Summative Existentials*

Itamar Francez
University of Chicago
ifrancez@uchicago.edu

To appear in *Linguistic Inquiry*

Abstract

Some existential sentences have readings that are not predicted, and cannot be modeled, given common assumptions about the construction. For example, the sentence *There could be three outcomes to this election* is normally taken to express, not that it is possible for the election to have three outcomes, but rather that there are three possibilities for what the single outcome will be. This paper proposes an analysis of such "summative" readings of existentials which pins them on a novel semantics for cardinal determiners as counting the values of an individual concept across worlds. The analysis is shown to predict the descriptive generalizations about summative existentials, including the highly restricted circumstances under which they arise, and the unorthodox semantics of cardinals it relies on is argued to be independently motivated.

1 Summative readings of existentials

This paper describes and analyzes a phenomenon in existential sentences that none of the many analyses of such sentences in the literature (Barwise and

*I thank Cleo Condoravdi, Karlos Arregi, Chris Kennedy, Zoltán Gendler Szabó, Ashwini Deo, Ming Xiang, Kyle Rawlins, Ezra Keshet, Marcin Morzycki, audiences at SALT 26 at UT Austin, and the workshop in Linguistics and Philosophy at University of Michigan, and three anonymous reviewers for discussion, questions, suggestions, critical comments and corrections. Thank you to Karlos Arregi, Ashwini Deo, Andrea Beltrama, Jason Moore and Lydia Zoells for judgments.

Cooper 1981; Zucchi 1995; Keenan 1987, 2003; McNally 1992; Francez 2007a among others) accounts for, or can be extended to account for. Specifically, it describes a reading of existential sentences that arises systematically, but only under particular conditions.

Suppose there is a race, in which only one participant will eventually win, and you are watching it with a friend. At the outset, all contestants stand a good chance of winning, given what is known about their abilities. As the race proceeds, however, some of the contenders, for various reasons, can no longer be realistically expected to win. Commenting on the race, you tell your friend:

(1) At this point, there can (only) be three winners in this race.

On one reading, paraphrasable as in (2-a), your statement is false in the relevant context, since only one person can win the race. On a more salient reading, paraphrased in (2-b), your statement might well be true.

(2) a. At this point, it is possible that this race will have (only) three winners.
b. At this point, (only) three people are such that they might win the race.

Exactly the same situation is presented by (3), the two readings of which can be paraphrased as in (3-a) and (3-b). Since world knowledge dictates that an election can only have one outcome, the sentence would normally be false on the interpretation in (3-a), but on the interpretation in (3-b) it might well be true.

(3) There can be three outcomes to this election.
a. It is possible that this election will have three outcomes.
b. There are three scenarios such that they might be the outcome of this election.

Borrowing terminology from Szabó (2006), I call these readings of existentials *summative*, since they involve summing the number of distinct entities satisfying a condition across a set of times or worlds. Szabó points out that sentences such as that in (4), have summative readings. The truth of (4) depends on how many distinct individuals satisfy the description *Helen's husband* across the set of past times.

(4) Helen had three husbands.

Similarly, the truth conditions of (1) on the summative reading paraphrased in (2-b) involve counting how many distinct individuals satisfy the description *the winner in the race* across the set of accessible possible worlds.

That existentials have summative readings is an utter surprise given what is believed about existentials. Consider the summative interpretation of (1), which is used as a running example throughout the paper. On the summative reading, the truth conditions of the sentence relative to a model (and a world of evaluation) do not involve a set of three winners, despite the occurrence in it of the noun phrase *three winners*. All existing analyses of existentials predict precisely the opposite. Second, as pointed out by Heim (1987), when an existential sentence features a modal, the modal always takes wide scope over the post-copular noun phrase (henceforth the *pivot*. Heim demonstrated this with the contrast in (5).

(5) a. There might be someone following me.
b. Someone might be following me.

On the summative reading of (1), however, the modal does not take wide scope, as shown by the contrast between (2-a) and (2-b). In fact, as pointed out in Francez (2007a, 2009b), neither on the common assumption that pivots are quantificational, nor on the assumption, made in McNally (1992) and much subsequent literature, that pivots are property denoting, is there a way to assign scope to the modal that yields a summative reading.

This paper develops an analysis that derives the summative interpretation of existentials, and does so in a way that accounts for the restricted circumstances, detailed below, under which it arises. The key component of the proposed analysis is the assumption that cardinal determiners are lexically ambiguous (at least) between their standard generalized quantifier meanings and a novel denotation, whereby they count the distinct values of an individual concept across a set of worlds, henceforth, a *concept value counting* denotation. The assumption that a concept value counting denotation is available to cardinal determiners is shown to have the benefit of immediately accounting for an entirely unrelated phenomenon, namely predicative uses of modal adjectives. Based on the descriptive generalizations about the distribution of summative readings in existentials, summative existentials are argued to manifest a different phenomenon than the summative readings of other quantified sentences discussed and analyzed by Szabó (2006; 2010;

2011. The latter are argued by Szabó to arise from a general mechanism of scope displacement, and are accordingly available whenever such mechanisms are expected to be operative. Summative readings of existentials, in contrast, show a much more restricted distribution, and the relevant restrictions are argued to follow from the proposed analysis, and specifically from the proposal that numerals have a concept-value counting denotation.

