

Adverbial Quantification and (Un)Reducibility: The *Quantification at a Distance* Construction in French

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Abstract

In this paper, I present a compositional semantic analysis of the *Quantification at a Distance* (QAD) construction in the standard dialect of European French. I argue that quantification in a QAD sentence is done by a binary adverbial quantifier over the verb's event argument and the direct object argument at the same time. I argue that the modeling of the interpretations assigned to QAD sentences necessarily involves a polyadic quantifier, since such a quantifier is unreducible to any iterations of unary quantifiers. I provide a compositional analysis of the construction based on previous treatments of the indefinites that appear in it as semantically incorporated nominals.

1 Introduction

The goal of this paper is to present a new compositional semantic analysis of the *Quantification at a Distance* (QAD) construction in the standard dialect of European French (SF). Since it was first noticed by Kayne (1975), the QAD construction has been frequently studied for the standard dialect of European French¹ ((Kayne, 1975); (Milner, 1978); (Obenauer, 1983) (Obenauer, 1994); (Rizzi, 1990); (Doetjes, 1997); (Boivin, 1999); (Mathieu, 2004); (Heyd, 2003) *inter alia*). In French, individual quantification can be realized by use of an adnominal quantifier (ex. *beaucoup* 'a lot') that selects a DP headed by the particle *de*. Following the literature, when *beaucoup* appears next to its restriction, I call this sentence a *Canonical Quantification* sentence.

- (1) J'ai lu **beaucoup de livres**
I have read **a lot** **de books**
'I read a lot of books' **Canonical Quantification**

¹The semantic properties of the QAD construction are subject to significant dialectal variation. The paper only analyses the construction in the standard. However, see (Cyr, 1991) and (Burnett, 2009) for a discussion of the semantics of the QAD construction in Québec French.

The quantifier may also be placed in an adverbial position to form a sentence that, at first glance, seems synonymous with (1). Sentences of this form are known as *Quantification at a Distance* sentences, and they are the subject of this paper.

- (2) J'ai **beaucoup** lu **de** livres
 I have **a lot** read **de** books
 'I read a lot of books'

Quantification at a Distance

I argue that, despite the large amount of attention devoted to this construction in the syntactic and semantic literature, it has not yet received a proper semantic analysis. I show that the previous attempts to account for the semantic properties of the construction are problematic, and I propose a new analysis with greater empirical coverage.

In this work, I make two sets of proposals: one syntactic and one semantic. With respect to the syntax of the construction, I argue that the quantification in QAD sentences is done by the adverbial quantifier *beaucoup*. In other words, I propose that QAD sentences are not transformationally derived from their canonical counterparts, but rather *beaucoup* is base-generated in a preverbal position, and the quantification it preforms is adverbial in nature. With respect to the semantics of the construction, I argue that QAD sentences in Standard French involve binary quantification by the adverb *beaucoup* over <event, object> pairs denoted by the verb phrase. I argue that an analysis of QAD that involves polyadic quantification is necessary because, as proven in (Burnett, 2009), the binary quantifier needed to account for the interpretations assigned to the construction is unreduceable to iterations of unary quantifiers. I therefore conclude that the Standard French QAD construction serves as another example of properly polyadic quantification in natural language.

The paper is organized as follows: In section 2, I present the data and review the previous approaches to the syntax of QAD. In section 3, I present the only previous analysis of QAD that explicitly deals with its semantics. I argue that, while this analysis can account for many of the puzzling properties of the construction, it makes wrong predictions as to the possible meanings that can be assigned to QAD sentences in certain contexts. In section 4, I present my analysis of quantification at a distance. I propose that the unary adverb *beaucoup* has a properly binary extension to <event, object> pairs. Finally, I provide a compositional analysis of the construction that shows how pair quantification can arise in a natural manner based on previous analyses of the lexical items that make up the construction and basic principles of semantic composition.

2 Syntactic Analyses

In this section, I contrast two opposing classes of proposals about the syntax of QAD sentences, both of which have received considerable support in the literature on this construction.

The first class of proposals are those that assume that QAD sentences are base gen-

erated as canonical quantification sentences. The quantifier then raises to a preverbal position. Although the fine details of the landing site of the quantifier and the motivation for its movement vary from author to author, all proponents of this style of analysis propose that the structure of a QAD sentence is similar to (3).

