Three types of indefinites: evidence from Ga (Kwa)

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Abstract

There is an ongoing discussion whether wide-scope indefinites denote choice functions that are existentially bound [7, 11, 14] or remain free [6]. Data from Ga, an under-researched language spoken in Ghana, show that there are wide-scope indefinites denoting existentially bound skolemized choice functions whose parameter is bound by a higher quantificational NP, free skolemized choice functions with the speaker or a higher quantificational NP as a parameter, and narrow scope quantificational indefinites. Thus the data show that both existentially bound and free skolemized choice functions are attested in natural language shedding new light on the semantics of indefinites.

1 Introduction

In the history of formal semantics, indefinites, whose small subset is exemplified in (1), have obtained many different analyses, e.g., quantificational [10, 1, 4] or dynamic [3, 5].

(1) Kofi read **a/some/one** book.

Moreover, in the recent literature, indefinites were analyzed as denoting choice functions. For example, [11] and [14] analyzed indefinites as existentially bound choice functions. By contrast, under the analysis of [6], choice functions denoted by indefinites remain free. This discrepancy lead to the still ongoing discussion whether the choice functions denoted by indefinites should be existentially bound or not.[1] In this paper, I argue that both free and existentially bound (skolemized) choice functions are attested in natural language.

The empirical focus of this paper is put on indefinites in Ga, i.e., two indefinite determiners *ko* and *kome* and bare NPs, which show non-homogeneous scopal properties with respect to negation and quantifiers. Based on these interactions, I argue that bare NPs can be properly analyzed as quantifiers, *ko* denotes an existentially bound skolemized choice function whose parameter is bound by a higher quantificational NP, if available, and *kome* denotes a free skolemized choice function, whose parameter can be bound either by the speaker or a higher quantificational NP. The structure of this paper is as follows. In section 2, I provide evidence that bare NPs, *ko*, and *kome* are interpreted as indefinites and I illustrate their scopal properties. Subsequently, section 3 presents the analysis of *ko* and *kome* as denoting different kinds of choice functions. Section 4 discusses some open issues and section 5 concludes.

2 Indefinites in Ga

Ga is an under-researched Ghanaian language spoken in The Greater Accra Region by ca. 600,000 speakers. It is an SVO language with two tones: high and low. All the data, unless written otherwise, stem from the author's original fieldwork in Accra with three Ga native

[1] For a discussion of problems of both types of analyses, see [2], [12] and [13].

speakers using the field research methodologies presented in [9]. All the language consultants were students at the time of conducting the fieldwork. None of them has a background in linguistics.

2.1 Bare NPs, *ko*, and *kome* are indefinites

Before I discuss the scopal properties of the bare NPs, *ko*, and *kome*, let me first provide empirical evidence that all of them are indeed indefinites. Below, I present the results of applying some diagnostics for detecting indefinites, whose design is based on the tests presented in [7].

The result of the diagnostic demonstrated in (2) shows that *bare NPs*, *NP ko*, and *NP kome*, as English indefinite determiners, can refer to two different discourse referents in a sentence. By contrast, if they were definite, they would refer to the same entities in both clauses leading to a pragmatically odd structure:[2]

(2) context: Shikatoohe ∅/**ko**/**kome** yɛ Osu...
bank INDF/INDF/INDF be.at Osu
'A bank is in Osu...'
...ni shikatoohe ∅/**ko**/**kome** yɛ Jamestown.
and bank INDF/INDF/INDF be.at Jamestown
'...and a bank is in Jamestown.'
#'The bank is in Osu and the bank is in Jamestown.'

Further, it turns out that unlike definite determiners, they can be used in contexts in which the discourse referent is not unique, as illustrated in (3):

(3) context: There is a tree outside the window. There are three birds on the tree.
Gbekɛ biihii lɛ fɛɛ na looflo ∅/**ko**/**kome**.
child boys DET ALL see bird INDF/INDF/INDF
'All the boys saw a bird.'
#'All the boys saw the bird.'

Finally, the test illustrated in (4) is based on the observation that NPs associated with the *wh*-remnant in sluicing constructions cannot be definite (see [7] and references there). The fact that *bare NPs, ko*, and *kome* are acceptable in sluicing constructions suggest that they are indefinites.

(4) John mii-tawo wolo ∅/**ko**/**kome**, shi mi-le tenoniji.
John PROG-look.for book INDF/INDF/INDF but 1SG-not.know which
'John is looking for a book but I do not know which.'
#'John is looking for the book but I do not know which.'