2 Summative existentials: the descriptive generalizations

Summative readings are not an idiosyncrasy of English existentials, but are a stable feature of their counterparts across a variety of unrelated languages, as demonstrated in (6-a). Native speakers of the relevant languages find these sentences to be correct descriptions of a scenario like the one described above for (1), that is, one in which the race can only have a unique winner, but there are three possibilities for who the winner might turn out to be. Summative readings of existentials are therefore systematic and arise in a grammatically principled way.

(6) a. *Ci possono essere tre vincitori in questa gara.*
ci can.pl be.inf three winners in this race
There can be three winners in this race.
(ITALIAN, Andrea Beltrama, p.c.)

b. *be-Slav ze, yexolim liyot SloSa menacxim ba-meruc.*
in-stage this, can.m.pl be.inf three.m winners in.the-race
At this stage, there can be three winners in the race.
(HEBREW)

c. *is samasyā-ke tin hal ho sakte*
this.obl problem-gen three solutions.nom be can.m.pl
hañ.
be.pres.3.pl
There can be three solutions to this problem.
(HINDI, Aswhini Deo, p.c.)

d. *asterketa honetan, hiru irabazle egon daiteke.*
race this.in three winner be can
There can be three winners in this race.
(BASQUE, Karlos Arregi, p.c.)

Summative readings do not arise with all existentials that feature a modal. Their distribution appears to be constrained by the following two descriptive generalizations:

A. **Restriction to relational nouns**: Summative readings of existentials arise only with so called relational nouns, never with sortal nouns.[1] For example, (7) does not have a distinct summative reading. It cannot describe a situation in which there are three things that might turn out to be books on the table in some worlds, but not in others.

   (7) There could be three books on the table.

   That this reading in unavailable can be diagnosed by the infelicity of a continuation enumerating the things that could turn out to be books. With summative existentials, such continuations are possible. While the discourse in (8) is perfectly coherent, the one in (9) is a contradiction, as is the one in (10).

   (8) The race has ten participants, exactly one of whom will win. At this point, there could be three winners: the Italian, the German, and the Eritrean.

   (9) The table is piled with things, exactly one of which is a book. #At this point, there could be three books on the table: the thing in the upper corner, the thing next to the vase, or the thing in the middle.

[1] Which relational nouns can give rise to summative readings in existentials is subject to cross linguistic variation. The Hebrew (i) has a summative reading, whereas the English equivalent in (ii) is ungrammatical.

(i) *la-yeled ha-ze yexolim lihiyot SloSa avot.*
to.the-boy the-this can.pl be.inf three.m fathers
Three people could be this boy's father.
(Lit: There could be three father to this boy.)

(ii) *There could be three fathers to/of this boy.

This variation merits closer scrutiny, but my conjecture is that it is due to syntactic constraints on the distribution of relational nouns and their arguments between pivot and coda positions.

(10) This spy holds exactly one disguised camera in her purse. # There can be three disguised cameras in her purse: the lipstick, the lighter, or the cigarettes.

B. **Restriction to existential modals**: Existentials with universal modals do not have summative readings distinct from the wide scope reading for the modal. For example, (11) is true if and only if in all accessible worlds, the race has three winners.

(11) There must be three winners in the race.

The generalization, in fact, is broader. Deontic modals, whether existential or not, never give rise to summative readings. There is no reading of (12-a) in which it is equivalent to (12-b).

(12) a. There may be three participants in this meeting.
b. Three people may participate in this meeting.

Additionally, summative readings are mode difficult to get with some possibility modals than with others. For example, many speakers do not intuit a summative reading with the modal *might*. Such speakers (myself included) cannot perceive a reading for (13-a) in which it is equivalent to (13-b). Later on, it is demonstrated that this restriction is not a restriction against epistemic modality.

(13) a. There might be three winners in the race.
b. Three people might win the race.

Any successful analysis of summative readings of existentials must be able to explain these restrictions on their distribution. The analysis proposed below explains generalization A. As for generalization B, the restriction against universal modals is explained. The observation that summative readings do not arise with deontic modals, while not explained, is shown to be part of a more general incompatibility between such modals and concept value counting denotations. The difficulty of getting summative readings with the modal *might*, to the degree that it is real, remains a challenge for further research.

3 The analysis: counting possibilities

Structurally, existentials vary across languages in complicated ways. For the purposes of this paper, I concentrate on English, and assume that existentials consist of an expletive subject[2], a copular verb, the pivot, and a verb phrase or sentence modifier called a coda. The sentence (1), repeated in (14), has the structure in (15) (or a similar one in which the coda is a VP modifier).[3].

(14) There can be three winners in the race.

[2]By expletive subject I mean a meaningless element that is present in order to satisfy a syntactic constraint specific to English, e.g. that every finite clause have a subject, that an EPP feature be checked, etc. See Deal (2009) for a recent discussion of the syntactic issues surrounding expletive selection.