- (3) J'ai *beaucoup*_i lu [*t*_i [de livres]]

This analysis is argued for, or implicitly assumed by, (Milner, 1978), (Rowlett, 1996), (Boivin, 1999), and (Labelle & Valois, 2004), among others.

The second class of analyses are those that propose that the *beaucoup* in QAD sentences is not the adnominal quantifier, but the adverbial one, i.e. the one that is found in simple event quantification contexts such as (4).

- (4) J'ai beaucoup dormi
I have a lot slept
'I slept a lot'

Thus the basic structure of a QAD sentence resembles (5).

- (5) J'ai [_{ADV} beaucoup [_{VP} lu [_{DP} de livres]]]

I call this style of analysis the *Adverbial Analysis*. Specific analyses that instantiate the adverbial analysis are given in (Kayne, 1975), (Obenauer, 1983), (Doetjes, 1997), and (Mathieu, 2004). This paper also presents a version of the adverbial analysis of QAD.

However, before we examine the adverbial properties of *beaucoup* in QAD, we must note that there are some reasons to think that locality, which is generally taken to indicate the presence of syntactic movement, plays an important role in the construction.

2.1 Arguments for the Movement Analysis

The main argument for the movement analysis of QAD is that, in certain contexts, the construction seems to be subject to the same type of locality effects as other cases of movement in French. In particular, QAD is impossible across phrases that we know, independently, are islands for movement. As shown by (Valois, 1991), QAD is impossible across PPs, inverted constituents, and definite DPs.

- (6) a. *J'ai beaucoup parlé à de filles
I have a lot talked to de girls
(cf. *J'ai parlé à beaucoup de filles*)
b. *J'ai beaucoup dormi pour guérir de petits maux
I have a lot slept to heal de little hurts
(cf. *J'ai dormi pour guérir beaucoup de petits maux*)
c. *J'ai beaucoup considéré intelligents d'étudiants
I have a lot considered intelligent de students

- (cf. *J'ai considéré intelligents beaucoup d'étudiants*)
 d. *J'ai beaucoup regardé la photo (de) d'enfants
 I have a lot looked at the photo (of) de children
 (cf. *J'ai regardé la photo de beaucoup d'enfants*)
 (Valois (1991: 139))

Additionally, QAD sentences are impossible across tensed clause boundaries.

- (7) *J'ai beaucoup dit que Jean a lu de livres
 I have a lot said that Jean has read de books
 (cf. *J'ai dit que Jean a lu beaucoup de livres*)

While, at first glance, these examples would seem to point to the existence of movement in the construction, movement is not the only possible way to account for them. In fact, there are reasons to think that the 'locality effects' observed in QAD do not actually mirror those that we find in clear-cut cases of movement elsewhere in the language. Firstly, as pointed out by (Valois, 1991), since QAD is clearly not a case of A-movement, it is not obvious why this movement would be clause-bound, given that other A-bar movements, like Wh-movement, are not. Secondly, as discussed by (Mathieu, 2004), the locality facts in (6) are actually part of a broader generalization about the distribution of *de* phrases in argument position, one that is independent from QAD: *de* phrases in argument position are only grammatical in surface direct object position

We can repeat the data in (6) using the negative quantifier *pas* 'not' that also licenses *de* phrases (8), noting that, since *pas* never forms a DP with a *de* phrase, the ungrammaticality of the examples in (9) cannot be due to movement violations.

- (8) Je (n')ai pas lu de livres
 I (neg) have not read of books
 'I didn't read any books'
- (9) a. *Je (n')ai pas parlé à de filles
 I (neg) have not talked to de girls
 (cf. **Je (n')ai parlé à pas de filles*)
 b. *Je (n')ai pas dormi pour guérir de petits maux
 I (neg) have not slept to heal de little hurts
 (cf. **Je (n')ai dormi pour guérir pas de petits maux*) etc.

Thus the data in (6) are best explained not as cases of movement being blocked, but as reflections of the special syntax of *de* phrases in argument position. I will return to the syntactic and semantic behaviour of *de* phrases in sections 3 and 4.

2.2 Arguments for the Adverbial Analysis

In this section, I present the major arguments for treating *beaucoup* as an adverb in QAD sentences. Thus, I argue, QAD sentences are not derived from the canonical versions, but are base-generated as adverbial quantification structures.

