Coercion: container, contents and measure readings

1 Background. It has been long observed that pseudopartitive DPs (*two glasses of beer*) have at least two readings (Doetjes 1997; Rothstein 2011, i.a): (i) a container reading (*two glasses containing beer*); (ii) a measure reading (*beer to the amount of two glassfuls*). Indeed, Landman (2016) argues that pseudopartitive DPs formed with classifier-like expressions (*two glasses of beer*) have four readings: three count readings and a mass reading:

container	two glasses filled with beer	COUNT
contents	two portions of beer, each the contents of a glass	COUNT
portion	two one-glassful sized portions of beer	COUNT
measure	beer to the amount of two glassfuls	MASS

We focus only on the container, contents, and measure readings in this paper. In support of this contrast, Rothstein (2011) and Landman (2016) give examples similar to the following:

CONTEXT: Two 1-litre glasses of beer and two half-litre glasses of beer.

(1) How many of the 4 glasses of beer were broken? - Half. (= 2 glasses) (container)

(2) How many of the 4 glasses of beer were drunk? - Half. (= 2 glass contents) (contents)

(3) How much of the 4 glasses of beer **was** drunk? - Half. (= 1.5 litres) (measure)

In (1), the verb *broke* enforces the container interpretation of *glass*. In (2), *drink* makes available the contents interpretation. *Many* selects plural count terms, and consequently, in both (1,2), verbal agreement is plural. *Much* selects only mass terms, and given that verbal agreement with *much* + partitive is singular, in (3), the measure DP *4 glasses of beer* can only have the mass interpretation 'beer to the amount of (the contextually provided) 4 glasses-worth'.

2 Puzzle. Whereas one can quite easily coerce *two beers* into a container or a contents reading (4,5), it is much harder to coerce *two beers* into a measure reading (6). This is despite the fact that it would be felicitous to use *two glasses of beer* in all of these contexts. These facts, which have not been noticed before now, are the focus of our paper.

CONTEXT: We watch Charlie pour beer from a tap into two glasses. We then see Charlie put them on the table, and then drink the contents.

(4) Charlie put two beers on the table. (container=two glasses containing beer)

(5) Charlie drank two beers. (contents=two glassfuls of beer)

(6) # A one litre bottle contains two beers. (measure=beer of two glass-sized measures)

However, measure readings are not completely impossible, as we see in (7), which marginally sanctions a *measure of two glasses-worth* reading:

(7) Alex drinks two glasses of beer every night. Sometimes she doesn't have any clean glasses, ?so she drinks two beers from one bottle.

(In 7, a kind reading is possible, but pragmatically odd.) Even so, with other mass nouns, such measure readings are still highly marked:

(8) Alex drinks two glasses of water every night. Sometimes she doesn't have any clean glasses, #so she drinks two waters straight from the tap.

The puzzle we address in this paper is as follows: Why is it much harder to coerce numerical NPs with mass terms like *two beers* into a contextually determined measure interpretation ('beer to the measure of two contextually specified amounts') than into a container or a contents interpretation, even though the units of measure are easily retrievable from the context?

3 Analysis. We use Type Theory with Records (TTR Cooper 2012) to extend the analyses of container readings of pseudopartitives in Sutton and Filip 2016 to also cover contents and measure readings. We also adopt some insights from Landman (2016). (Here, we abstract away from the treatment of plurality and numerical expressions that will be addressed in the talk.)

The basic (simplified) lexical entry for a CN like *bottle* is a function from a record (situation) that contains an entity of the type Ind to a record type that contains the condition that that entity satisfies the predicate $\mathbf{bottle}$:

(9) $$[\![\text{bottle}]\!] = \lambda r : [x : \mathit{Ind}].[s : \mathbf{bottle}(r.x)]$$

