

# QUANTIFICATION IN THE CODA OF EXISTENTIALS

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Existential sentences with PP codas containing quantifiers (e.g. *There's ominous music in most nightmares*) are analyzed. It is argued that they require abandoning the common view that codas denote properties of individuals. An alternative analysis is presented in which codas are not predicates but rather contextual modifiers. The parallels between codas and temporal modifiers are discussed, as is a previously unnoticed contrast between codas and post-copular predicates in the licensing of free choice *any*.

## 1. Introduction

This paper proposes a semantics for existentials in which a PP coda contains a quantified expression, as in (1). (In an existential of the form *there be NP XP*, I refer to the NP as the *pivot* and the XP as the *coda*.)

- (1) There's [a drummer]<sub>pivot</sub> [in most punk bands]<sub>coda</sub>.

Such examples have not been explicitly analyzed in the literature, and I argue that existing approaches to existentials must be amended in order to accommodate them. I suggest an analysis that assimilates codas to contextual PP modifiers, treating both as generalized quantifiers over contextual variables or context sets, and demonstrate some of the empirical advantages of this assimilation.

Most analyses of existentials model codas as denoting properties of individuals of type  $(e, t)$ . For example, McNally 1992 models them as secondary predicates, on a par with depictive modifiers (e.g. *alive* in *The whale swallowed Jonah alive*). Barwise and Cooper 1981 model pivots as denoting generalized quantifiers (GQs) and codas as post-nominal modifiers combining intersectively with the common noun in the pivot. On their analysis codas thus contribute a restriction for the pivot GQ. The same effect is achieved in a different way in Zucchi 1995, where codas operate on the context change potential of existentials, restricting the domain relative to which the common noun in the pivot is interpreted to a set denoted by the coda. Keenan 1987 analyzes codas as predicates that take pivots as subjects, and thus provide the scope set for the pivot GQ rather than its restriction. In all four analyses, codas are type  $(e, t)$  and contribute a property (or set) of individuals.

## 2. Quantified codas

PP codas with quantifiers as in (1) above cannot be modeled simply as contributing a property or set. If this were the case, the coda in (1) would have to contribute the property of being in most punk bands (or the set of individuals who are in most punk band). But there is clearly no reading of (1) involving this property. Rather, the sentence means that most punk bands *have* a drummer.

Furthermore, if codas contribute sets, whether to the restriction or to the scope of the pivot, then multiple codas should be interpreted as multiple conjuncts, giving rise to familiar kinds of conjunct-elimination entailments. However, multiple quantified codas do not give rise to such entailments: (2a) entails neither (2b) nor (2c).

- (2) a. There are two phones in every home in most countries.  $\nrightarrow$   
b. There are two phones in most countries.  
c. There are two phones in every home.

The logical form of (2a) is represented informally in (3), where the second coda binds a context variable in the restriction of the quantification in the first.

- (3) For most countries  $c$ , for every home  $h$  in  $c$ , there are two phones in  $h$

The behavior of quantified codas thus requires some mechanism for handling their scopal behavior, both in relation to the pivot and in relation to each other.

## 3. Contextual modifiers

Given these properties of codas, it is natural to model them on a par with temporal PP modifiers such as those in (4).

- (4) a. Mary wept [during my funeral].  
b. Mary wept [during every funeral].

Contextual modifiers with quantifiers (4b) are analyzed in Pratt and Francez 2001 and von Stechow 2002. They raise a parallel problem to the one raised by quantificational codas in that they generally scope over the existential quantification over events in the sentence they modify. They can therefore not be analyzed as intersective predicates of events in a Davidsonian event-semantics. Thus, while (4a) can be analyzed along the lines of (5), (4b) cannot be assigned a similar intersective meaning, since it does not describe a weeping event occurring throughout every funeral.

- (5)  $\exists e[\text{weep}(m, e) \ \& \ \text{during}(e, \text{my funeral})]$

Like multiple codas, multiple temporal PP modifiers are not interpreted intersectively but rather form what PF call *cascades*. This is exemplified in (6a), the meaning of which can be represented informally as in (6b).

- (6) a. Madonna said a prayer before each meal during most holidays.  
 b. For most holidays  $H$ , for each meal  $m$  during  $H$ , there is an event of Madonna saying a prayer before (the onset of)  $m$ .

Here, as in (2a), each modifier binds a restriction within the previous one(s).