My first argument for the adverbial status of *beaucoup* comes from the class of quantifiers that participate in the QAD construction. I argue that the definition of this class is impossible without reference to the notion of ‘adverb’. This fact is unexpected under a movement analysis, where the element that is quantifying is actually an adnominal determiner. The argument goes as follows: suppose there were a QAD movement rule, or, in Minimalist terms, some [+QAD] syntactic feature that caused an adnominal quantifier to raise into the left periphery of the VP. Then there must be some syntactic or semantic criteria that groups the elements that bear such a feature together to the exclusion of all the other adnominal quantifiers. However, it seems that there is no such criteria. The point is made quickly through the use of an example. Consider the French adnominal quantifier *plein*, lit. ‘full’. For all intents and purposes, *plein* is syntactically and semantically identical to the adnominal use of *beaucoup*: it selects for a *de* phrase, and roughly means ‘a lot’ (10).

- (10) J’ai lu plein de livres
I have read full de books
‘I read a lot of books’

Thus any principled algorithm that would assign a [+QAD] feature to *beaucoup* would have to assign it to *plein*; however, QAD with *plein* is ungrammatical.

- (11) *J’ai plein lu de livres
I have full read de books

Nevertheless, there is a generalization that successfully defines the class of QAD quantifiers to the exclusion of other adnominal quantifiers: as originally observed by (Kayne, 1975),

- (12) All QAD quantifiers have a corresponding use as an adverbial quantifier.

Thus, the grammaticality of QAD sentences with *beaucoup* ‘a lot’, *peu* ‘little’, *assez* ‘enough’, *pas mal* ‘fairly’, *autant* ‘as’, and *tellement* ‘so’ etc. is explained by the grammaticality of simple adverbial quantification sentences with these elements (13).

- (13) a. Elle a beaucoup applaudi
She has a lot clapped
‘She clapped a lot’
b. Elle a peu applaudi
She has little clapped

- 'She clapped little'*
- c. Elle a assez applaudi que...
 She has enough clapped that...
'She clapped enough that...'
- d. Elle a pas mal applaudi
 She has not bad clapped
'She clapped a fair amount' etc.

plein does not have a use as an adverbial quantifier.

- (14) *J'ai plein applaudi
 I have full applauded

If the quantifier in QAD is the same lexical item as the adverb, we explain why QAD with *plein* (11) is impossible, something that a classical movement analysis cannot do.

The second argument that quantification in QAD is done by the adverbial quantifier is that QAD sentences actually involve quantification over the event variable of the verb. This is extremely unexpected in an analysis where *beaucoup* is a nominal quantifier.

As first noticed by (Obenauer, 1983), QAD sentences can be used in only a subset of the contexts in which canonical quantification sentences are used. In particular, QAD sentences in Standard French are only true if *beaucoup* holds of the set of events denoted by the verb. This generalization is known in the literature as Obenauer's *Multiplicity of Events* requirement.

- (15) ***Multiplicity of Events Requirement: (MER)***
 QAD sentences are only true in contexts involving many events

In what follows, I present two tests for the presence of the MER in QAD sentences, the majority of which are drawn from the works of Obenauer. I argue that the presence of the MER indicates that, in QAD sentences, the quantifier *beaucoup* is an adverb that applies to the verb.

The first way of testing for adverbial quantification is through the use of point adverbials. We can insert a prepositional phrase, like *dans cette cassette* 'in this box' or *en soulevant le couvercle* 'lifting the lid' into the sentence, and this serves to create a single event context. As shown below, sentences with canonical quantification are compatible with single-event contexts.

- (16) a. Dans cette cassette, il a trouvé beaucoup de pièces d'or
 In this cassette, he has found a lot de pieces of gold
'In this cassette, he found a lot of gold pieces'
- b. En soulevant le couvercle, il a trouvé beaucoup de pièces d'or
 In lifting the lid, he has found a lot de pieces of gold
'Lifting the lid, he found a lot of gold pieces'
 (Obenauer (1983: 78, his (42)))

QAD sentences with PPs forcing a single-event reading are ungrammatical.