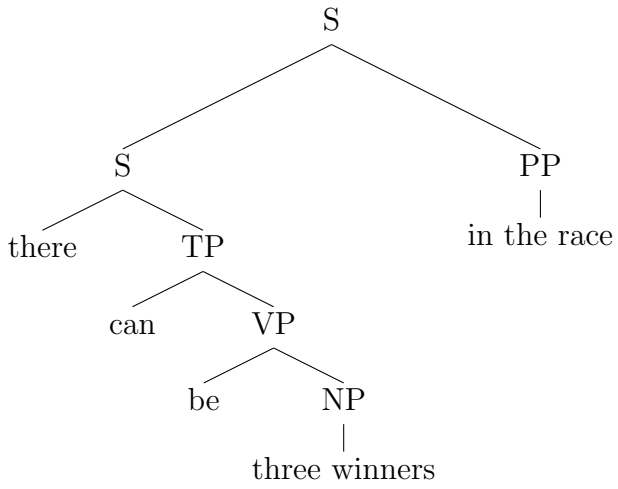
[3]That English existentials have roughly this structure has been widely assumed in the literature. It is argued for extensively by McNally (1992) and Francez (2007a; 2009b) (though see e.g. McCloskey (2014) for detailed arguments against maintaining it for Irish). Many authors (Barwise and Cooper 1981; Williams 1984; Jenkins 1975; Hazout 2004 *inter alia*) assume that any constituent to the right of the pivot is an internal noun modifier. This is an unwarranted assumption. An existential, like any other sentence, can feature sentential and VP modifiers as well as noun modifiers. (i-b) shows that the PP in (i-a) cannot be part of the pivot, and the non-synonymy of (ii-a) and (ii-b) indicates the same.

(i) a. There are three winners with red jerseys in every game.
b. *Three winners with red jerseys in every game are here.

(ii) a. How many winners could there be in every game?
b. How many winners in every game could there be?

Following Francez (2007a), I reserve the term *coda* for material that follows the pivot NP and is not internal to it. This paper assumes the parse of (1) in which the PP is a coda, though the proposed semantic analysis of summative existentials would work exactly the same for NP internal PP modifiers (see also fn. 6).

(15)



In intuitive terms, the analysis I propose is that (14) is true if and only if the individual concept *the winner in the race* has three distinct values across the set of (in this case, metaphysically or circumstantially) accessible possible worlds.

Articulating the composition in slightly more detail, the sentence's truth conditions are that the familiar race **r** is such that, for three things x, the set of propositions p such that $CAN(p)$ contains the proposition that x is the value of the concept *the winner in* **r**.

The analysis rests on three assumptions:

(1) Relational nouns like *winner* can denote (relational) individual concepts, i.e. functions from worlds and individuals to individuals.

(2) Codas like *in the race* determine the value of one of the arguments of the relational noun.

(3) Cardinal determiners like *three* have available a concept value counting denotation, whereby they take an individual concept and a set of worlds as arguments.

These three assumptions, discussed in more detail below, lead to an analysis in which the expression *three winners* requires a modal argument, and composes with the modal auxiliary *can*. The sentence *there can be three winners* denotes a context dependent proposition, i.e. a function from individuals to propositions (much like a sentence containing a pronoun in a variable free semantics, see e.g. Jacobson (1999)). Given some contextually supplied individual d, the proposition is true if and only if across the worlds

specified by the modal, there are three values to the concept *the winner in d*. Modeling the meaning of the sentence as a function from individuals to truth values is a way of capturing the fact that the truth of a summative existential depends on supplying the first argument of the relational concept provided by the head noun in the pivot, and that this argument is implicit, contributed either by context or else by the coda, a contextual modifier. This kind of context dependence is a general characteristic of all existentials (see Francez 2009a). In (14), the relevant individual is supplied by the coda *in the race*.

Of these three assumptions, (3) is by far the most controversial, and might seem, on the face of it, like a stipulation, tailored to deal with summative readings. I show below, however, that concept value counting denotations are independently required to account for data unrelated to existentials, and furthermore that assuming them is what enables an explanation for generalizations A and B above about the restricted availability of summative readings in existentials.

More formally, the analysis is built on the following denotations. Nouns like *winner* or *solution* denote relational individual concepts, functions from individuals to functions from worlds to individuals, as in (16), where for any individual d in the domain of quantification, $f_{winner-of-d}(w)$ is the unique (but potentially plural) individual who wins d in w.[4]

(16) $\quad [\![\text{winner}]\!] = \lambda u \lambda w . f_{\text{winner-of-u}}(w)$

That nouns like *winner* have available the denotation in (16) (or a related extensional functional reading in Löbner (1985)) is a view often adopted in the literature so called "concealed questions", exemplified in (17-a) (Heim 1979; Romero 2005; Frana 2010; Aloni 2008 *inter alia*), as well as in related literature on so-called specificational copular constructions such as (17-b) (e.g. Romero 2005; Arregi et al. 2013).[5]

[4]Of course, the meaning in (16) by no means exhausts what must be said about the meaning of *winner*. At a minimum, a full account of nouns like this must say more about their apparent sortal uses, as in *Shirin is a winner*. Furthermore, *winner* is a deverbal noun that involves a derivational morpheme *–er*, about which there is much to say. The details of such a fuller account, however, are immaterial to my arguments here.

[5]As a reviewer notes, the concept analysis is not an uncontroversial one for concealed questions, see Nathan (2006); Schwager (2008); Aloni and Roelofsen (2011) for discussion. The analysis developed here, however, does not hang on the correct analysis of concealed questions. What matters here is that nouns contribute individual concepts to the com-

(17) a. Shirin knows the winner in the race.
b. The winner in the race is Shirin.

The concept value counting denotation I propose for cardinal determiners like *three* is given in (18). The numeral *three* takes a relational concept, a set of propositions, and an individual, and returns *True* if and only if there are three entities x such that the proposition that x is the value of the concept is an element in the set. For example, in my running example, *three* takes (not in this order) a race r, the set M of propositions true in some possible world, and the relational concept *the winner in x* and returns *True* if and only if there are three individuals such that the proposition that they are the value of the concept *the winner in r* is in M.

