Functional indefinites: Skolemization As Alienable Possession [1]

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1 Introduction

For an analysis of indefinites to adequately capture the data, two kinds of indefinites need to be distinguished: *a certain* indefinites and *a/some* indefinites. These indefinites differ in two aspects: 1) In non-monotonic context, only *a certain* indefinites give rise to functional readings (Schwarz, 2001, 2011; Chierchia, 2001). 2) *a/some* indefinites can give rise to pair-list readings (Endriss, 2009; Ebert, 2020) under the scope of true distributive quantifiers *every* and *each* (Solomon, 2011). Choice functional analyses have been successful in accounting for the exceptional wide scope of indefinites. However, it has been argued that these accounts cannot capture the differences between the two types of indefinites without appealing to stipulative constraints. In this paper, I propose a formalization of functional interpretation of indefinites which separates the functional dependency from the semantics of indefinite determiners, which uniformly introduce skolem functions f of type $\langle\langle e,t\rangle,e\rangle$ that are existentially closed in the topmost level of the derivation (Matthewson, 1999). The differences between two types of indefinites are derived pragmatically, without a need for stipulations.

In the next section I will discuss the differences between *a certain* indefinites and *a/some* indefinites, and the problems they pose for the choice functional accounts of indefinites.

1.1 Non-monotonic contexts

Chierchia (2001) and Schwarz (2001) observe that both existentially closed (Reinhart, 1997; Winter, 1997), and contextually given skolemized choice functions (Kratzer, 1998) generate unattested readings for indefinites in non-upward monotone contexts. Compare (1a) and (1b) in a scenario where Sue wrote two papers SP=$\{S_1,S_2\}$, only submitted S_1, and Mary wrote two papers MP=$\{M_1,M_2\}$, only submitted M_2.

(1) a. No candidate$_1$ submitted *a* paper they$_1$ had written.
b. No candidate$_1$ submitted *a certain* paper they$_1$ had written.

While (1a) is judged false in this scenario, (1b) is true. According to the choice functional analysis proposed by Reinhart (1997) and Winter (1997), a *choice function* variable introduced by an indefinite determiner can be bound by an existential quantifier at any level of the compositional derivation. Given the free scope of existential closure, two LFs in (2) can be assigned to the sentences containing indefinites in (1a) and (1b).

(2) a. No candidate$_1$ λ_1 [$\exists f$[t_1 submitted f [paper they$_1$ had written.]]]

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b. $\exists f$[No candidate$_1$ λ_1[t_1 submitted f [paper they$_1$ had written.]]]

However, none of these sentences is ambiguous. The sentence (1a) only means that for no candidate there is a paper they wrote that they submitted. The LF in (2a) accounts for this interpretation. The LF in (2b) accounts for the interpretation of (1b), conveying that there's a way of choosing among papers that each candidate wrote such that no candidate submitted whatever paper is selected for them, namely a function that picks S_2 for Sue, and M_1 for Mary.

Let us also consider the sentences in (3a) and (3b) in the following scenario: Smith and Baker are the teachers, both Sue and Mary (the students) read every book Smith praised, but only Sue read every book Baker praised.

(3) a. Not every student read every book *some* teacher had praised.

b. Not every student read every book *a certain* teacher had praised.

The sentence (3a) is judged to be false in this scenario, but (3b) is judged to be true. Two LFs in (4) can be assigned to the sentences containing indefinites in (3a) and (3b).

(4) a. $\neg\forall$x[student'(x) $\rightarrow$ $\exists f\forall$z[praised'(z, f(book')) $\rightarrow$ read' (x,z)]]

b. $\exists f\neg\forall$x[read'(x) $\rightarrow$ $\forall$z[praised'(z, f(x, book')) $\rightarrow$ student' (x,z)]]

The LF in (4a) accounts for the interpretation of (4a), conveying that not for every student, there is a way of choosing among teachers such that they read every book the chosen teacher for them has praised. The LF in (4b) accounts for the interpretation of (3b), conveying that there's a way of choosing among teachers such that not every student read every book praised by the teacher that is selected for them, namely a function that picks Smith for Sue, and Baker for Mary. Therefore, a choice functional account has to be equipped with some constraints to exclude the LFs (2b) and (4b) for sentences containing *a/some* indefinites in (1a) and (3a), and the LFs (2a) and (4a) for sentences containing *a certain* indefinites in (1b) and (3b).