- (17) a. *Dans cette cassette, il a beaucoup trouvé de pièces d'or
 In this cassette, he has a lot found de pieces of gold
 b. *En soulevant le couvercle, il a beaucoup trouvé de pièces d'or
 In lifting the lid, he has a lot found de pieces of gold
 (Obenauer (1983: 78, his (43))

Note that QAD sentences with PPs suggesting a context where there are many events are fine.

- (18) a. Dans cette caverne, il a beaucoup trouvé de pièces d'or
 In this caverne, he has a lot found de pieces of gold
 '*In this caverne, he found a lot of gold pieces*'
 b. En cherchant partout, il a beaucoup trouvé de pièces d'or
 In searching everywhere, he has a lot found de pieces of gold
 '*Searching everywhere, he found a lot of gold pieces*'
 (Obenauer (1983: 78, his (45))

In summary, we see that for a QAD sentence to be felicitous, *beaucoup* must hold of the verbal event argument.

Secondly, that QAD is adverbial event quantification can be seen by the fact that QAD is impossible in stative contexts. (Obenauer, 1994):121) observes that QAD is impossible with a stative verb like *posséder* 'to own' (19), and (Burnett & Bouchard, 2008) show that, in Standard French, QAD is impossible in existential constructions (20).

- (19) *Jean a beaucoup possédé de chevaux
 Jean has a lot owned de horses
 (20) *Il y a beaucoup eu de personnes chez nous hier
 It there has a lot had de people at us yesterday

In summary, we have seen that the quantification in QAD sentences actually involves quantification over an event variable: they are only true in contexts involving many events. These truth conditions are unexpected under a movement analysis where *beaucoup* quantifies over individuals, but are expected in an analysis where *beaucoup* is an adverb: Straightforward adverbial uses of *beaucoup* also display the MER. For example, (21) is also only true if there are many events of me going to the movies.

- (21) Je suis beaucoup allée au cinéma la semaine passée
 I was a lot gone to the cinema the week last
 '*I went to the movies a lot last week*'

2.3 Summary

In summary, I have argued, following Kayne, Obenauer, and Doetjes, that QAD sentences are not derived from their canonical counterparts. I argued that *beaucoup* is base-generated as an adverb, and, as such, directly takes the completed VP as its complement. This conclusion is based on 1) the identity between the class of QAD quantifiers and degree adverbs, 2) the fact that QAD involves quantification by *beaucoup* over the verb's event argument. In the next section, I present a previous adverbial analysis of the semantics of QAD. I argue that, although it succeeds in accounting for some of the properties listed above, it is insufficient to cover the full range of data that exemplifies QAD.

3 Semantic Analyses

In this section, I present the main formal semantic analysis of QAD in the literature, which I will henceforth refer to as the *incorporation* analysis. This analysis is really a proposal about the semantics of *de* phrases in French; however, it has implications for the analysis of QAD. Versions of this proposal are presented in (Heyd, 2003), (Mathieu, 2002), and (Mathieu, 2004). The incorporation analysis claims that *de* phrases in French undergo *semantic incorporation*: a semantic process that accompanies syntactic incorporation in languages like Inuktitut (West-Greenlandic) (22)

- (22) Amajaraq **eqalut** -tur -p -u -q
 Amajaraq.ABS salmon eat IND [-tr] 3SG
 'Amajaraq has eaten a salmon' ((van Geenhoven, 1998); cited in (Mathieu, 2004))

Heyd and Mathieu provide a number of arguments for the claim that *de* phrases are semantically incorporated. Their most important one comes from the inability of *de* phrases to take scope higher than the position in which they appear. For example, *de* phrases may never take scope over negation.

- (23) Je (n')ai pas lu de livres
 I (NEG) have not read de books
 'I did not read any books' **not** 'There were books that I did not read'

Similarly, as first noticed in (Haïk, 1982), *de* phrases in QAD sentences must also take scope lower than negation.

- (24) Je (n')ai pas beaucoup lu de livres
 I NEG-have not a lot read de books
 'It is not the case that I read a lot of books'

Note, for comparison, that the DP containing *de livres* is free to scope wherever it wants in the canonical sentence.

- (25) Je (n')ai pas lu beaucoup de livres
 I NEG-have not read a lot de books
 'It is not the case that I read a lot of books' or
 'There are a lot of books that I haven't read'

Furthermore, the *de* phrase in a QAD sentence must obligatorily scope underneath an intensional verb like *chercher* 'to look for'. In these constructions, *de* phrases must always be interpreted *de dicto*.

