango’. Because, just like in English, in Banda Acehnese one can use either ‘what’ or ‘how much’ to ask for the price of something, the X element in *tu-X* can be either *dum* ‘how much’ or *peue* ‘what’. In (10), the CQ-DP is *ibukota Aceh* ‘the capital city of Aceh’. One can ask about the location or the name of the city. If she chooses to ask about the former, she uses *pat* ‘where’ as the X element. If she chooses to ask about the latter, she uses *peue* ‘what’.

- (9) Ibrahim geu tu-dum/peue yum boh-mamplam.
 Ibrahim 3POL know-how much/what price fruit-mango
 ‘Ibrahim knows the price of mango.’
 (10) Ibrahim geu tu-pat/peue ibukota Aceh
 Ibrahim 3POL know-where/what capital Aceh
 ‘Ibrahim knows (what/where) the capital city of Aceh (is).’

It is worth noting here that when *tu-X* embeds a declarative complement, the X is invariably *peue* and cannot be any other wh-element. Take (11) and (12) for example. The use of time or place wh-phrases in them cannot render the intended **declarative** interpretation.

- (11) Ibrahim geu tu-peue/*jan Hasan reubah baroe.
 Ibrahim 3HON know-what /*when Hasan fall yesterday
 ‘Ibrahim knows that Fatimah fell yesterday.’
 (12) Lôn hana lôn tu-peue/*pat aneuq miet nyan tungoh di ma’en
 1.SG NEG 1.SG.DIM know-what/where child baby DEM PROG DIM play
 ‘I do not know that the child is playing.’

In this paper we assume that CQs are subject to the same semantic interpretation across languages. We treat the parallel sensitivity shown by *tu-X* to its overt interrogative question and to its CQ-DP complements as evidence that CQs and overt wh-questions have the same semantics. Semantically CQs denote questions. The DP ‘the price of mango’ used as a CQ is interpreted identically to the wh-clause ‘what the price of mango is’, both being a set of propositions:

- (13) \llbracket the price of mango_{CQ} $\rrbracket = \llbracket$ what the price of mango is \rrbracket
 $= \lambda w \lambda p. p(w) \ \& \ \exists !x \ p = \lambda w'. \text{PRICE-OF-MANGO}(x, w')$

Then it follows naturally that wh-question-taking ‘know’ has the same semantics as CQ-taking ‘know’, and we take this lexical economy as a welcome result.² Both the exhaustive and mention-some uses of ‘know’ (14) denote a relation between a set of propositions and an individual (i.e. the knower). The difference between them is that for the mention-some use the epistemic state of the knower only contains some, but not all, of the true answers. The exhaustive use is just the opposite.

- (14) a. \llbracket know $\rrbracket_{\text{exhaustive}} = \lambda p_{\langle s, \langle s, t \rangle, t \rangle} \lambda x \lambda w. \forall w' \in \text{Dox}_x(w) [p(w') = p(w)]$
 b. \llbracket know $\rrbracket_{\text{mention-some}} = \lambda p_{\langle s, \langle s, t \rangle, t \rangle} \lambda x \lambda w. \exists p'_{\langle s, \langle s, t \rangle, t \rangle} [p' \leq p(w) \ \& \ \forall w' \in \text{Dox}_x(w) [p' \leq p(w')]]$

The semantic definitions of ‘know’ in (14a-b) have empirical support. Both CQs which have an exhaustive interpretation and CQs which have a mention-some interpretation can be embedded under ‘know’. In the first case the knower has exhaustive knowledge about what the CQ-DP de-

²Frana (2006) and Romero (2005) noted that in languages like German, Italian and Spanish there are two lexically distinguished predicates corresponding to English ‘know’. Still, it is likely that they share a core component in their lexical semantics. We leave this to future research.

notes, and in the second case the knower does not necessarily have complete knowledge. For (15a) to be true, John has to know the names of all professors in the phone directory. The truth of (15b) only requires that John knows the name of one person or another in the phone directory. It does not matter which name or whose name it is.³

- (15) a. John knows the names of professors in the phone directory..
b. John knows a name in the phone directory.