(18) $[\![\text{three}]\!] = \lambda\mathcal{I}_{e,se}\lambda\mathcal{M}_{st,t}\lambda y.\exists 3x : \mathcal{M}(\lambda w.\mathcal{I}(y)(w) = x)$

The value counting denotation certainly does not resemble familiar denotations for numerals in the literature. It is not a generalized quantifier, nor is it an adjective-like modifier of set denoting expressions. It does involve quantification, however, in particular what Szabó (2011) calls a bare quantifier, a quantifier the domain of which is not restricted in any way by linguistic material. What the arguments of *three* on this denotation contribute is rather its scope. What *three* ends up quantifying over are the values of a concept across the possible worlds. That the denotation in (18) involves quantification is merely a convenience. A concept value counting denotation can equally well be given without invoking quantificational elements, as in (19).

(19) $[\![\text{three}]\!] = \lambda\mathcal{I}_{e,se}\lambda\mathcal{M}_{st,t}\lambda y. \mid \{x : \mathcal{M}(\lambda w.\mathcal{I}(y)(w) = x)\} \mid = 3$

The denotation of the modal auxiliary *can* in (20) is standard. The modal denotes the set of propositions true in some world accessible from the actual world @ according to some accessibility relation R. The notation $R_@$ designates the set of worlds that are R-accessible from @.

(20) $[\![\text{can}]\!] = \lambda p.\exists w \in R_@ : p(w)$

Finally, codas are treated as sentential (or perhaps VP) modifiers whose role is to provide a value for the implicit argument of the existential, which in

positional computation of meaning, whether they do so lexically, as I assume here, or otherwise, e.g. through a type shifting operation, through combination with the numeral (as assumed for the definite determiner by Lasersohn 2005), or contextually.

this case is the argument of the relational noun. Like other modifiers, codas can be stacked, with interesting semantic effects (Francez 2009b). The same is true for summative existentials. Roughly, each coda provides a restriction for the previous coda.

(21) a. There can be three winners in each race in this tournament.
b. There can be two outcomes to the elections in each of the neighboring countries.

For simplicity, however, I disregard stacking here, and assume that codas, in the case of summative readings, are simply quantifiers that take existentials as their scope argument.[6] The meaning of *in the race*, assuming the preposition is vacuous is in (22).[7]

(22) $[\![\text{in the race}]\!] = \lambda P_{et}.P(r)$

Given these denotations, composition is completely unremarkable and proceeds by function application. The meaning of *three winners* is in (23). This noun phrase takes a modal, and returns a property that holds of any individual y if and only if there are three entities d such that the proposition that d is the winner of y is in the denotation of the modal.

[6] The data in (21) clearly argue against an analysis of codas as internal noun modifiers (and see Francez (2007b; 2009b) for extensive discussion of quantified codas) but it is worth pointing out that analyzing the PP as a noun modifier would not affect its compositional contribution in any way.

[7] Two reviewers express healthy skepticism about the semantic vacuity of the preposition, but the skepticism seems exaggerated to me. First, semantically vacuous occurrences of prepositions like *in* very likely occur in modifiers, e.g. in examples like *An Italian won in the race*, or *The hero dies in the movie*. Second, the preposition in my running example is clearly not locative, since a race is not a location, and reference to its location requires the locative preposition *at* (cf. *I'll meet you at the race*). The preposition could be taken to express a relation of constitutive parthood, as in *There are three Italians in the race* or *There are no wheels in a hoverboard*. On an analysis in which *in* is interpreted this way, the noun *winner* would contribute not a relational concept but simply a concept, *the winner*, and the coda would specify that the individual who is the value of the concept is, in a relevant sense, part of the race. The plausibility of such an analysis depends on an explanation for the indefeasible inference that the relevant winner won the race, rather than something else. It also depends on an account of the preposition *to* in *There can be three outcomes to the elections*. In other words, the preposition in the modifier seems to be idiosyncratically determined by the relational noun. Be that as it may, the simpler (if perhaps simplifying) assumption that the preposition is semantically vacuous suffices to explain the generalizations this paper is concerned with.

(23) $[\![\text{three winners}]\!] =$
$\lambda\mathcal{M}_{st,t}\lambda y.\exists 3x : \mathcal{M}(\lambda w.f_{winner-of-y}(w) = x)$

The meaning of the existential without the coda is then derived as in (24), by applying the meaning of the pivot to the modal.

(24) $[\![\text{there can be three winners}]\!] = [\![\text{three winners}]\!]([\![\text{can}]\!]) =$
$\lambda y.\exists 3x : [\![\text{can}]\!](\lambda w.f_{winner-of-y}(w) = x) =$
$\lambda y.\exists 3x : \exists w \in R_{@} : F_{winner-of-y}(w) = x$

Finally, the meaning of the coda is applied to the meaning of the existential, to yield the desired truth conditions, in (25).

(25) $\exists 3x : \exists w \in R_{@} : f_{winner-of-r}(w) = x$

This analysis, then, derives the correct meaning for summative existentials, and does so in conformity with the more general assumption that codas are optional contextual modifiers saturating or restricting an implicit argument of the pivot (Francez 2009b). Its merit and insight, however, measure with the degree to which it can explain the restrictions on summative readings observed above, and the degree to which its key components, in particular concept value counting denotations for cardinals, can be independently motivated. The next two sections are dedicated to these issues.