2.2 Scopal properties of *ko* and *kome*

Interestingly, bare NPs, *ko*, and *kome* exhibit non-homogeneous scopal properties with respect to various operators, e.g., negation and quantifiers. First, it turns out that whereas *ko* can take

[2]The glosses used in this paper are as follows: INDF = indefinite; DET = determiner; SG = singular; PL = plural; 3 = Third person; PRT = particle; NEG = negation; REL = relativizer; PFV = perfective; PROSP = prospective. An example marked with '#' means that the example was judged to be unacceptable in the given context and I hypothesize that it is for semantics or pragmatic reasons. Examples without any diacritics were judged as acceptable in the given context.

both wide and narrow scope with respect to negation, bare NPs can take only narrow scope, and *kome* only wide scope. Consider (5). Since the context specifies that Kofi bought a lot of fish, it clashes with the narrow-scope interpretation which would lead to the meaning that Kofi didn't buy any fish.

(5) WIDE-SCOPE INTERPRETATION
context: Kofi bought a lot of fish, but
E-he-ko loo #∅/**ko/kome**
3SG-buy-PFV.NEG fish INDF/INDF/INDF
'He didn't buy a certain fish.'

The context in (6), on the other hand, specifies a narrow-scope interpretation. Since it is known that Kofi didn't buy any fish, a wide scope interpretation which says that Kofi didn't buy a certain fish is ruled-out.

(6) NARROW-SCOPE INTERPRETATION
context: Kofi went to the market yesterday. He bought vegetables, shoes, and toys but he didn't buy any fish.
Kofi he-ko loo ∅/**ko/#kome**.
Kofi buy-PFV.NEG fish INDF/INDF/INDF
'Kofi didn't buy any fish.'

Second, whereas *kome* can obtain both a constant and a covarying interpretation with respect to quantifiers, as suggested by its acceptability in the context of (7) and (8), bare NPs and *ko* can get only a covarying interpretation, as suggested by their acceptability in the context of (8) but not in the context of (7):

(7) CONSTANT INTERPRETATION
context: There were four women in the library. It looked really funny because all of them were reading one book.
Yei lɛ fɛɛ kane wolo **#∅/#ko/kome**.
women DET every read book INDF/INDF/INDF
'Every women read some book.'

(8) COVARYING INTERPRETATION
context: When I came to the library yesterday, four women were reading a book. Each of them was reading a different book.
Yei lɛ fɛɛ kane wolo ∅/**ko/kome**.
women DEF every read book INDF/INDF/INDF
'Every women read some book.'

In addition, while both *ko* and *kome* can obtain an intermediate scope interpretation, bare NPs cannot. For example, the intermediate scope interpretation of (9) is the one in which most linguists chose one problem to work on but the choice of the problem varies with the linguist.

(9) context: Four linguists chose one linguistic problem to work on. Linguist 1 chose the syntax of Ga, linguist 2 chose the syntax of Akan, linguist 3 chose the phonology of Ewe, linguist 4 chose the morphology of Avatime. Linguists 1, 2, and 3, but not 4, read all the analyses solving the respective problem.
Otsiamii pii ekwɛ susumɔi saji fɛɛ ni yeɔ boa sane
linguist most have.looked analysis analysis every that help solve problem

#∅/**kome/ko** naaboamɔ.
INDF/INDF/INDF solve
'Most linguist have looked at every analysis that solves some problem.'

The discussed scopal properties of bare NPs, *ko*, and *kome* are summarized in Table 1.

Table 1: Scopal properties of *ko* and *kome*

	intermediate scope	negation	quantifiers
bare NPs (∅)	–	narrow	covarying
ko	✓	wide, narrow	covarying
kome	✓	wide	constant, covarying

3 Analysis

Based on the data presented in section 2, I argue that whereas bare NPs can obtain a quantificational analysis, both *ko* and *kome* denote skolemized choice functions. The former is empirically motivated by the observation that bare NPs cannot obtain an intermediate scope interpretation in (9), suggesting that they cannot move out of syntactic islands. The strongest evidence for the latter is the availability of intermediate scope readings [11, 14, 6, 7, 2]. For example, *ko* and *kome* indefinites in (9) can be neither quantificational (because quantifiers cannot move out of islands) nor referential (because the linguists in (9) choose different problems to solve). In the next subsection, I will explicate the semantics of *ko* and *kome*, leaving a more precise discussion of the semantics of bare NPs for a further occasion.