- (26) J'ai beaucoup cherché de livres pour mon travail de syntaxe
 I have a lot sought de books for my paper of syntax
 'I looked for a lot of books for my syntax paper'
- a. ...parce qu'une longue bibliographie donne l'air intelligent
 ...because a long bibliography gives the air intelligent
 '...because a long bibliography makes one look smart'
- b. *...notamment, Kayne (1975), Milner (1978), Rizzi (1990), et de Swart
 ...notably Kayne (1975), Milner (1978), Rizzi (1990), and de Swart
 (1993)
 (1993)
 *'...notably Kayne (1975), Milner (1978), Rizzi (1990), and de Swart
 (1993)'

An incorporation analysis of *de* phrases is suggested in the works of (Heyd, 2003) for *de* phrases that appear under negation and (Mathieu, 2002); (Mathieu, 2004) for *de* phrases that appear in the Split-Combien construction (27).

- (27) Combien as-tu cherché de livres?
 how many have-you sought de books
 'How many books did you look for?'

Heyd proposes that verbs selecting *de* phrase complements are *incorporating* verbs, and, as such, they have the argument structure in (28).

- (28) $\lambda x_e. \lambda P_{\langle e,t \rangle}. \exists y [V(x, y) \& P(y)]$ (Heyd (2003: 199, her (57)))

Thus, under this analysis², the denotation of the VP *lire de livres* has the form in (29).

- (29) $\llbracket \text{lire de livres} \rrbracket = \lambda y \lambda e. \exists x (\text{Reading}(e, y, x) \& \text{Book}(x))$

²I have switched the order of the arguments in Heyd's (57) so as to have the direct object combine with the verb first, as is standardly assumed.

Presumably, the subject is added, and then negation is applied to the event variable. Therefore, the denotation of *Je (n')ai pas lu de livres* ‘I did not read any books’ would be as represented in (30)

$$(30) \quad \llbracket \text{Je (n')ai pas lu de livres} \rrbracket = \text{NO}e(\exists x(\text{Reading}(e, I, x) \ \& \ \text{Book}(x)))$$

For Mathieu, the semantic incorporation of *de* phrases is not governed by verbal lexical semantics, but, rather, is a freely occurring process. In his analysis, the determiner *de* is not semantically a determiner; it is “a morphological spell-out of incorporation” ((Mathieu, 2004): 7). Despite this difference in implementation, his analysis assigns the same meanings to sentences containing *de* phrases as Heyd’s.

Both of these authors suggest extending their proposal of semantic incorporation to the analysis of the QAD construction. In such an extension, *beaucoup* is presumably treated as a unary event quantifier, and, therefore, a QAD sentence would be assigned the interpretation in (31) .

$$(31) \quad \llbracket \text{J'ai beaucoup lu de livres} \rrbracket = \text{BCPe}(\exists x(\text{Reading}(e, I, x) \ \& \ \text{Book}(x)))$$

In other words, in the incorporation analysis, *J'ai beaucoup lu de livres* has a semantics closer to the English ‘There were many events of me book-reading’ than to ‘I read a lot of books’.

3.1 Merits of the Incorporation Analysis

This analysis has many merits: Firstly, to the extent that, independently, we have a theory of why, cross-linguistically, incorporation seems to be limited to the direct object position, the insight that QAD involves semantic incorporation accounts for the locality effects that have been previously attributed to movement. Secondly, the incorporation analysis accounts for the multiplicity of events requirement. Under this analysis, *beaucoup* is simply the unary event quantifier found in such mundane contexts as *J'ai beaucoup dormi* ‘I slept a lot’. *beaucoup* applies directly to the event argument of the verb, and therefore QAD sentences will only be true in multiple event contexts. Thirdly, it accounts for the special interpretation of the direct object in QAD sentences: the scopal inertia of *de* phrases is a direct consequence of semantic incorporation. A final merit of the incorporation analysis is its treatment of *beaucoup* in a QAD structure as the same lexical item as in pure event quantification contexts; this reflects both the position of *beaucoup* in the structure, and the identity between the QAD quantifiers and the adverbial degree quantifiers.

However, as we will see in the next section, the quantification in QAD is not pure event quantification. It is something much more interesting, and this is problematic for the incorporation analysis.