4 The restricted distribution of summative readings

The analysis proposed derives summative readings for all and only existentials that involve a cardinal determiner with a value counting denotation. Such a determiner requires, semantically, a (relational) individual concept denoting noun and a modal expression as its arguments, and it is therefore already expected that not all existentials will have summative readings. It is, also expected, however, that there should be non-existential sentences in which such cardinal determiners can be found, giving rise to similar interpretations. Both of these expectations are met, as are a few others discussed in this section.

Generalization A above, that summative readings do not arise in the presence of a sortal noun, is precisely what the analysis predicts. This is because

sortal nouns cannot contribute relational concepts to the compositional interpretation. Recall the contradictory discourse in (26), repeated from (10).

(26) We know this spy holds exactly one disguised camera in her purse. There can be three disguised cameras in her purse: the lipstick, the lighter, or the cigarettes.

If the existential which is the second sentence in (26) had a summative reading, it would be perfectly consistent with the first sentence, which asserts the existence of a unique hidden camera in the spy's purse. The proposed analysis attributes the unavailability of a summative reading for (26) to the inability of nouns like *camera* (and/or the noun phrase *disguised camera*) to denote relational individual concepts. This inability, however, is not an an absolute semantic property. When the context suggest such an interpretation strongly enough, it becomes available (see e.g. Schwager (2008); Frana (2010)). This can be readily observed in contexts thought to involve concept interpretations, such as the subject position of verbs of change of state (see Deo et al. 2013 for extensive discussion). Out of the blue, example (27-a) is naturally interpreted to involve a different winner in every race, whereas (27-b) is, somewhat oddly, interpreted as describing a single camera that changes.

(27) a. The winner will change next week.
b. The camera will change next week.

It is fairly easy, however, to imagine a context that makes (27-b) perfectly natural. For example, suppose a spy's purse must contain a camera at all times, and the cameras are changed once a week. Then (27-b), uttered by a spy about the contents of her purse, is unremarkable. Similarly, existentials with sortal nouns can receive summative readings in a context that strongly suggests a concept interpretation of the pivot, as in (28).

(28) The syllabus for this class always contains one book and five articles. There is no final decision yet, but at this point there could only be three books on the syllabus: *Ulysses*, *Charlotte's Web* and *The Road*.

Generalization A, then, turns out to be more refined than was stated earlier. The restriction against sortal nouns is not absolute, and summative readings are tied to the presence of individual concept interpretations for

pivots, which are not equally available for sortal and relations nouns.[8] The dependence of summative readings on concept interpretation for the pivot is precisely what the proposed analysis predicts in locating the source of such readings in the value counting denotation of cardinal determiners.

Generalization B, that universal modals do not give rise to distinct summative readings, is an immediate consequence of the concept value counting denotation proposed for cardinals. To reiterate the generalization, the sentence in (29) can only be interpreted as asserting that it is necessary that three people win the race.

(29) There must be three winners in the race.

On the proposed analysis (as the reader is invited to verify for herself), (29) receives the interpretation in (30).

(30) $\exists 3x : \forall w \in R_{@} : f_{winner-of-r}(w) = x$

Clearly, this interpretation entails, i.e. is a special case of, the wide scope reading for the modal. If there are three individuals that are the values of the concept *the winner of the race* in every world, then in every world, there are three people who win the race.

What seems at first to be a stipulative aspect of the proposed analysis, the assignment of concept value counting denotations to cardinals, turns out upon further examination to have significant explanatory power, predicting generalizations about when summative readings arise. The next section discusses independent motivation for introducing concept value counting denotations for cardinal determiners, including evidence from sentences with predicative modal adjectives. The latter also demonstrate that the unavailability of summative readings with deontic modals, observed above, is predictable if such readings are tied to concept value counting cardinals.

5 The case for concept value counting denotations

Independent motivation for concept value counting denotations as possible interpretations for cardinal determiners comes from copular sentences with

[8] Why this asymmetry holds is, of course, a very intriguing question to explore, but falls far beyond the scope of this paper.

modal adjectives in predicative position, such as (31-a). As far as I am aware, such sentences have not been discussed in the literature. Assuming that predicative *possible* has the denotation in (20) above, denoting the set of propositions true in some possible world, the derivation of (31-a) is trivial given the value counting denotation proposed in (18), proceeds by simple function application ($[\![\text{three}]\!]([\![\text{winners}]\!])([\![\text{possible}]\!])$) and correctly captures the fact that the sentences in (31) are truth conditionally equivalent.

(31) a. Three winners are possible in this race.
b. There can be three winners in this race.

Having brought in modal adjectives, it is worth considering briefly a temptation to favor an alternative analysis of summative existentials, deriving them in some way from existentials with attributive modal adjectives, such as (32), which is also truth conditionally equivalent to the sentences in (31).

(32) There are three possible winners in this race.

A concept value counting denotation for the numeral will not account for (32). A numeral with that denotation must combine with a concept noun, and only then with a modal, it is not designed to combine with a modified concept noun.[9] This fact might be taken to indicate that the proposed analysis is wrong, and that summative existentials should rather be derived from sentences like (32), perhaps by some operation raising the adjective into the position of the modal, or by assuming that both positions are in fact occupied, due to some concord phenomenon, and only one is interpreted and pronounced. Perhaps the syntactic assumptions such an account entails can be motivated. Even so, the idea of deriving the relevant summative existential from (32) can be dismissed, for the simple reason that the synonymity between existentials with a modal and existentials with an attributive adjective, unlike the synonymy in (31), does not generally hold. In particular, attributive modal adjectives can occur in existentials with sortal nouns, giving rise to meanings not available to equivalent sentences with a modal auxiliary. This can be seen by contrasting (33-a) and (33-b).