3.1 Skolemized choice functions

A choice function (CF) is a function of type $\langle\langle e,t\rangle, e\rangle$ which takes a set as its argument and returns one element from that set:

(10) A **choice function** is a function from sets of individuals that picks a unique individual from any non-empty set in its domain. [6]

Choice functions can be existentially bound [11, 14, 7] or remain free [6, 8]. For example, under the analysis of the indefintie determiner *a* as denoting an existentially bound CF, the sentence in (11) obtains the interpretation in (11-a) and under the analysis of *a* as denoting a free CF in (11-b), where f is a variable ranging over choice functions. In the latter, the value of the CF is provided by the context, which usually is the one intended by the speaker:

(11) Kofi read a book.
a. $\exists f$(Kofi read f(book))
≈ There is a way of choosing a book such that Kofi read this book.
b. Kofi read f(book)
≈ Kofi read a book chosen in a way known to the speaker.

Choice functions can also be skolemized, i.e., they can take an additional covert pronominal index (also called the parameter or the skolem index). The index, as overt pronouns, can be either interpreted with respect to the assignment function, usually relativized to the speaker, or

can be bound by a higher quantificational NP. The former leads to the wide scope interpretation in (12-a) and the latter triggers a narrow scope interpretation in (12-b):

(12) Every student read a book.
a. every student read f_1(book)
≈ I know a way of choosing a book such that every student read the book chosen that way
b. every student$_z$ read f_z(book)
≈ every student read a book chosen in a way relative to every student

Analyzing indefinites as denoting skolemized choice functions can account for the intermediate scope interpretation. For example, the intermediate reading of (9) in the Kratzer's approach [6] to CF is as in (13):

(13) for most x[linguist(x) → $\forall z$[analysis(z) ∧ z solves f_x(problem) → x looked at z]]
≈ For most linguists, there is a way of choosing a problem such that they have looked at every analysis that solves that problem.

As it has been already written, I argue that both *ko* and *kome* denote skolemized choice functions.The question is whether they are bound or free, and what are the possible binders of their parameters. I argue that the answers for these questions are provided by different scopal properties of *ko* and *kome* presented in subsection 2.2.

Interaction with negation. I argue that in a semantic fieldwork situation, interaction with negation is a good test method for determining whether a CF denoted by an indefinite is existentially bound or not. Crucially, a narrow scope interpretation with respect to negation is only possible if a CF denoted by an indefinite is existentially bound. Otherwise, only a wide scope interpretation is available. Consider (14):

(14) Kofi didn't buy any fish.

With an existentially bound CF both a wide scope interpretation, as in (15-a), and a narrow scope interpretation, as in (15-b), is possible, because negation can scope above or below existential closure:[3]

(15) a. $\exists f$[¬buy[Kofi, f_1(fish)]] ≈ As for the speaker, there is a way of choosing a fish such that Kofi didn't buy it (there is a fish that Kofi didn't buy.)
b. ¬$\exists f$[buy[Kofi, f_1(fish)]] ≈ As for the speaker, there is no way of choosing a fish such that Kofi bought it (Kofi didn't buy any fish.)

With a free CF, on the other hand, only a wide scope interpretation is possible, because there is no other operator that negation could scope over:

(16) ¬buy[Kofi, f_1(fish)] ≈ The speaker knows a way of choosing a fish such that Kofi didn't buy it (there is a fish that Kofi didn't buy.)

Since *ko* can get both a wide and a narrow scope interpretation with respect to negation, I argue that it denotes an existentially bound skolemized CF. By contrast, since *kome* can only

[3] I argue that both *ko* and *kome* denote skolemized CFs. Since there is no binder that could bind the index in (15), its value is provided by the context, i.e., by the assignment function. Even though in the case of (b) the CF is bound by the context, due to the presence of existential closure it does not obtain a wide scope interpretation.

get a wide scope interpretation with respect to negation, it denotes a free skolemized choice function.

Interaction with quantifiers. The interaction with quantifiers, on the other hand, can detect possible parameter (skolem index) binders. If an indefinite has the speaker as its parameter, it gets a constant interpretation. Conversely, if the parameter is bound by a higher quantificational NP, an indefinite gets a covarying interpretation. Consider (17):

(17) Every woman read some book.

The representations of (17) given in (18) illustrate what happens when the parameter is bound by the speaker. In both cases, i.e., when the CF is existentially closed or remains free, the indefinite obtains a constant interpretation:

(18) a. $\exists f \forall z[\text{woman}(z) \rightarrow \text{read}(z, f_1(\text{book}))]$
≈ As for the speaker, there is a way of choosing a book such that every woman read a book chosen that way.
b. $\forall z[\text{woman}(z) \rightarrow \text{read}(z, f_1(\text{book}))]$
≈ The speaker knows a way of choosing a book such that every woman read a book chosen that way

By contrast, if the parameter is bound by a higher quantificational NP, then the indefinite invariably obtains a covarying interpretation. Note that in the case of indefinites denoting an existentially bound CF, it does not matter whether $\exists$ scopes over $\forall$ or vice versa: since in both cases the parameter is bound by the higher quantificational NP, both give rise to the same truth conditions.