3.2 Problems with the Incorporation Analysis

Recall that in the incorporation analysis, the *de* phrase direct object is existentially closed, and *beaucoup* is a unary event quantifier.

$$(32) \quad \llbracket \text{J'ai beaucoup lu de livres} \rrbracket = BCPe (\exists x(\text{Reading}(e, I, x) \ \& \ \text{Book}(x)))$$

The entire structure receives an interpretation similar to the English ‘I did a lot of book-reading’.

The problem with this analysis is that the quantification involved in QAD is not pure adverbial quantification, i.e. *J'ai beaucoup lu de livres* is not, in fact, equivalent to the English ‘I did a lot of book-reading’. For a QAD sentence to be felicitous, *beaucoup* must hold not only of the predicate’s event argument, but also of its direct object. On analogy to the MER, I call this generalization the *Multiplicity of Objects* requirement.

$$(33) \quad \textit{Multiplicity of Objects Requirement: (MOR)}$$

QAD sentences are only true in contexts involving many objects

QAD sentences involving many events but a single object are judged false. For example, (34) cannot be uttered in a context in which I called only my own mother many times.

$$(34) \quad \begin{array}{ll} \text{J'ai} & \text{beaucoup} & \text{appelé} & \text{de} & \text{mères} \\ \text{I have a lot} & & \text{called} & \text{de} & \text{mothers} \end{array}$$

Similarly, contexts with multiple events and few objects are also judged to be false. For example, it is infelicitous to say *J'ai beaucoup lu de livres* if I read my two favourite books many times. The fact that the cardinality of the *de* phrase must be ‘a lot’ suggests that the MOR is due to quantification of *beaucoup* over the direct object, not the plural marking on the *de* phrase.

Therefore, it seems that in QAD sentences in Standard European French, *beaucoup* quantifies over both the verb’s event variable and its direct object variable that is restricted by the *de* phrase. Since, in the incorporation analysis, *beaucoup* only applies to the event argument, this analysis cannot account for the MOR.

3.3 Summary

In summary, I presented some previous syntactic and semantic analyses of the *Quantification at a Distance* construction in the standard dialect of European French. I argued that quantification in QAD sentences is done by the adverbial quantifier, and is over both the event argument and the direct object argument at the same time. Thus, any analysis that proposes that *beaucoup* applies to a single argument does not account for the construction’s peculiar semantics. In the next section, I present my analysis of the construction, and show how it creates the particular interpretations assigned to QAD

sentences.

4 Analysis

In this section, I present a new analysis of quantification at a distance in Standard French. I propose that the adverb *beaucoup* can quantify not only over events, but also over <event, object > pairs. I then present a compositional analysis of the construction that shows how the meanings of QAD sentences are constructed from compositional principles and the meanings of their parts. I first outline my assumptions with respect to the semantics of *beaucoup* when it combines with VP that does not contain a *de* phrase.

4.1 The Analysis of Unary Adverbial *beaucoup*

In this section, I present a semantic analysis of the unary use of the adverb *beaucoup*, the one that appears in simple event quantification contexts like (35).

- (35) a. J'ai beaucoup dormi
 I have a lot slept
 'I slept a lot'
- b. Brutus a beaucoup poignardé César
 Brutus has a lot stabbed Caesar
 'Brutus stabbed Caesar a lot'

I follow much recent work that supposes that completed VPs denote sets of events ((de Swart, 1991); (Zwarts, 2006) *inter alia*). In particular, I assume that verbs have an argument structure similar the one proposed in Parsons (1990)(36) for the sentence *Brutus a poignardé César* 'Brutus stabbed Caesar'.

- (36) $\exists e(\text{Stabbing}(e) \ \& \ \text{Subject}(e, B) \ \& \ \text{Object}(e, C))$ ((Parsons, 1990): 14)

Thus, a ditransitive verb like *poignarder* 'to stab' denotes a set of triples:

- (37) $\llbracket \text{poignarder} \rrbracket = \{ \langle x, y, e \rangle : \text{Stabbing}(e) \ \& \ \text{Subject}(e, y) \ \& \ \text{Object}(e, x) \}$

In sentences without adverbial quantifiers, like (36), I assume an *existential closure* operation that targets the event argument.