To capture the behavior of *some/a* indefinites under non-upward entailing quantifier, Chierchia (2001) and Schwarz (2001, 2011) propose some constraints on existential closure of choice functions. These constraints either make reference to the monotonicity of the quantifier that binds the individual argument of the skolemized choice function, or restricts the position of the existential closure with respect to that quantifier (Chierchia, 2001; Schwarz, 2001). *a certain* indefinites, on the other hand, are proposed to introduce a contextually given free variable over skolemized choice functions (Kratzer, 1998; Schwarz, 2011). However, given the cost associated with such stipulative constraints, it has been doubted whether or not the semantics of indefinites involves choice functions (Schwarz, 2001, 2011).

1.2 Pair-list readings

Parallel to the distinctions between functional and pair-list readings of questions (Groenendijk & Stokhof, 1984; Chierchia, 1993; Sharvit, 1997), Endriss (2009), Solomon (2011), and Ebert (2020) argue that (*natural*) functional readings of indefinite should be distinguished from pair-list readings (Endriss's *genuine intermediate scope readings*; Solomon's unrestricted functional readings). Given that every pair-list assignment can also be expressed as a functional relation, Endriss (2009) proposes that natural functions have to be nameable and informative. These two kinds of readings can be distinguished by a *namely* type continuations. Such a continuation is only available to natural functional readings with *a certain* indefinites (Schwarz, 2001; Solomon, 2011; Ebert, 2020).

(5) a. No man loves a certain woman he knows— namely, his mother-in-law.
 b. # No man loves some woman he knows— namely, his mother-in-law.

Solomon (2011) argues that (5a) does not have a pair-list reading, which would be equivalent to (6b). If there is no salient, natural function f which maps men to women they know such that no man loves the woman f maps him to, (6a) cannot be uttered truthfully, but (6b) can.

(6) a. No man loves a certain woman he knows— # Sam doesn't love Sue, Mark doesn't love Mary,...
 b. No man loves every woman he knows— Sam doesn't love Sue, Mark doesn't love Mary,...

He argues that pair-list readings is available to indefinites under the scope of true distributive quantifier *each* and *every* (See also Spector (2004) for a similar observation.).

(7) every man loves a woman he knows— Sam loves Sara, Mark loves Mona,...

To account for the difference between these readings, a choice function theory has to posit the existence of two kinds of LFs. The natural functional readings can be modeled by restricting the domain of existential quantification over choice functions to only *natural functions* (Schwarz, 2001; Kratzer, 2003; Endriss, 2009; Solomon, 2011). This restriction, however, has to be loosened in order to derive pair-list readings (Endriss, 2009; Ebert, 2020). In an LF corresponding to such readings, the existential quantification should range over all functions including non-natural ones. Some other constraints still need to be in place to restrict the availability of pair-list readings to the scope of distributive quantifiers (Solomon, 2011).

1.3 Interim summary

In sum, we have seen that there are two types of indefinites which differ in giving rise to pair-list readings. They also behave differently under the scope of non-upward entailing quantifiers. Therefore, for the choice functional treatment of indefinites to adequately capture the data, the two kinds of indefinites need to be distinguished. *a certain* indefinites give rise to natural functional readings. (Schwarz, 2001, 2011) argues that *a certain* indefinites are better captured via contextually given free choice functions (Kratzer, 1998). *a/some* indefinites, in contrast, have been argued to denote existentially closed choice functions (Reinhart, 1997; Winter, 2002), which need to be subject to some constraints in order to rule out their unattested readings under the scope of non-upward entailing quantifiers Schwarz (2001, 2011). Solomon (2011) argues that even with such constraints, a choice functional analysis cannot explain why a pair-list reading is only available when *a/some* indefinites are under the scope of distributive quantifiers. Therefore, given the cost associated with such stipulative constraints, it has been doubted whether or not the semantics of indefinites involves choice functions (Schwarz, 2001, 2011). In the next section I will argue that a choice functional account of indefinite can in fact account for the problems mentioned here without a need for ad hoc constraints.