(19) a. $\exists f \forall z[\text{woman}(z) \rightarrow \text{read}(z, f_z(\text{book}))]$
≈ There is a way of choosing a book relative to every woman such that she read a book chosen that way.
b. $\forall z[\text{woman}(z) \rightarrow \text{read}(z, f_z(\text{book}))]$
≈ For every woman there is a way of choosing a book such that she read a book chosen that way.

In subsection 2.2, it was shown that whereas *kome* can get both a constant and a covarying interpretation, *ko* can only get a covarying interpretation. Building on these data and the observations presented in (18) and (19), I argue that while the parameter of *kome* can be bound either by the speaker or a higher quantificational NP, the parameter of *ko* can only be bound by a higher quantificational NP. Putting all the elements together, *kome* denotes a free skolemized CF whose pronominal parameter can be bound either by the context or by a wider scope quantificational NP. *Ko*, on the other hand, denotes an existentially bound skolemized CF, whose parameter is bound by a higher quantificational NP (if available).

3.2 *Ko* and *kome* in downward entailing contexts

The way I have set things up makes predictions for the behavior of *ko* and *kome* in downward entailing contexts. In particular, it predicts different scopal behavior of *ko* and *kome* in the contexts of (20) and (25).[4] First, consider (20):

[4]The acceptability of the following two example were checked with one Ga native speaker in Berlin.

(20) context: There were three woman in the literature course: Mrs Smith, Mrs Müller, and Mrs Laryea. They were supposed to read three books of their choice. Mrs Smith chose 'Anna Karenina,' 'Gone with the wind,' and 'Madame Bovary.' She read 'Anna Karenina' and 'Gone with the Wind' but she didn't read Madame Bovary. Mrs Müller chose 'The Hobbit,' 'Pride and Prejudice,' and 'Madame Bovary.' She read 'The Hobbit' and 'Pride and Prejudice' but she didn't read 'Madame Bovary.' Mrs Laryea chose 'The Lord of the Rings,' 'Anna Karenina,' and 'Madame Bovary.' She read 'The Lord of the Rings' and 'Anna Karenina' but she didn't read 'Madame Bovary.'
Jeee yei lɛ fɛɛ kane wolo **#ko/kome**.
NEG woman.pl DET every read book INDF/INDF
'Not every woman read a book.'

The context of (20) is presented schematically in (21), where the capital letters stand for books' titles and the underlined capital letters for the books read by the respective woman:

(21) Mrs Smith: {AK, GW, MB}
Mrs Müller: {TH, PP, MB}
Mrs Laryea: {LR, AK, MB}

The analysis of *ko* as an existentially bound CF with a higher quantificational NP as the parameter can account for the unacceptability of *ko* in the context of (21). The semi-formal representation of the target sentence with *ko* is given in (22).[5]

(22) $\neg\exists f$[every woman$_z$ read f_z(book)]

It says that there is no way of choosing a book such that every woman read a book chosen by 'her CF.' Crucially, it is false in the context of (20), because there is a way of choosing a book such that every woman read a book chosen that way, as illustrated in (23).

(23) Mrs Smith: {AK, GW, MB} → AK
Mrs Müller: {TH, PP, MB} → PP
Mrs Laryea: {LR, AK, MB} → LR

Conversely, the target sentence with *kome* is judged to be acceptable in the context of (20). *Kome* denotes a free skolemized CF. When the value of the skolem index of *kome* is relativized to the speaker, it obtains the following representation:

(24) ¬[every woman read f_1(book)]

(24) says that the speaker knows a way of choosing a book such that it is not the case that every woman read this book. This is true in the context of (20), because it is possible to choose a book in the relevant way. For example, 'Madame Bovary' is the book that was not read by every woman (in fact nobody read it). Now, consider (25):

(25) context: The same as before, but this time Mrs Smith didn't read 'Madamy Bovary', Mrs Müller didn't read 'Pride and Prejudice', and Mrs Smith didn't read 'Anna Karenina.' They read all other books they chose.

[5] An open issue is whether Ga native speakers can also obtain an interpretation of (22) with the existential closure scoping above the negation, which is not excluded by the proposed analysis of *ko*, and why my Ga native speaker preferred the reading with the existential closure below the negation. I plan to explore this issue in future research.

Jeee yei lɛ fɛɛ kane wolo **#ko/kome**.
NEG woman.pl DET every read book INDF/INDF
'Not every woman read a book.'