In the spirit of (de Swart, 1991), I assume that eventive adverbs are generalized quantifiers over sets of events. In addition, following (Peters & Westerstahl, 2006), I assume that what differentiates degree quantifiers like *beaucoup* from other intersective quantifiers like *trois fois* 'three times' is that degree quantifiers are *extremely context dependent*: They require a contextual 'standard' parameter for the truth of sentences containing them to be evaluated. Therefore, when a degree quantifier like *beaucoup*

occur as a VP modifier (38), I propose that it denote the function in (39).

- (38) a. J'ai beaucoup dormi
 I have a lot slept
 'I slept a lot'
 b. Je suis beaucoup allée au cinéma l'année passée
 I was a lot gone to the cinema the year last
 'I went to the movies a lot last year'

- (39) Let $s_1 \in \mathbb{N}$.
 For all $P \in \mathcal{P}(E)$ $BCP_{s_1}^1(P) = 1$ iff $|P| > s_1$

Thus, a sentence like *Brutus a beaucoup poignardé César* 'Brutus stabbed Caesar a lot' is true just in case BCP^1 with the parameter s_1 holds of the set of events in which Brutus stabbed Caesar.

- (40) $\llbracket Brutus a beaucoup poignardé César \rrbracket = 1 \leftrightarrow BCP_{s_1}^1(\{e : \text{Stabbing}(e, B, C)\}) = 1$

4.1.1 The Analysis of Binary Adverbial *beaucoup*

I now provide a semantic analysis of the adverb *beaucoup* when it combines with VPs containing *de* phrase direct objects. To account for the properties of QAD, I propose that the adverbial quantifier BCP^1 is extended to deal with binary relations in the following way:

- (41) Let $s, t \in \mathbb{N}$ such that $0 < s, t < |E|$,
 For all $R \in \mathcal{P}(E \times E)$, $BCP_{s,t}^{SF}(R) = 1$ iff
 $BCP_s^1(Dom(R)) = 1$ & $BCP_t^1(Ran(R)) = 1$

BCP^{SF} takes a set of <event, object > pairs and yields true just in case the cardinality of the set of first co-ordinates is a lot, and the cardinality of the set of second co-ordinates is also a lot.

- (42) $\llbracket J'ai beaucoup lu de livres \rrbracket = 1$ iff $|\{e : \text{Reading}(e, I, x) \ \& \ \text{Book}(x)\}| > s_e$ &
 $|\{x : \text{Reading}(e, I, x) \ \& \ \text{Book}(x)\}| > t_x$

J'ai beaucoup lu de livres is true just in case there were many events of me book-reading, and I read many books. Thus, I accurately account for both the multiplicity of events requirement and the multiplicity of objects requirement, since these requirements are straightforwardly built into the meaning of the quantifier.

Besides the fact that it gets the interpretations of QAD sentences right, the main argument for a binary quantification approach to QAD is the following fact about BCP^{SF} .

- (43) **Theorem 1 (Burnett, 2009):**
BCP^{SF} is unreducible to any iteration of unary quantifiers.

The proof of Theorem 1 is given in (Burnett, 2009). Informally speaking, *BCP^{SF}* cannot be decomposed into two unary quantifiers because it is true of relations in which there are many events with few or even a single participant in each event, provided that the total number of participants is large enough to count as *beaucoup*. The iteration of two unary quantifiers, say the composition of two occurrences of *BCP¹*, builds in a scope dependency between the two quantifiers. Such a binary quantifier is only true of relations in which there are many events with many participants. In QAD sentences; however, there is no such dependency. This is why QAD in Standard French must be modeled with polyadic quantifiers.

4.2 A Compositional Analysis

I now present a compositional analysis of the Quantification at a Distance construction. As shown by the unreducibility proof, the *de* phrases cannot be interpreted as regular quantified noun phrases. I therefore propose that the intuition that *de* is a semantically ‘deficient’ determiner presented in the incorporation analysis is right, and, following Heyd & Mathieu, I assume that *de* phrases denote bare properties. However, in contrast to the incorporation analysis, I propose that combining the verb and the *de* phrase does not existentially close the direct object. Instead, I propose that *de* phrases in object position are combined with the verb via an unsaturating compositional rule such as Chung & Ladusaw (2004)’s *Restrict*. To account for scopally inert direct objects in incorporation-type contexts, Chung & Ladusaw (2004:5) propose a binary operation that composes a predicate directly with a property to yield a predicate without changing the degree of unsaturation. This mode of composition, called *Restrict*, is illustrated in (44).