3 The Case of English CQs

The question-in-disguise approach to concealed questions has been repeatedly criticized in the literature as insufficient for English CQs (Heim, 1979; Nathan, 2006; Frana, 2006; among others). Thus, in order to maintain our proposal that CQs denote questions crosslinguistically we have to find a way to dismiss the criticism. In this section, we argue that, with some proper ramification, the question-in-disguise analysis can handle (some of) the phenomena that have been claimed to be fatal challenges to the approach. In particular, we look at five prominent empirical patterns of English CQs that have been claimed to be problematic, and show how the question-in-disguise analysis works for them.

3.1 Identity Questions

It has been repeatedly noted (e.g. Heim, 1979; Nathan, 2006) that English CQs only have the meanings of identity questions, i.e. questions of the form *who/what/how much/ how many X is*. The English sentence in (16a), for example, can only be paraphrased as in (16b); it does not have the non-identity meanings in (16c-d).

- (16) a. John knows the capital city of South Dakota.
b. =John knows what the capital city of South Dakota is.
c. ≠John knows where the capital city of South Dakota is.
d. ≠John knows how to drive to the capital city of South Dakota.

Various authors (Frana, 2006; Nathan, 2006; Romero, 2005) take this limitation on CQ interpretation as evidence against the question-in-disguise analysis of CQs. Nothing, they argue, prevents (16a) from having the interpretations of (16c-d). If CQs are questions and the *wh*-phrase and the copula in them are deleted by some process of ellipsis, then we would expect (16c) to be an acceptable paraphrase for (16a) as well. By no means is (17a), which yields the reading in (16b), the only option for ellipsis. The unpronounced material in (16a) can be *how to drive to* or *where* along with the copula (17b-c), which, if grammatical, correspond to the readings in (16c-d).

- (17) a. John knows ~~what~~ the capital city of South Dakota ~~is~~.
b. John knows ~~where~~ the capital city of South Dakota ~~is~~.
c. John knows ~~how to drive to~~ the capital city of South Dakota.

However, the generalization that CQs can only have identity interpretations does not hold in all languages. In Banda Acehese, CQs do not necessarily have to be interpreted as identity questions. In (18), with the X element being *pat* ‘where’, the embedded CQ-DP *ibukota Aceh* has the non-identity reading ‘where the capital city of Aceh is’. Furthermore, the sentences in (19) suggest that in Banda Acehese CQs are not restricted to DPs. Certain CPs embedded under *tu-X* can also have a CQ interpretation when the X element is not the default *peue*. This is a clear empirical difference from English: CPs embedded under ‘know’ never can receive a CQ interpretation.

- (18) Ibrahim geu tu-pat ibukota Aceh
Ibrahim 3HON know-where capital Aceh
‘Ibrahim knows where the capital city of Aceh is.’

³The sentences in (15) are due to Masa Gibson.

- (19) a. Ibrahim geu tukon Fatimah galaq boh-mamplam
 Ibrahim 3HON know-why Fatimah like fruit-mango
 ‘Ibrahim knows why Fatimah likes mangos.’
 b. Ibrahim hana geu tu‘oh tingue bayi nyan.
 Ibrahim NEG 3POL know-how carry baby DEM
 ‘Ibrahim does not know how to carry the baby.’

The existence of non-identity interpretations of Banda Acehese CQs as illustrated in (18-19) is not surprising. The non-identity information comes from the X element in *tu-X*. If X is the core of a place wh-phrase, it contributes a location interpretation to the CQs embedded under it. If X is the core of a time wh-phrase, it contributes a temporal interpretation to the CQs embedded under it.

It then follows that if we replace the X element in (18-19) with the default *peue*, there would be no element that can contribute a non-identity interpretation. In such cases the embedded CPs do not have a CQ interpretation (just like in English). For example, with the substitution of *-kon* for *peue*, (19a) would mean (20), in which the embedded clause is interpreted as a proposition rather than as a question of any sort.