(33) a. There are three possible cameras in this purse.

[9]The details of an analysis of (32) that *does* work are irrelevant to my argument here. One option is to assign *possible* a denotation that maps nouns to sets of individuals that satisfy the descriptive content of the noun in some possible world.

b. There could be three cameras in this purse.

The assertion of (33-a) is that there are three things in the purse that might turn out to be cameras.[10] It entails that there are at least three things in the purse. (33-b) entails no such thing and is compatible with the purse being potentially empty. Furthermore, (33-a) commits the speaker to the existence of things suspected to be potential cameras, whereas (33-b) does not. Both of these observations come out clearly in the continuations in (34) and (35).

(34) a. There are three possible cameras in this purse, # but it might be empty.
b. There could be three cameras in this purse, but it could be empty.

(35) a. There are three possible cameras in this purse, # but currently there are no possible cameras there.
b. There could be three cameras in this purse, but currently there are no possible cameras there.

Since there is no general synonymy between existentials with modal auxiliaries and existentials with corresponding attributive modal adjectives, there is no motivation for deriving one from the other, even if such a derivation can be shown to be syntactically plausible.

Going back to modal adjectives in predicative position, it can be observed in (36) that such adjectives cannot be deontic. The sentence in (36-a) cannot be interpreted as semantically equivalent to their counterpart in (36-b).

(36) a. Three winners are allowed / required in this race.
b. Three people are allowed / required to win this race.

This indicates that, for reasons that deontic modals are not just ruled out in summative existentials, but more generally in context that involve concept value counting. In other words, for reasons that are not clear to me, deontic modality is simply not compatible with concept value counting. Further reflection on why this might be is left for future research, but if it is indeed the case, as the data suggest, then the absence of summative readings with deontic modals is a direct prediction of an analysis that pins such readings

[10]Note that (33-a) is not a summative existential. It is not compatible with a scenario in which the purse can in fact contain only one camera, but there are three things that might turn out to be that camera.

on concept value counting denotations.

Another interesting piece of data that seems to support the existence of concept value counting denotations comes from *how many* questions. The question in (37) cannot be interpreted as asking how many people might win, only as asking how many winners the race can have.

(37) How many winners can there be in the race?

This is predicted if summative existentials do not involve cardinal determiners with standard denotations. If the numeral in the non-interrogative, summative existential counterpart of (37) had its standard meaning, specifying the cardinality of a set contributed by its complement noun, the pied-piping in (37) would retain that reading, counterfactually. According to a widespread assumption in the literature on quantity questions like *how many* (see for example Heycock 1995; Romero 1998; Hackl 2000; Rett 2006), they track the cardinality of a set contributed by the common noun. On the proposed analysis, the set the cardinality of which the numeral is tracking in the summative existential version of (37) is the one in (38).

(38) $\{x : \exists w \in R_{@}[x \text{ is the winner of the race in } w]\}$

It is entirely unsurprising that a *how many winners* question cannot track the cardinality of this set, since it is not a set contributed by the noun *winners* (neither as its extension nor as its intension). The assumption that there are concept value counting numerals, and that it is such numerals that are involved in summative readings, therefore immediately predicts the unavailability of a summative question reading for (37).

6 Summative readings and quantifier displacement

As mentioned in the introduction (and already in Francez 2007a), summative existentials resemble closely the more general phenomenon discussed by Szabó (2006; 2010; 2011). Szabó discusses summative readings of sentences like the following:

(39) a. John believes that eleven terrorists live in his building.
b. This race could have three winners.

Szabó argues that the summative reading of these sentences is a genuine instance of bare quantification in natural language. His analysis invokes a special mechanism of quantifier displacement, wherein a determiners can move to a position where it is restricted by an empty noun whose denotation is the entire domain of quantification, leaving behind what he calls a "restricted trace". A restricted trace is a trace that carries as a presupposition the content of the noun that, before movement, acted as the restrictor of the determiner. Szabó demonstrates that this mechanism can capture the summative readings of the examples he analyzes. From the perspective of parsimony, clearly an analysis of summative existentials that subsumes them under this more general phenomenon of summativity is preferable to one that doesn't. This section argues that such a move would be a mistake, since the phenomena are only superficially identical.

Omitting some detail, applying this mechanism to my running existential example would generate the LF in (40) (ignoring the prepositional phrase for simplicity).

(40) $[_S[_{DP}\ [_D$ Three] $[_N\ ]\ ]\ [_8\ 8[_S$ there [can [be $[_{DP}[_D\ t_8]\ [_N$ winners]]]]]]]

As mentioned, the empty noun slot in (40) is interpreted as denoting the domain of quantification E, and the constituent [$[t_8]$ $[_N\ ]$], called a restricted trace, is interpreted, relative to an assignment g, as $g(8)$ if $g(8)$ is in the extension of the noun *winners*, and is undefined otherwise. How exactly this LF is to be interpreted is not an entirely straightforward question, and depends on what one assumes about the interpretation of an existential with a restricted trace in pivot position. Assuming (non trivially, see below) that the interpretation of the constituent in (41-a) is as in (41-b), we get the truth conditions in (41-c) for the sentence, whenever it is defined. These are the summative truth conditions.