2 Proposal

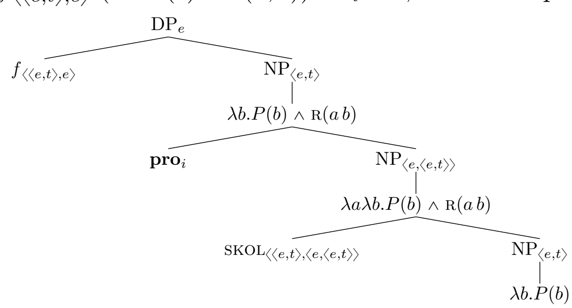
I propose that the functional dependency between a DP and a higher quantifier is built in the NP level. I introduce a type-shifter that introduces a functional dependency between a by shifting a $\langle e,t\rangle$-type noun to an $\langle e,\langle e,t\rangle\rangle$-type noun. As a result of this type-shifer, which I call SKOL, a functional variable R, and an individual variable x_i are introduced. R is free variable whose referent is contextually determined. The variable x_i has to be bound by a higher quantifier in the structure. The discourse referent of the functional variable introduced by SKOL has to be a total function.[2]

(8) $⟪\textsc{skol}\ P⟫= \lambda a \in \textsc{a}.\ \lambda b \in \beta.\ [\ P(b) \wedge\ \textsc{r}(a,b)]$, where R is a total function.

The skolem function f denoted by the indefinite determiner takes this function, which is fed an individual pronoun a co-indexed with other bound variables in the larger structure, as argument and chooses a unique witness for every value of the variable a, as shown in (9).

(9) $f_{\langle\langle e,t\rangle,e\rangle}\ (\lambda b.P(b) \wedge\ \textsc{r}(a,b)) = b_i \in \textsc{b}$, which is equivalent to $f(\textsc{r}\ (a_i)) = b_i$

(10)



This has the effect of narrowing the NP restrictor of the skolem function to only those elements that are related to some a_i. The argument of this skolem function is not a set of individuals in the extension of the NP, but a function. Therefore, the restriction (P) of a skolem function will be restricted to only those individuals $b \in \beta$ that have been mapped to an $a \in \textsc{a}$. Thus, this skolem function is equivalent to a choice function over a singleton set (See also (Schwarzschild, 2002) for an analysis of indefinites as existential quantifiers which can be implicitly restricted to a singleton set.)

A functional NP ($\lambda b.P(b) \wedge \textsc{r}(a\,b)$) presupposes that there is a function that maps every a to a b. The value of this functional variable comes from the context. The discourse model not only keeps track of a list of individuals that are relevant in the discourse, but also a list of salient relations (Groenendijk & Stokhof, 1991; Van der Does, 1992; Brasoveanu, 2007; Keshet, 2018). The discussion of how to formalize the discourse representation in order to find the referent of a relation

[2] This condition is in place because SKOL builds a functional dependency. A is said to functionally determine B, iff each A value in R is associated with precisely one value in B. R is then said to satisfy the functional dependency (A→ B).

variable is important but beyond the scope of this paper. For our current purpose, it suffices to have a discourse model that maintains the dependencies between individuals. The immediate advantage of encoding the pragmatic component of the functional interpretation at the NP level, is that both types of indefinite determiners (*a/some* and *a certain*) can have a uniform semantics. They denote a skolem (choice) function which is existentially closed at the topmost level of the derivation (Matthewson, 1999).

The implicit functional variable R, introduced via SKOL, is subject to a strong contextual felicity condition (Tonhauser et al., 2013; King, 2018) such that it can only be felicitously used in linguistic contexts that already entail them. Therefore, the existence of R has to be entailed by existing salient relations in the linguistic context of utterance.

A functional reading of indefinites (both pair-list readings and natural functional readings) arises when the skolem function introduced by the indefinite determiner takes a functional NP as its argument. The specification of R has to come from the linguistic context. When an NP is modified via a relative clause, containing a variable that the choice of the witness depends on, as in (11a), it can provide a salient referent for R in the linguistic context.

(11) a. Every student_i read every book some teacher they_i like had praised.

b. $\exists f \forall x\,[\,\text{Student}(\mathbf{x}) \rightarrow \forall y\,[\,\text{book}\,(y) \wedge \textbf{praised-by}_2\,(y, f(\lambda z.teacher(z) \wedge R(\mathbf{x}, z) \wedge \text{like}(\mathbf{x}, z))) \rightarrow \textbf{Read}_1(\mathbf{x}, y)\,]]$

In (12a), for instance, an R which maps every student x to a teacher z who the student x *read* every book *praised by z* is computable from the composition of the existing relations *read* and *praised-by*.