Again, the context is presented schematically in (26), where the capital letters stand for books' titles and the underlined capital letters for the books read by the respective woman:

(26) Mrs Smith: {AK, GW, MB}
Mrs Müller: {TH, PP, MB}
Mrs Laryea: {LR, AK, MB}

The same as in the example discussed before, the target sentence with *ko* is unacceptable in the context of (26). Again, it is judged to be wrong because there is a way of choosing a book, relativized to every woman, such that the respective woman read a book chosen by 'her CF,' contrary to what is suggested by the formal representation of the target sentence with *ko*:

(27) $\neg\exists f$[every woman$_z$ read f_z(book)]

Conversely, the target sentence with *kome* is judged to be acceptable, because *kome* takes invariably a wide scope with respect to negation. Consider (28) with the speaker as the parameter:

(28) $\neg$[every woman read f_1(book)]

It can be paraphrased as: the speaker knows a way of choosing a book such that it is not the case that every woman read this book. This is true in the context of (25), because for example 'Anna Karenina' was not read by every woman.

4 Some open issues

Throughout the paper, I simplified the semantics of *kome* a bit. Namely, it derives from *ekome* 'one' and the cardinality one forms part of its meaning. This claim is based on the data presented in (29) – (31), which show that *kome* can only combine with singular count nouns:

(29) SINGULAR COUNT NOUN:
Q: What did Kofi buy yesterday?
A: Kofi he adafitswawolo kome nyɛ.
Kofi buy newspaper INDF yesterday
'Kofi bought (one) newspaper yesterday.'

(30) PLURAL COUNT NOUN:
Q: What did Kofi buy yesterday?
A: #Kofi he adafitswawo-ji kome nyɛ.
Kofi buy newspaper-PL INDF yesterday
'Kofi bought one newspapers yesterday.'

(31) MASS NOUN:
Q: What did Lisa buy yesterday?
A: #Lisa he fɔ kome nyɛ.
Lisa buy oil INDF yesterday
'Lisa bought (one) oil yesterday.'

I propose modeling the meaning of *kome* as in (32), where g is an assignment function determining which CF will be used in a particular context:

(32) $[\![\text{kome}_i]\!]^g = \lambda P_{\langle e,p\rangle} : ([g(i)](P))\,\text{is atomic}.[g(i)](P)$

Unfortunately, I do not have data which would illustrate an interaction of *ko* with different types of common nouns. This definitely should be examined in order to determine whether it is or it is not another dimension in which the semantics of both indefinites differ.

In addition, there are some open issues and data that still need to be accounted for and/or double-checked. In particular, the proposed analysis cannot account for the following data:

(33) There were four women in the library. Three of them were reading a book, i.e., the first one was reading 'Pride and Prejudice,' the second 'Gone with the Wind,' and the third 'Anna Karenina.' The fourth woman was writing an article, she was not reading any book.
Jeee yei lɛ fɛɛ kane wolo **#ko/#kome**.
NEG woman.pl DET every read book INDF/INDF
'Not every woman read a book.'

The analysis presented so far predicts *kome* to be acceptable in this context, contrary to fact. Note, however, that this sentence was checked only with one Ga native speaker and its unacceptability should be double-checked.

Moreover, I did not discuss in this paper the scopal properties of *ko* and *kome* with respect to if-clauses. The relevant data are presented below:

(34) E-baa-ŋɔɔ Mary naa kɛji onukpa **ko/kome** ba.
3SG-PROSP-happy1 Mary happy2 if elder INDF/INDF come
'Mary will be happy if an elder comes.'
context 1: Mary doesn't know if there are any elders, but...
→ both *ko* and *kome* are acceptable in this context
context 2: There are many elders in the community.
→ both *ko* and *kome* are acceptable in this context
context 3: There are bunch of elders in this community. Mary dislikes most of these elders and doesn't want them to come, but there is a particular elder who she likes and wants her to come.
→ both *ko* and *kome* are unacceptable in this context

Since in order to account for these data, the systematic field research on the semantics of conditionals needs to be conducted, it is left for future research.

5 Summary

Based on novel data from Ga, I argued that both existentially bound skolemized choice functions and free skolemized choice functions are attested in natural language. In particular, it was shown that there are three types of indefinites in Ga: bare NPs, *NP ko*, and *NP kome*. Bare NPs denote quantifiers, *ko* denotes an existentially bound CF that takes a higher quantificational NP as its parameter (if available) and *kome* denotes a free skolemized CF that always can take either the speaker or a higher quantificational NP as its parameter.

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