Container readings: We argue that CNs denoting vessels etc. have a generally licensed CONTAINER shift (in English, triggered in measure DPs, for example). It takes a container expression of type $([x : \textit{Ind}])$RecType, like $[\![\text{bottle}]\!]$, and maps it to an expression that maps a contents argument of the same type, (e.g., $[\![\text{beer}]\!]$:$([x$:*Ind*$])$RecType), and a record containing an entity, to a type in which e.g., the entity is a bottle which contains some beer. ($R_1@r$ means that the property provided for R_1 is applied to the record provided for r.):

$$\text{CONTAINER} = \lambda R_1{:}([x{:}\textit{Ind}])\text{RecType}\ \lambda R_2{:}([y{:}\textit{Ind}])\text{RecType}\ \lambda r{:}[x{:}\textit{Ind}] \begin{bmatrix} s_{\text{vessel}} & : & R_1@r \\ \text{par} & : & [y : \textit{Ind}] \\ s_{\text{in.ves}} & : & R_2@\text{par} \wedge [s_{cont} : \mathbf{contain}(r.x, \text{par}.y)] \end{bmatrix} \tag{10}$$

Contents readings: Similarly, we assume a shift from a common noun to a container reading. It takes, e.g, $[\![\text{bottle}]\!]$, and maps it to an expression that maps a contents argument, (e.g., $[\![\text{beer}]\!]$) and a record containing an entity, to an expression that says there is, e.g., beer that is within the argument entity (which is a bottle):

$$\text{CONTENTS} = \lambda R_1{:}([x{:}\textit{Ind}])\text{RecType}\ \lambda R_2{:}([y{:}\textit{Ind}])\text{RecType}\ \lambda r{:}[x{:}\textit{Ind}] \begin{bmatrix} \text{par} & : & [y : \textit{Ind}] \\ s_{\text{contents}} & : & R_2@\text{par} \\ s_{\text{holds.contents}} & : & R_1@r \wedge [s_{within} : \mathbf{within}(r.x, \text{par}.y)] \end{bmatrix} \tag{11}$$

Measure readings: Key to our analysis is the assumption that measure readings are the result of two shifts. First, one must shift to a contents reading, then a context-specified measurement function is formed that measures in terms of the amount specified by the contents reading. In other words, the measure reading is obtained by e.g., shifting *bottle* to a contents reading, applying *beer*, then shifting that whole thing to a measure with a scale of beer of a bottle's-worth. This yields a type that maps a record that specifies an entity, and returns type of, say *beer*, that measures 1 with respect being a bottle's-worth. This is specified by a measure function (of type $(\textit{Ind}, (([x{:}\textit{Ind}])\text{RecType}))\mathbb{R}$) from individuals and a property to a real number. For the case in hand, the property would be that of being the contents of a bottle of beer and the function would be a measure in terms of this amount of beer.

$$\text{MEASURE} = \lambda R{:}([y{:}\textit{Ind}])\text{RecType}\ \lambda r{:}[x{:}\textit{Ind}] \begin{bmatrix} s_{\text{stuff}} & : & (R@r).s_{\text{contents}} \\ \mu_{meas} & : & (\textit{Ind}, (([x{:}\textit{Ind}])\text{RecType}))\mathbb{R} \\ \mu_{meas}(r.x, R) & : & \mathbb{R}_1 \end{bmatrix} \tag{12}$$

Restrictions on coercion. For expressions such as *two beers*, the result of applying a numerical to a mass noun results in a type clash. This can be resolved in at least three ways: (i) find a contextually salient entity concept (like BOTTLE), shift it to a container reading, and apply it to the entry for beer; (ii) find a contextually salient entity concept (like BOTTLE), shift it to a contents reading, and apply it to the entry for beer; (iii) find a contextually salient entity concept (like BOTTLE), shift it to a contents reading, and apply it to the entry for *beer*, *then* shift it a second time, now to a measure reading (pure measured quantity of stuff reading, abstracting away from the contextually salient entity concept). Since the measure reading takes an extra step of shifting, and given that the initial type clash is resolved after the first shift, this account predicts that measure readings will be harder to retrieve.

Summary. We have presented an account of new data regarding restrictions on the available coerced readings for numerical + mass N phrases like *two beers*. We have established the need for different kinds of shifting operations for these data (not all coercions are the same (i.a., Asher 2015)). Furthermore, we have argued that a two-step shifting operation is required to obtain measure readings of pseudo-partitive DPs, namely one that is parasitic on the contents reading. This, we contend, is why such readings are hard to access in phrases such as *two beers* (6&8).

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