- (44) *Restrict* ($\lambda y \lambda x$ [feed’ (y)(x)], dog’)
 $= \lambda y \lambda x$ [feed’ (y)(x) \wedge dog’(y)]

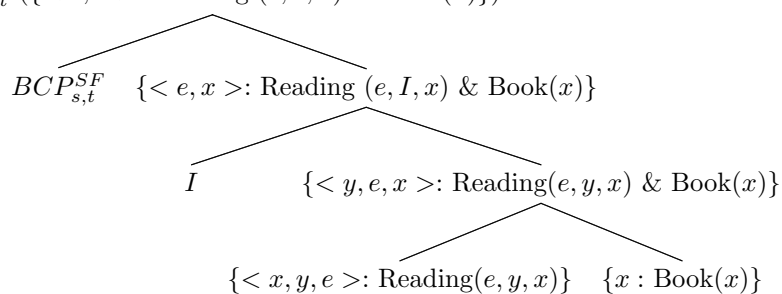
In many of their examples, Chung & Ladusaw apply *existential closure* (EC) immediately after they apply *Restrict*. However, if one were to not apply EC immediately after, but rather to add another argument (the subject) to the predicate $\lambda y \lambda x$ [feed’(y)(x) \wedge dog’(y)], then the subject would be interpreted as the object, which is the wrong result. So we need to add something to the definition of *Restrict* that moves the argument that is being restricted to the end of the sequence that constitutes the verb. I therefore propose that *de* phrases are combined with the verb via *Restrict*’

- (45) **Restrict’:**
 For nodes β and γ such that $[[\beta]] = \{ \langle v_1, v_2 \dots v_n \rangle : P(v_n, v_{n-1} \dots v_1) \}$ and $[[\gamma]] = \{ v_k : Q(v_k) \}$, then $[[Merge(\beta, \gamma)]] = \{ \langle v_2, v_3 \dots v_n, v_1 \rangle : P(v_n, v_{n-1} \dots v_1) \& Q(v_1) \}$

Chung & Ladusaw are conscious of this consequence of their formulation of *Restrict*, and so assume the following: “Let us therefore adopt the notational assumption that when an argument is targeted by a composition operation, it is possible to demote it from the top of the lambda prefix to a position just above the event argument.” (p. 10). I assume *Restrict'* since it gives no special status to the event argument, but Chung & Ladusaw’s “notational assumption” would also be compatible with my proposal. Under this analysis, the *de* morpheme can be viewed as the spell-out of the application of *Restrict'*. Assuming *Restrict'*, the derivation of the QAD sentence is straightforward.

(46) J’ai beaucoup lu de livres

$BCP_{s,t}^{SF}(\{ \langle e, x \rangle : \text{Reading}(e, I, x) \ \& \ \text{Book}(x) \})$



4.3 Summary

In summary, I proposed that, in QAD sentences, the adverb *beaucoup* has an unreducible binary extension that combines with VPs formed by the semantic incorporation of property denoting *de* phrases.

I argue that this analysis accounts for the three key empirical properties of QAD presented in the previous sections: Firstly, since my analysis is a variant of the incorporation analysis, I account for the locality effects, to the extent that we have some external theory of the syntax of incorporation constructions. Secondly, since the multiplicity of events requirement and the multiplicity of objects requirement are built into the definition of the quantifier, these aspects of the construction are accounted for. Note that since a lexical element that encodes both of these requirements is properly polyadic, I argue that my proposal has a clear advantage over rival ones based on unary quantification. Finally, because I follow the incorporation analysis in treating *de* phrases as denoting bare properties, I explain their scopal inertia.

5 Conclusion

In conclusion, I have presented a new analysis of the *Quantification at a Distance* construction in the standard dialect of European French. I proposed that quantification involved in QAD is binary quantification over the event argument and the direct object. I argued that such an analysis is necessary to account for the semantics of the

construction since the binary extension of *beaucoup* is not reducible to the composition of unary quantifiers. I therefore conclude that QAD constitutes an example of properly binary quantification in natural language.

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