(12) a. Every student read every book praised by some teacher.

b. $\exists f \forall x\,[\,\text{Student}(\mathbf{x}) \rightarrow \forall y\,[\,\text{book}\,(y) \wedge \textbf{praised-by}_2\,(y, f(\lambda z.teacher(z) \wedge R(\mathbf{x}, z))) \rightarrow \textbf{Read}_1(\mathbf{x}, y)\,]]$

R is computable in context: $R(x,\text{teacher}) \subseteq R(y, \text{teacher}) \circ R(x,y)$

In (13a), the presence of the NP modifier "*certain*" (Charlow, 2014) makes the accommodation strategy, which is otherwise unavailable, possible.

(13) a. Every student read every book praised by a certain teacher.

b. $\exists f \forall x\,[\,\text{Student}(\mathbf{x}) \rightarrow \forall y\,[\,\text{book}\,(y) \wedge \textbf{praised-by}_2\,(y, f(\lambda z.teacher(z) \wedge R(\mathbf{x}, z))) \rightarrow \textbf{Read}_1(\mathbf{x}, y)\,]]$

R is locally accommodated.

Although the intermediate scope is possible in all three cases above, this approach predicts that the intermediate scope of indefinite should be easier when the existence of R is lexically specified or locally accommodated by an indexical modifier like *certain*, because computing the R which is entailed in a given linguistic context, is costly. This captures Kratzer's intuition that intermediate readings, are more easily available when there are overt bound variables inside the indefinite phrase.

3 Solving the problems

In this section, I show that this new proposal can solve the problems that were mentioned for the choice functional accounts.

3.1 Non-monotonic contexts

As *certain* indefinites can locally accommodate the existence of a function R, this type of indefinites are predicted to always yield functional readings. There are, however, two cases where *some/a* indefinites cannot give rise to functional readings: (i) A lexically specified relation is not a total function. (ii) The existence of R is not entailed in the linguistic context. I show that all cases of problems in non-upward monotone contexts are due to either (i) or (ii).

Let us first consider (1a) and (1b), repeated here as (14a) and (14b) in the same context. We saw earlier that without a further constraint, both of these sentences can be assigned the LF in (14c). This wrongly predict both (14a) and (14b) can be true in this scenario. However, only (14b) is true in the given scenario.

(14) a. No candidate$_1$ submitted *a* paper they$_1$ had written.
b. No candidate$_1$ submitted *a certain* paper they$_1$ had written.
c. $(\exists) f$[No candidate$_1$ λ_1[t$_1$ submitted a$_{f_1}$ [paper they$_1$ had written.]]]

The new approach assigns the LF (15) to both (14a) and (14b).

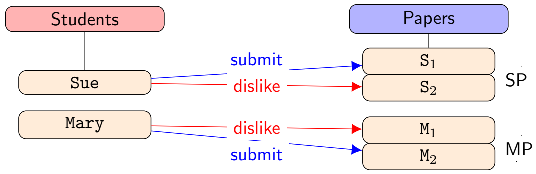
(15) $\exists f$[No candidate($\mathbf{x}$) λ_1[t$_1$ submitted f [λz.paper(z)$\wedge$R($\mathbf{x}$, z)$\wedge$write($\mathbf{x}$, z)]]]

The sentence containing *a certain* indefinite in (14b) is predicted to be true in this scenario, as the existence of a total function R can be easily accommodated. The sentence (14a) with *some* indefinite, on the other hand, is only predicted to be true if R has a referent in the linguistic context. The relation *write* can serve as the referent of R if it is taken to be a total function. That is only the case when the function *write* outputs the unique *set* of papers each candidate wrote, i.e. R=$\{\langle Sue, \{S_1,\mathrm{S}_2\}\ \rangle, \langle Mary, \{M_1,\mathrm{M}_2\}\ \rangle\}$. But the output of the skolem function which takes this R as argument does not verify (15). Therefore, the sentence is correctly predicted to be false in the scenario.