- (20) Ibrahim geu tupeue Fatimah galaq boh-mamplam
 Ibrahim 3HON know-what Fatimah like fruit-mango
 ‘Ibrahim knows that Fatimah likes mangos.’

For English CQs, no retrievable wh-element in CQ-taking verbs can add extra information. There is no covert wh-element in *know*. Nor can the head noun of a CQ-DP add any new information to the semantics beyond the property (or whatever) denoted by it. So it comes as no surprise that English CQs are limited to identity interpretation.

An interim conclusion of this sub-section is that, contrary to what many authors claim, the identity interpretation of English CQs does not cause problems for the question-in-disguise approach. The unavailability of non-identity readings of English CQs is due to the absence of appropriate contributors, so to speak, of non-identity information. Banda Acehese has such contributors; consequently CQs in the language have non-identity interpretations.

3.2 Heim’s Ambiguity

CQs can be nested and nested CQs are generally ambiguous. Heim (1979) was the first to discuss this particular case of ambiguity, so it is often referred to as Heim’s Ambiguity. She described two distinct readings for the sentence in (21), typically paraphrased in the literature as Reading A and Reading B.⁴ Imagine a scenario where the unique price that Fred knows is the price of milk in a grocery store. Then for reading A to be true John has to know how much the milk costs as well. Reading B does not have such a requirement; rather it requires that John knows the fact that Fred has knowledge about a certain price.

- (21) John knows the price that Fred knows.
Reading A: Fred knows the answer to the question ‘What is the price of milk?’, and John knows the answer to the question as well. They may know the answer independently.
Reading B: John knows what the question about price is to which Fred knows the answer. John does not necessarily know the answer to that question.

For our purpose we would like to re-paraphrase the two readings of (21) as in (22). For Reading A, John and Fred share the same knowledge about a certain price. For Reading B, John’s knowledge is about the product the price of which Fred knows or about some other property of the

⁴I want to point out here that for Reading A to be true, neither John nor Fred has to know the price-product pair, contrary to what I claimed in Xie (2009). Imagine a contest where John and Fred are asked to choose from a set of numbers one of which happens to be the price of something or other in their local Wegmans grocery store. Both John and Fred make the correct choice and know what the price-number is. Reading A is true in this scenario, where John and Fred know nothing about the product that the price-number pairs with.

price that Fred knows. It does not need much reasoning to see the paraphrases for Reading A are equivalent. The equivalence of the two paraphrases for Reading B may require some more thought. Here is how to show the equivalence in an informal way. Suppose the paraphrase for Reading B in (21) is true, then Fred knows the answer to a certain question about price, and John knows what the question is. The question has to contain some property for Fred to identify the price-answer by. In the most typical cases the property is the product paired with the price. Less typically the property can be, for example, the number on the second price tag that was shown to Fred. John's knowledge about the question entails his knowledge about the product or, less typically, some other property associated with the price, which is given in the question. This is exactly our paraphrase for Reading B in (22). Likewise, from the truth of the paraphrase for Reading B in (22) we can get the truth of the paraphrase for Reading B in (21). For the sake of simplicity, we only discuss cases where the property is the product paired with the price.

- (22) John knows the price that Fred knows.

Reading A: John and Fred (independently) know what the price of a particular product is, i.e. they both know the price, but not necessarily the associated product

Reading B: Fred knows what the price of a certain product is, or he knows what a certain price, which happens to have some other non-product property, is, and John knows what product/what property the price pairs with, without necessarily knowing the price itself.

In addition, it is worth noting that only CQs consisting of relational nouns (e.g. *capital*, *price*, *president*) give rise to Heim's Ambiguity. CQs of non-relational nouns (e.g. *secret*, *number*, *street*) do not when they are used in a parallel way.⁵

- (23) John knows the secret that Fred knows.

Reading A: ☺John and Fred know the same secret.

Reading B: ☹There is a person such that Fred knows what his secret is; John knows who the person is. (...)