(41) a. $[_8\ 8[_S$ there [can [be $[_{DP}[_D\ t_8]\ [_N$ winners]]]]]]
b. $\lambda x.\exists w \in R_@[x \in E]$ if $x \in$ winners in w, else undefined.
c. THREE(E)($\{x : \exists w \in R_@[x \in E\ \&$ winner$(x)(w)\}$)

There are two reasons, however, against assimilating summative readings of existentials to summative readings elsewhere. The first is that an analysis involving quantifier displacement is far too general for the data involved. Quantifier displacement is a general syntactic operation, not sensitive to the lexical semantics of nouns, or to the force of modals. An analysis based

on quantifier displacement has, therefore, no way of accounting for the descriptive generalizations A and B above, and wrongly predicts summative readings for all existentials that contain a modal. This lack of descriptive adequacy clearly outweighs considerations of parsimony.

The second reason is that an analysis involving quantifier displacement goes against what is generally known about existential sentences. In particular, it goes against the well known empirical generalization, discussed extensively by Heim 1987 and mentioned in the introduction, according to which scoping out of the pivot position in an existential is impossible. Heim is interested in defending the theoretical claim that scoping out of existentials is ruled out when it leaves behind an individual variable, and she takes this to be an instance of the definiteness effect. Her generalization is stated in (42).

> **Heim's generalization** (Heim 1987): No scoping out of existentials
> *There be x, where x is an individual variable.

The LF in (40), generated using Szabó's mechanism of displacement, clearly violates this generalization. The constituent $[_{DP}\ [_{D}\ t_8]\ [_{N}$ winners$]\ ]$ is an individual variable, denoting, relative to any assignment function g, the individual assigned by g to the index 8 if that individual is a winner, and denoting nothing otherwise. Heim's generalization, however, is empirically quite robust. It is manifested in the absence of de-re readings exemplified in the introduction by (5), and in the ungrammaticality (in English) of sentences like (42) (Heim's example 2) in which the pivot is a bound individual pronoun.

(42) *No perfect relationship is such that there is it.

Heim furthermore argues that her generalization is manifested in a range of other phenomena that have been analyzed as involving displacement and scope, including the oddity of the sentences in (43).[11]

(43) a. ?? Which actors were there in the film?

[11] See Heim's paper for elaborate discussion of why these sentences are manifestations of the ban on scoping out of the pivot position. For example, (43-a), under standard assumptions, would have to be interpreted as a set of true propositions of the form *there is x in the film*, where x is some actor. Of course, the data in (43) are only examples of generalizations about scope if they are taken to involve movement and variable binding, which is a theoretical assumption rather than a descriptive fact.

b. *The men, all of whom there were in the room, ate guavas.

An analysis that seeks to assimilate summative readings of existentials to the more general phenomenon of summativity analyzed by Szabó, then, is disadvantageous compared to the analysis proposed here on both empirical and theoretical grounds. Empirically, it overgenerates, missing important generalizations about the availability of summative readings and about scopal interactions in existentials. Theoretically, assuming a theory that involves mechanisms of scope displacement, it requires such mechanisms to apply in a context in which there is significant reason to believe they do not. Summative existentials, therefore, are a different phenomenon, and the source of their summativity lies elsewhere, as this paper argues.

7 Summary and conclusion

This paper introduced and provided an analysis of the puzzling phenomenon of summative existentials. Summative readings were shown to be restricted to existentials in which the pivot is interpreted as an individual concept, and which contain a non-deontic existential modal. The main argument of the paper is that summativity in existentials arises from a special interpretation of cardinal determiners as concept value counters. It was shown that an analysis of summative readings of existentials as involving concept value summation explains the observed restrictions on their availability. The concept value counting interpretation of cardinal determiners was argued to receive independent motivation from the properties of sentences involving predicative modal adjectives, as well as from the unavailability of *how many* questions. A comparison was drawn between the proposed analysis and one that seeks to assimilate summative existentials to a more general phenomenon arguably due to scope and quantifier displacement, and the conclusion was defended that, for both empirical and theoretical reasons, the two phenomena should not be unified, and the proposed analysis should be preferred. If the proposed analysis is correct, it uncovers the existence of concept value counting determiners, and contributes to a growing body of literature (Condoravdi et al. (2001); Aloni (2000); Schwager (2007); Zimmermann (2006); Löbner (2011); Deo et al. (2013); Saebø (2014); Francez (2015) *inter alia*) highlighting the ubiquity of individual concepts in the interpretation of nominal expressions in natural language.

References

Aloni, Maria. 2000. Quantification under conceptual covers. Doctoral Dissertation, ILLC/Department of Philosophy, University of Amsterdam.

Aloni, Maria. 2008. Concealed questions under cover. In *Knowledge and questions*, ed. Franck Lihoreau, volume 77 of *Grazer Philosophische Studien*, 191–216. Amsterdam: Rodopi.

Aloni, Maria, and Floris Roelofsen. 2011. Interpreting concealed questions. *Linguistics and philosophy* 34:443–478.

Arregi, Karlos, Itamar Francez, and Marina Martinović. 2013. Specificational subjects are individual concepts. Paper presented at *Sinn und Bedeutung 18*, Vitoria-Gasteiz, 11–13 September.

Barwise, Jon, and Robin Cooper. 1981. Generalized quantifiers and natural language. *Linguistics and Philosophy* 4:159–219.