In a context where the relationship *write* is a total function that returns a unique paper for every candidate such that the paper chosen is not submitted, the sentence (14c) becomes acceptable. Consider this context: Sue and Mary are students. They are supposed to submit two papers: a review of a paper they were assigned to read, and a paper they wrote on a topic of their choice. Sue's papers to submit are: SP=$\{S_1,S_2\}$, but she only submitted S_1, which is the review of the article she was assigned. Mary's papers to submit are: MP=$\{M_1,M_2\}$. Like Sue, she only submitted the paper she reviewed (M_2). The sentence (14a) is judged true in this context.

Moreover, if the linguistic context entails the existence of a referent for the function R, the functional reading becomes available. Assume Sue and Mary disliked the papers that they didn't submit.(16a) is judged true, as predicted.

(16) a. No candidate$_1$ submitted **a** paper they$_1$ wrote but disliked.
b. $\exists f$[No candidate($\mathbf{x}$) λ_1[t$_1$ submitted f [λz.paper(z)$\wedge$R($\mathbf{x}$, z)$\wedge$write($\mathbf{x}$, z)$\wedge$dislike($\mathbf{x}$, z)]]]



Now consider (3a) and (3b), repeated here as (17a) and (17b), in the same context. (17a) and (17b) are predicted to be true in this context by both wide scope of existentially closed choice functions (Reinhart, 1997; Winter, 1997), and contextually given skolemized choice functions (Kratzer, 1998), because they can be assigned the LF in (17c). We can find a skolemized choice function f such that f(Sue, the teachers) = Smith, and f(Mary, the teachers) = Baker. But only (17b) is judged true. (17a) is judge as false in this scenario.

(17) a. Not every student read every book *some* teacher had praised.
b. Not every student read every book *a certain* teacher had praised.
c. $(\exists)f$[Not every student$_1$ λ_1[t_1 read every book some/a certain$_{f_1}$[teacher had praised.]]]

Under our approach, both (17a) and (17b) are assigned the LF in (18), where the restriction of f is narrowed to only those teachers that have been mapped by R to a student.

(18) $\exists f \neg \forall x$ [Student($\mathbf{x}$) $\rightarrow \forall y$ [book (y) $\wedge$ **praised-by**$_2$ (y, $f(\lambda$ z.teacher(z) $\wedge$R($\mathbf{x}$, z))) $\rightarrow$ **Read**$_1$($\mathbf{x}$, y)]]

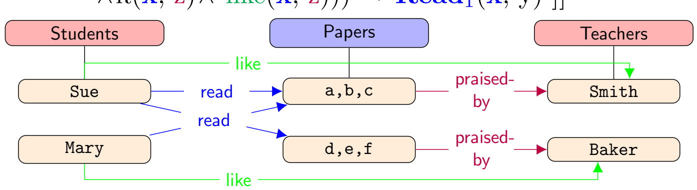
The sentence (17b) is predicted to be true, as R can be easily accommodated. The sentence (17a), on the other hand, is only predicted to be true if R has a referent the linguistic context. Computing R(x,teacher) $\subseteq$ $R_{praised-by}$(y, teacher) $\circ$ R_{read}(x,y) from the information in the linguistic context, there are two possible total functions that can serve as a referent for R:

(19) R_1=$\{\langle Sue, Smith\rangle,\langle Mary, Smith\rangle\}$ R_2=$\{\langle Sue, Baker\rangle,\langle Mary, Smith\rangle\}$

As none of these options verifies (18), The sentence containing *some* indefinite (17a) is correctly predicted to be false by this approach.

If the linguistic context provides a suitable referent for R, sentences containing *some* indefinites are also predicted to render a functional reading. This prediction seems to be borne out. In the same scenario, further assume that Sue likes Smith and Mary likes Baker. (20a) is judged true in this context, as predicted. This shows that a functional reading can be available in non-monotonic context, provided that a suitable total function is linguistically given.

(20) a. Not every student$_i$ read every book **some** teacher they$_i$ like had praised.
b. $\exists f \neg \forall x$ [Student($\mathbf{x}$) $\rightarrow \forall y$ [book (y) $\wedge$ **praised-by**$_2$ (y, f(λ z.teacher(z) $\wedge$R($\mathbf{x}$, z)$\wedge$ like($\mathbf{x}$, z))) $\rightarrow$ **Read**$_1$($\mathbf{x}$, y)]]



In sum, I have shown that this new approach to functional interpretations of indefinites can account for the differences between the behavior of *a/some* and *a certain* indefinites in non-monotonic contexts, without a need for stipulation.