Relational nouns differ from non-relational nouns in that they have an unsaturated argument (Frana, 2006). The argument is the syntactic complement of the relational head noun in CQ-DPs. In this paper we assume that the argument is introduced by a covert preposition 'of' (or the like). Under such an assumption, we analyze Heim's Ambiguity as between asking about the head noun and about its covert complement introduced by 'of'. (24) illustrates how to derive the two interpretations of (22). For Reading A, it is the copula and *what/who* that undergo ellipsis. In (22a) the CQ-DP asks about what the price is that both John and Fred know. For Reading B, it is the copula and the preposition phrase *of what/of whom* that undergo ellipsis. In (22b) the CQ-DP seeks information about the product the price of which Fred knows.

- (24) a. John knows the price that Fred knows ~~[is] [what]~~.
b. John knows the price that Fred knows ~~[is] [of what]~~.

The analysis predicts that when a covert prepositional phrase headed by 'of' (or the like) is no longer available to introduce a complement for a relational noun, Reading B is unavailable. The prediction is borne out with English CQs. It is ungrammatical to follow 'the European capital' with a complement preposition phrase like 'of France' (i.e. *'the European capital of France'). So

⁵When the context somehow forces a non-relation noun to become relational, Reading B becomes (at least marginally) available again, which confirms our observation. For example, normally the sentence in (i) just has Reading A. However, imagine a contest in which Fred's task is to pair a set of rivers with a set of countries. Fred only knows that the Yangtze River goes with China. Reading A is available in cases where John knows the pairing relationship too. Reading B, in which John knows that the river Fred has the relevant knowledge about goes with China, is marginally acceptable if John indeed knows it. In this case John may be completely ignorant of the fact the river that goes with China is the Yangtze River.

- (i) John knows the river that Fred knows.

in (25) there cannot be a covert ‘of what’ in the sentence that undergoes ellipsis. Our analysis predicts (25) not to have Reading B, conforming to fact.⁶ Likewise, it is very marginal to follow ‘the same price’ with a complement prepositional phrase like ‘of milk’ (i.e. */?? ‘the same price of milk’). So it comes as no surprise that (26) does not have Reading B either (Schwager, 2007). The absence of this reading is confirmed by the unacceptability of continuing (26) with ‘but John does not know the price’.

- (25) John knows the European capital that Fred knows.
- (26) John knows the same price that Fred knows. (Romero, 2005: (23))

To conclude this sub-section, Heim’s Ambiguity does not pose any real challenge to the question-in-disguise analysis of CQs. Though (27a) has just one interpretation which corresponds to Reading A of (22), it is not the only overt counterpart for (22). The other overt counterpart (27b) has the interpretation which corresponds to Reading B of (22).

- (27) a. John knows what the price that Fred knows is.
- b. John knows of what the price that Fred knows is

3.3 Indefinite and Quantified CQs

CQs occur not just with definite phrases as we discussed above, but also with quantified and indefinite phrases (Frana, 2006; Schwager, 2007). Quantified and indefinite CQs are often ambiguous between a strong, pair-list reading and a weak, set reading (Heim, 1979; Roelofsen & Aloni, 2008). The sentence in (28) is an example of a CQ with an indefinite phrase.⁷ Its pair-list reading requires that John knows how much a certain product in the store costs, while for its set reading to be true John only has to know of a certain number that it is the price of something or other in the store. The sentence in (29) (Roelofsen & Aloni, 2008: (4)) is an example of a CQ with a quantified phrase. The pair-list reading requires John to know which phone number associates with which person, while the set reading only requires that John can separate all the phone numbers from the non-phone numbers. For indefinite and quantified CQs, the most salient reading is usually the pair-list reading. The set reading becomes more felicitous when the context has a set of items only some of which are prices, numbers, etc.