The parallelism between temporal modifiers and codas can be made transparent by viewing sentence meanings as GQs over intervals. For example, the meaning of *Mary wept* can be written as (7), where  $i$  is the type for intervals.

$$(7) \quad [[ \text{Mary wept} ]] = \lambda P_{(i,t)} [\mathbf{a}(\lambda i[\text{weep}(m)(i)], P)]$$

Modifiers can then also be modeled as GQs over intervals that take sentence meanings as their arguments. For example, the derivation of the meaning of *during every funeral* is as in (8).

$$(8) \quad \begin{aligned} [[ \text{during} ]] &= \lambda P_{((i,t),t)} \lambda Q_{((i,t),t)} [\mathcal{P}(\lambda i[\mathcal{Q}(\lambda j[i \subseteq j]]))] \\ [[ \text{every funeral} ]] &= \lambda P_{(i,t)} [\text{every}(\lambda i[\text{funeral}(i)], P)] \\ [[ \text{during every funeral} ]] &= \lambda Q_{((i,t),t)} [\text{every}(\lambda i[\text{funeral}(i)], \\ &\quad \lambda i'[\mathcal{Q}(\lambda j[j \subseteq i'])])] \end{aligned}$$

(7) says that the set of intervals in which Mary weeps has a non-empty intersection with the set of subintervals of the funeral interval.<sup>1</sup> When no modifiers are present, sentence meanings are applied to the set of subintervals of the contextually salient reference interval  $\mathcal{R}$ . I suggest an analogous analysis of existentials and codas.

#### 4. Semantics for existentials

I take *bare existentials* (BEs) (existentials with no overt coda) to denote the GQ denoted by their pivot. However, I assume that GQs can range over sets of entities of any (simple) type (individuals, events, times, etc.). The meaning of a BE is given in (9), where  $\tau$  is any simple type,  $\mathcal{Q}$  is a relation between sets determined by the determiner of the pivot, and  $N$  is a set determined by the common noun in the pivot.

$$(9) \quad [[ \text{there be NP} ]] = [[ \text{NP} ]] = \lambda P_{(\tau,t)} [\mathcal{Q}_{((\tau,t),((\tau,t),t))}(N_{(\tau,t)}, P)].$$

For example, consider the derivation of the existential in (1) above. The meaning of *There is a drummer* is in (10).

$$(10) \quad [[ \text{there is a drummer} ]] = [[ \text{a drummer} ]] = \lambda P_{(e,t)} [\mathbf{a}(\lambda x[\text{drummer}(x)], P)].$$

In the absence of modification, the meaning in (10) is applied to a contextually relevant domain of entities, possibly the universe of discourse. I model codas as generalized quantifiers over such contextual sets. Thus, the meaning of *in most punk bands* is derived as in (11). (For legibility I write @ for “applied to”).<sup>2</sup>

<sup>1</sup>I abstract away from issues of tense and aspect here.

<sup>2</sup>Alternatively, codas and temporal modifiers could be analyzed as involving quantifying-into the NP position, e.g. by a rule of quantifier raising (see von Stechow 2002). I see no stakes in the choice of analysis for my core semantic arguments.

$$\begin{aligned}
 (11) \quad & [[ \text{most punk bands} ]] = \lambda P_{(e,t)} [\mathbf{most}(\lambda x [\mathbf{PB}(x)], P)] \\
 & [[ \text{in most punk bands} ]] = [[ \text{in} ]][[ \text{most punk bands} ]] = \\
 & \lambda \mathcal{P}_{((e,t),t)} \lambda \mathcal{Q}_{((e,t),t)} [\mathcal{P}(\lambda y [\mathcal{Q}(\lambda x [\text{in}(x, y)])])] @ \\
 & (\lambda P_{(e,t)} [\mathbf{most}(\lambda x [\mathbf{PB}(x)], P)]) = \\
 & \boxed{\lambda \mathcal{Q}_{((e,t),t)} [\mathbf{most}(\lambda x [\mathbf{PB}(x)], \lambda y [\mathcal{Q}(\lambda x [\text{in}(x, y)])])]}
 \end{aligned}$$

This meaning combines by function application with the meaning of the BE in (10) to derive the meaning of (1) as in (12).

$$\begin{aligned}
 (12) \quad & [[ \text{There is a drummer in most punk bands} ]] = \\
 & [[ \text{in most punk bands} ]][[ \text{there is a drummer} ]] = \\
 & \lambda \mathcal{Q}_{((e,t),t)} [\mathbf{most}(\lambda x [\mathbf{PB}(x)], \lambda y [\mathcal{Q}(\lambda u [\text{in}(u, y)])])] @ \\
 & (\lambda P_{(e,t)} [\mathbf{a}(\lambda z [\text{drummer}(z)], P)]) = \\
 & \boxed{\mathbf{most}(\lambda x [\mathbf{PB}(x)], \lambda y [\mathbf{a}(\lambda z [\text{drummer}(z)], \lambda u [\text{in}(u, y)])])}
 \end{aligned}$$