3.2 Pair-list readings

We have seen that while *some* indefinites do not yield natural functional readings under a negative quantifier. This was shown by the contrast in (5), repeated here as (21).

(21) a. No man loves a certain woman he knows— namely, his mother-in-law.
b. # No man loves some woman he knows— namely, his mother-in-law.

Under our account, this is explained by the requirement that the referent of the functional variable R necessarily needs to be entailed in the linguistic context, and cannot be accommodated as is the case for *a certain* indefinites.

Moreover, as the referent of R is computed in the linguistic context from the dependency established between individuals by means of existing relations, the resulting dependency often does not pass the criterion of *nameability* (Endriss, 2009; Ebert, 2020). For instance, the function R(x,teacher) in the example below is computed from the composition of existing relations (*read* and *praised-by*). The resulting function (R(x,teacher) ⊆ R(y, teacher) ∘ R(x,y)), however, is not necessarily nameable, in which case they yield a pair-list reading.

(22) a. Every student read every book praised by some teacher.
b. $\exists f \forall x$ [Student($\mathbf{x}$) $\rightarrow \forall y$ [book (y) $\wedge$ $\textbf{praised-by}_2$ (y, $f(\lambda z.teacher(z) \wedge \text{R}(\mathbf{x}, z))$) $\rightarrow$ $\textbf{Read}_1(\mathbf{x}, y)$]]

In the case of *a certain* indefinites, the referent of the relational variable is not constructed from the information in the linguistic context, thus it does not have a pair-list reading. This account is in line with analyses of functional questions and pair-list questions that take both to denote functions, but to differ in the way their domains are fixed (Sharvit, 1997; Chierchia, 1993).

Finally, as the referent of R has to be a total function, it is only under quantifiers *every* and *each* that such a total function can be entailed in the linguistic context. This explain why pair-list readings are restricted to *a/some* indefinites under the scope of *each* and *every*.

3.3 Implications for cross-linguistic variation

The analysis proposed in this paper also provides a new window to capture the cross-linguistic variation in availability of functional readings under the scope of non-upward entailing contexts. Recent cross-linguistic studies of indefinites by Dawson (2020) and Renans (2018) show that the constraint on the existential closure over choice function (Schwarz, 2001, 2011; Chierchia, 2001) does not hold cross-linguistically, which adds to the adhocness of such a constraint. Under the current account, such cross-linguistic variation can be explained in terms of different contextual restrictions imposed on the referent of the free relational variable, and whether or not the local accommodation is possible.

4 Relation to Possessives and E-type pronouns

The account of functional interpretation of indefinites presented in this paper is similar to the analysis of possessive description (Partee, 1986; Barker, 1995;

Vikner & Jensen, 2002) and E-type pronouns (Kratzer & Heim, 1998) in containing a relational/functional noun which introduces a free relation/function variable whose referent is determined in the context.
This is welcome, because they all seem to share two properties:
(i) *Narrowing*, which is the property that a possessor DP or an E-type pronoun does not quantify over all individuals in the extension of NP, but only over those individuals which have a relation to another element. For instance, the fact that the sentence (23a) is judged true shows that the quantifier *most* ranges only planets that have rings (Barker, 1995).

(23) a. Most planets' rings are made of ice.
b. $[\![\text{most}]\!]$ ([**planets**$(x) \wedge$ **rings**$(y) \wedge \textsc{r}(x,y)$], **made-of-ice**$(y)$])

Similarly, when *it* is interpreted as *a bottle of wine*, it refers to *the bottle of wine every host bought*.

(24) Every host bought a bottle of wine and served *it* with the dessert.

According to accounts that posit the existence of a relational/functional noun in the structure of these constructions, the narrowing property is the result of quantifying only over a relation/function.
(ii) *Maximality effect*, which is the property that a possessor DP or an E-type pronoun have maximal references. The requirement that the referent of R is a total function, also predicts that functional indefinites should also give rise to a similar effect. We have seen that it is indeed the case. As mentioned before, the witness of the indefinite in (25) is the set of *all* papers each candidate wrote.