Condoravdi, Cleo, Richard Crouch, and Martin van den Berg. 2001. Counting concepts. In *Proceedings of the Thirteenth Amsterdam Colloquium*, ed. Robert van Rooy and Martin Stokhof, 67–72. Institute for Logic, Language and Computation, University of Amsterdam.

Deal, Amy Rose. 2009. The origin and content of expletives: evidence from selection. *Syntax* 12:285–323.

Deo, Ashwini, Itamar Francez, and Andrew Koontz-Garboden. 2013. From change to value difference in degree achievements. In *Proceedings of the 23rd Semantics and Linguistic Theory conference*, ed. Todd Snider, 97–115. Ithaca, NY: CLC Publications.

Frana, Ilaria. 2010. Concealed questions. in search of answers. Doctoral Dissertation, University of Massachusets, Amherst.

Francez, Itamar. 2007a. Existental propositions. Doctoral Dissertation, Stanford University.

Francez, Itamar. 2007b. Quantification in the coda of existentials. In *Proceedings of the 16th Amsterdam Colloquium*, ed. Maria Aloni, Paul Dekker, and Floris Roelofsen.

Francez, Itamar. 2009a. Context dependence and implicit arguments in existentials. *Linguistics and Philosophy* 33.

Francez, Itamar. 2009b. Existentials, predication, and modification. *Linguistics and Philosophy* 32:1–50.

Francez, Itamar. 2015. Chimerical conditionals. *Semantics and Pragmatics* 8:1–35.

Hackl, Martin. 2000. Comparative determiners. Doctoral Dissertation, MIT.

Hazout, Ilan. 2004. The syntax of existential constructions. *Linguistic Inquiry* 35:393–430.

Heim, Irene. 1979. Concealed questions. In *Semantics from different points of view*. Berlin: Springer.

Heim, Irene. 1987. Where does the definiteness constraint apply? Evidence from the definiteness of variables. In *The representation of (in)definiteness*, ed. Eric Reuland and Alice ter Meulen, 21–42. Cambridge, MA: MIT Press.

Heycock, Caroline. 1995. Asymmetries in reconstruction. *Linguistic Inquiry* 26:547570.

Jacobson, Pauline. 1999. Towards a variable-free semantics. *Linguistics and Philosophy* 22:117–185.

Jenkins, Lyle. 1975. *The English existential*. Tübingen: Niemeyer.

Keenan, Edward. 1987. A semantic definition of indefinite NP. In *The representation of (in)definiteness*, ed. Eric Reuland and Alice ter Meulen, 286–317. Cambridge, MA: MIT Press.

Keenan, Edward. 2003. The definiteness effect: Semantics or pragmatics? *Natural Language Semantics* 11:187–216.

Lasersohn, Peter. 2005. The temperature paradox as evidence for a presuppositional analysis of definite descriptions. *Linguistic Inquiry* 36:127?144.

Löbner, Sebastian. 1985. Definites. *Journal of semantics* 4:279–326.

Löbner, Sebastian. 2011. Concept types and determination. *Journal of Semantics* 28:279–333.

McCloskey, James. 2014. Irish existentials in context. *Syntax* 17:343–384. URL `http://dx.doi.org/10.1111/synt.12020`.

McNally, Louise. 1992. *An interpretation for the English existential construction*. New York: Garland.

Nathan, Lance. 2006. On the interpretation of concealed questions. Doctoral Dissertation, MIT.

Rett, Jessica. 2006. How many maximizes in the balkan sprachbund. In *Proceedings of Semantics and Linguistic Theory XVI*, ed. Masayuki Gibson and Jonathan Howell, 190–207.

Romero, Maribel. 1998. Focus and reconstruction effects in wh-phrases. Doctoral Dissertation, University of Massachusetts, Amherst.

Romero, Maribel. 2005. Concealed Questions and Specificational Subjects. *Linguistics and Philosophy* 28:687–737.

Saebø, Kjell Johan. 2014. Do you know what it means to miss new orleans: More on missing. In *Approaches to meaning: Composition, values, and interpretation*, ed. Daniel Gutzmann, Jan Kpping, and C'ecile Meier, 105–

127. Leiden: Brill.

Schwager, Magdalena. 2007. Bodyguards under cover. In *Proceedings of the 17th Semantics and Linguistic Theory conference*, ed. Masayuki Gibson and Jonathan Howell, 246–263.

Schwager, Magdalena. 2008. Keeping prices low: an answer to a concealed question. In *Proceedings of Sinn und Bedeutung 12*, ed. Alte Grønn, 582–596. Oslo: ILOS.

Szabó, Zoltán Gendler. 2006. Counting across times. *Philosophical Perspectives* 20:399–426.

Szabó, Zoltán Gendler. 2010. Specific, yet opaque. In *Logic, Language and Meaning: 17th Amsterdam Colloquium, Amsterdam, The Netherlands, December 16-18, 2009, Revised Selected Papers*, ed. Maria Aloni, Harald Bastiaanse, and Tikitu de Jagerand Katrin Schulz, 32–41. Berlin: Springer.

Szabó, Zoltán Gendler. 2011. Bare quantifiers. *Philosophical Review* 120:247–283.

Williams, Edwin. 1984. *There*-insertion. *Linguistic Inquiry* 15:131–153.

Zimmermann, Thomas Ede. 2006. Monotonicity in opaque verbs. *Linguistics and Philosophy* 29:715–761.

Zucchi, Alessandro. 1995. The ingredients of definiteness and the definiteness effect. *Natural Language Semantics* 3:33–78.