- (28) John knows a price in the store.
 - a. John knows that an apple is \$1.79/lb in the store. (pair-list reading)
 - b. John knows that (\$)1.79 is a price (of something or other) in the store. (set reading)
- (29) John knows every phone number.
 - a. John knows what A’s number is, what B’s number is, ... (pair-list reading)
 - b. John knows of every phone number that it is a phone number. (set reading)

The ambiguity in quantified and indefinite CQs can be analyzed in the same manner as Heim’s Ambiguity, and therefore it does not constitute a challenge to the question-in-disguise analysis of CQs. The pair-list reading arises from asking about the complement of the head noun in a quantified CQ-DP, and the set reading from asking about the head noun itself. Take (28) for example. For the pair-list reading (30a), the ellipticized *of what* asks about a property of the price that John knows, i.e. what product the price goes with. Moreover, John has to know the pairing relationship. It is hard to imagine a context where John knows the product that a price goes with without knowing how much the product costs. This is a clear difference from the Reading B of (22), where John does not necessarily know what the value of the price that Fred knows is. For the set reading (30b), the ellipticized *what* only seeks information about the price-amount. It is

⁶Kyle Rawlins (p.c.) reported that he could get Reading B for (25). However, at the same time he said he would accept such phrases as ‘the European capital of France’. Thus his acceptance of (25) as having Reading B does not cause any real problem for our analysis.

⁷Some native speakers of English find (28) to be just unacceptable, unless being forced by a strong context. I have no idea regarding why there is such an inter-speaker variation of judgment.

irrelevant whether John knows the associated product(s) or not.

- (30) a. John knows a price ~~is of what~~ in the store.
 b. John knows ~~what is~~ a price (of something or other) in the store.

3.4 Coordination

Coordination does not pose as much challenge as the above three empirical patterns to our analysis of CQs as questions in disguises. It is nevertheless worthwhile to spend a few paragraphs showing that our analysis can make correct predictions with respect to several cases of coordination in CQs. First, CQs and full-fledged interrogative questions can be coordinated ((31), Roelofsen & Aloni, 2008: (13)). In our analysis CQs are the covert counterpart of interrogative questions. So the legitimacy of the coordination is easily guaranteed:

- (31) I only knew the capital of Italy and who won the World Cup in 1986.

Second, it has been observed in the literature (e.g. Nathan, 2006) that a CQ-DP cannot be embedded under a CQ verb and under a ‘regular’ extensional verb at the same time (32). This is expected in our analysis. CQs denote questions, and questions are incompatible with ‘regular’ extensional verbs (33). So CQs share the same incompatibility.

- (32) *John guessed and kissed the winner of the election.
 (33) *John kissed who the winner of the election is.

Third, there is a class of verbs whose meaning combines directly with an individual concept of type <s,e> (Nathan, 2006; Romero, 2006). Such verbs include *fall*, *rise*, *change* and *fluctuate*. The DP ‘the price of milk’ in (34) denotes an individual concept. The type of CQs, as questions in disguise, is distinct from that of individual concepts. So we would expect that a DP cannot serve as the argument of a verb requiring an individual concept argument and of a CQ verb at the same time. The prediction is borne out, as shown in (35):

- (34) The price of milk fell yesterday and rose today.
 (35) */?? The price of milk just fell and is known to John.

In addition, *wh*-questions are not a proper subject for such proposition-taking predicates as *surprising* and *disappointing*. CQs share the same restriction (36), which provides further evidence that CQs are questions in disguise.^{8,9}

- (36) ??The price that John knows is surprising.

⁸This is actually not a case of coordination; however, we find it interesting enough to be included in this paper, and this section is probably the best place.

⁹Some have pointed out to me that the grammaticality of such sentences as (i) casts doubts on our analysis. If the CQ-DP ‘the price of gasoline’ is interpreted as a question in disguise, then why can it still serve as the subject of the individual concept verb ‘rise’?

- (i) John knows the price of gas, which happens to be rising.

At this stage we do not have a satisfactory answer to the question yet. Here is a tentative conjecture. Internal elements of a *wh*-question can be accessed by outside modification. For example, in (ii) the question-internal ‘the price of gasoline’ is modified by a question-external non-restrictive relative clause. As CQs denote questions in disguise in our analysis, we would expect the internal elements in CQs to be modifiable from outside CQs as well.

- (ii) ? John knows how to calculate the price of gas to maximize his profits, which happens to be rising.