#### 4.1. Stacking

As noted above, the effect of coda stacking is to restrict the quantification over context sets in the first coda. However, the meaning in (12) cannot compose with further coda modifiers. Semantically, multiple codas quantify over context sets restricting the quantification introduced by the first coda, which in turn quantifies over the context sets that form the scope sets for pivot GQs. There are various ways of introducing context sets into the restriction of a quantificational structure<sup>3</sup>. However, there are not many explicit analyses of how modifiers binding such sets are to be interpreted compositionally. Here I assume that any quantificational structure can be made open to further contextual restriction by abstraction over an (otherwise possibly implicit) context set in the restriction. I call this process *contextualization*.

$$(13) \quad \mathbf{contextualization}: \\
 \mathcal{Q}(\alpha_{(\tau,t)}, \beta_{(\tau,t)}) \Rightarrow \lambda C_{(\tau,t)} [\mathcal{Q}(\alpha_{(\tau,t)} \& C, \beta_{(\tau,t)})]$$

Contextualization derives (14) from the meaning in (12). (12) can combine straightforwardly with a further modifier, yielding an output that can itself be contextualized.

$$(14) \quad \lambda C [\mathbf{most}(\lambda x [\mathbf{PB}(x) \& C(x)], \lambda y [\mathbf{a}(\lambda z [\text{drummer}(z)], \lambda u [\text{in}(u, y)])])]$$

As an example, the derivation of *There is a drummer in most punk bands in every festival* is given in (15). I write  $[[\phi]]_{cont}$  for the result of contextualizing a quantificational formula  $\phi$ .

<sup>3</sup>For example, by making the meaning of nouns relational (Pratt and Francez 2001, Stanley and Gendler Szabó 2000), or by building an implicit domain restriction into the meaning of quantifiers (Westerstahl 1984).

$$\begin{aligned}
 (15) \quad & [[ \text{there is a drummer in most punk bands in every festival} ] ] = \\
 & [[ \text{in every festival} ] ] ( [[ \text{there is a drummer in most punk bands} ] ]_{cont} ) = \\
 & \lambda \mathcal{Q}_{((e,t),t)} [ \mathbf{every} (\lambda x_1 [ \text{festival}(x_1) ], \lambda y_1 [ \mathcal{Q} (\lambda z_1 [ \text{in}(z_1, y_1) ]) ]) ] ] \\
 & @ (\lambda C [ \mathbf{most} (\lambda x [ \text{PB}(x) \ \& \ C(x) ], \lambda y [ \mathbf{a} (\lambda z [ \text{drummer}(z) ], \lambda u [ \text{in}(u, y) ]) ]) ]) ] ) = \\
 & \boxed{ \begin{aligned} & \mathbf{every} (\lambda x_1 [ \text{festival}(x_1) ], \\ & \quad \lambda y_1 [ \mathbf{most} (\lambda x [ \text{PB}(x) \ \& \ \text{in}(x, y_1) ], \\ & \quad \quad \lambda y [ \mathbf{a} (\lambda z [ \text{drummer}(z) ], \lambda u [ \text{in}(u, y) ]) ]) ]) ] \end{aligned} }
 \end{aligned}$$

### 5. Codas, predicates and free choice *any*

The assumption that pivots and codas stand in a subject-predicate relation (e.g. in a “small clause”) is common in syntactic literature and underlies the widespread typological view that existentials and copular constructions derive from a common source (e.g. Freeze 1992). However, codas exhibit several semantic properties that predicates do not (see Francez 2007). Here I discuss one such property: the licensing of free choice *any*.

Codas, but not post-copular predicates, license free choice *any*, as the contrast between (16a,b) shows. (16c) shows that codas in this respect pattern with contextual modifiers, as expected on the current analysis.

- (16) a. There’s a drummer in any punk band.  
 b. ??A drummer is in any punk band.  
 c. The drummer smokes in any punk band.

I suggest that the key to understanding this contrast is the availability of a generic reading for *any* (Dayal 1998, Horn 2000). In both (16a) and (16b), *any* is interpreted as involving a quasi-universal force similar to the force associated with generics. In fact, both (16a) and (16c) are paraphrasable with a generically interpreted indefinite replacing *any*, as in (17a,b) respectively, both of which can have a generic reading.

- (17) a. There’s a drummer in a punk band.  
 b. The drummer smokes in a punk band.

Thus, a coda with free choice *any* is a sub-type of quantificational coda, where the quantification is generic. Generic NPs are generally infelicitous in post-copular predicates, as shown in (18). Presumably, the reason is that predicates denote properties of individuals, and generics conceptually cannot form such properties. A guard cannot have the property of being in the generic jail.

- (18) ??A corrupt guard is in a jail. (strange on generic reading of *a jail*)

Codas in contrast do not, on the current proposal, denote properties of individuals, but quantify over context sets, generic quantification being one possibility.

## 6. Conclusion

In conclusion I point out two general consequences of assimilating codas to contextual modifiers. First, modification is a method for determining values for context sets, possibly by binding to explicit quantifiers. Second, an interval, such as the standard “reference interval”, also constitutes a context set, namely the set of its subintervals.

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