(25) No candidate$_1$ submitted *a* paper they$_1$ had written.

The strong contextual felicity condition we have posited for the referent of the relational variable in *a/some* indefinites closely resembles the restriction on the felicitous use of E-type pronouns. The relation variable of E-type pronouns have been argued to receive a denotation from the linguistic context (Kratzer & Heim, 1998; Elbourne, 2005). We have seen that this requirement results in the unavailability of functional readings for *a/some* indefinites in non-monotone contexts. E-type pronouns show a similar anomaly with negative quantifiers.

(26) Nobody entered. # They were carrying an umbrella.

Possessive DPs, like *a certain* indefinites, are not subject to similar restrictions, and the referent of the relational/functional variable can be accommodated. However, the sentence in (27a) that shows that some restrictions are in place on what qualifies as a contextually salient relation. (27a) is also false in the same context given for (1a), because the relation between candidates and their not-submitted paper is apparently not salient enough to serve as the referent of the alienable possessive relation either.

(27) a. No candidate's paper was submitted.
b. $[\![\text{no}]\!]$ ([**candidate**$(x) \wedge$ **paper**$(y) \wedge \textsc{r}(x,y)$],**was-submitted**$(y)$])

Functional dependency	**narrowing**	**maximality effect**	**accommodation**	**SFC**	**DE**
E-type pronouns	✓	✓	✗	✓	✓
a/some indefinites	✓	✓	✗	✓	✓
a certain indefinites	✓	✓	✓	✗	✗
Possessives	✓	✓	✓	✗	✗

I take it to be a strength of the present approach that it can account for the similarities in the properties of functional readings of indefinites with possessive DPs and E-type pronouns. Similarities between the behavior of these constructions call for a unified analysis of how functional dependencies are encoded in natural languages. A proper investigation of similarities and variation in this domain remains a subject for future research.

5 Conclusion

In this paper, I have proposed that the functional dependency between a DP and a higher quantifier is built in the NP level. Under this proposal, both *a/some* and *a certain* indefinite determiners denote skolem functions which are existentially closed. The existential closure always takes the widest scope (Matthewson, 1999). The dependency between the indefinite and a higher quantifier is a result of a type-shifting operator that shift the type of an NP from $\langle e,t\rangle$ to $\langle e,\langle e,t\rangle\rangle$. This type-shifter, which I call SKOL, introduces an implicit functional variable whose referent is contextually determined. The difference between *a, some* and *a certain* indefinites is pragmatic. In the case of *some/a* indefinites, the free functional variable is subject to a strong contextual felicity constraint (Tonhauser et al., 2013; King, 2018) such that the linguistic context should entail that the functional variable has a referent (the reference implication). This reference implication cannot be accommodated. In the case of *a certain* indefinites, the reference implication of the functional variable can be locally accommodated. I argue that differences between the two kinds of indefinites with respect to the availability of pair-list readings, and their behavior under non-upward entailing quantifiers follow from their pragmatic differences.

Appendix: Skolemization and Axiom of Choice

The correctness of skolemization depends on the axiom of choice, defined in (28).

(28) For any relation R between sets A, B,
$\forall x \in \text{A} \exists y \in \text{B}[\text{R}(x,y)] \Rightarrow \exists f[f: \text{A} \rightarrow \text{B} \;\&\; \forall x \in \text{A}[\text{R}(x, f(x))]]$

For the skolemization to be correct, the axiom of choice, (28), has to be satisfied. This is only the case when an indefinite is under the scope of a universal distributive quantifier. This entailment does not hold for other quantifiers, in particular negative ones (Solomon, 2011).

(29) $\neg\exists x \in \text{A} \exists y \in \text{B}[\text{R}(x,y)] \not\Rightarrow \exists\, f[f{:}\text{A}\rightarrow \text{B} \;\&\; \neg\exists x \in \text{A}[\text{R}(\text{x}, f(x))]]$

Solomon (2011) argues that functional readings arise only in sentences that have functional witnesses, which is the semantic content of skolemization that is lost in the skolemized choice function approach. Note that the current analysis has encoded this semantics in the type-shifter SKOL, by the requirement that the reference of the variable R has to be a total function.

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