3.5 Greenberg's Contrast

B. Greenberg (1977) and Heim (1979) observed that CQs and their full-fledged interrogative counterparts may differ in meaning. According to the two authors, though (37a-b) share the reading that John solved the mystery who murdered Smith, (37b) has one additional meaning — John found out something essential about the person referred to as the murderer of Smith (e.g. that it was Smith's brother-in-law), without having to know s/he was the murderer of Smith.

- (37) a. John found out the murderer of Smith.
b. John found out who the murderer of Smith was.

Greenberg's Contrast, if real, would constitute a crucial argument against our analysis of CQs as questions in disguise. However, empirically it remains very suspicious whether and to what extent the contrast is valid. Roelofsen & Aloni (2008) observed quite a few exceptions to the contrast. Here is an example taken from their paper. Suppose that three out of ten men were murderers of someone or another. John's task was to find out who the three murderers were. For (38) (Roelofsen & Aloni 2008: (58)) to be true, John did not have to find out of the murderer of Smith that he murdered Smith, but just that he murdered someone.

- (38) So far, John only found out the murderer of Smith.

In addition, according to Roelofsen & Aloni (2008), Greenberg's Contrast stands in conflict with Heim's Ambiguity, which we believe is a much stronger empirical pattern. Take the sentence in (39) for example. If Greenberg and Heim were correct in saying that for (37a) to be true John has to know of the murderer that he murdered Smith, by a parallel line of reasoning we should expect that (39) 'entails that John knows of the capital that Fred knows that it is the capital that Fred knows'. Apparently this is not necessarily the case, as we have already indicated. Reading A of (39) — John and Fred know the same capital — does not require John to know that the capital he knows is the same capital that Fred knows.

- (39) John knows the capital that Fred knows.

There are many other exceptions to Greenberg's Contrast. The existence of such exceptions casts serious doubt on its validity. Though there is still room for further investigation, we tend to conclude tentatively that the contrast is not systematic and is most likely due to some pragmatic factors. If this hypothesis is correct, then the contrast is dismissed and does not pose any challenge to our analysis.

4 Conclusions and Further Issues

In this paper we examine some cross-linguistic data on concealed questions and revive C. L. Baker's (1968) analysis of CQs as questions in disguise. Banda Acehnese *tu-X* 'know' shows similar patterns of sensitivity when it embeds an overt *wh*-question and when it embeds a CQ-DP. This suggests that CQs in Banda Acehnese are semantically equivalent to *wh*-questions. We assume the approach applies cross-linguistically. With such an assumption we show how the question-in-disguise analysis successfully accounts for the four prominent patterns of English CQs: identity questions, Heim's Ambiguity, quantified and indefinite CQs, and coordination. We follow Roelofsen & Aloni (2008)'s suggestion that Greenberg's Contrast is most likely not a valid observation, and hence it does not cause any real problem for our analysis.

However, there are still several empirical observations that our analysis fails to capture. Potential problems arise from two aspects. On the CQ-DP side, it is an empirical fact that relational nouns like *capital* and *price* are more suitable for acting as the head noun of a CQ-DP than non-relational ones. Our analysis has nothing to say regarding this preference on the head noun of CQ-DPs. At this stage we have no idea how to approach this problem, and have to leave it as it stands. However, we would like to note that no analysis of CQs so far -- probably with the exception of

Nathan (2006) -- offers any decent account of the restriction. So this issue alone does not put our analysis at a significant disadvantage compared to other analyses.

On the CQ verb side, CQs are not allowed with every predicate that can take wh-questions. For example, both *wonder* and *care* can take wh-questions as their arguments (40), but they cannot embed a CQ-DP (41). This limited distribution of CQ verbs has often been used as argument against the question-in-disguise analysis (e.g. Frana, 2006). Unfortunately we do not have any good answer to this question either. We think why the wh-phrase embedded under such verbs as *wonder* and *care* cannot be ellipticized is an issue separate from the interpretation of CQs per se, which is the primary aim of this paper.

- (40) a. The teacher wondered what his student's answers were.
 b. The farmer does not care what the height of the plants is.
- (41) a. *The teacher wondered his student's answer.
 b. *The farmer does not care the height of the plants.

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