Portion Readings are Count Readings, not Measure Readings

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Abstract

We assume, following Rothstein 2010, 2011, 2016 and Landman 2011, 2013, 2015, a semantic theory of the mass-count distinction which defines the notion of *count* in terms of disjointness, non-overlap, and in which the mass-count distinction applies to noun phrases of any complexity (i.e. not just lexical nouns). We derive, following Rothstein 2011, two interpretations for pseudo-partitives like *three glasses of wine*, a container classifier interpretation which we show to be count and a measure interpretation which we argue to be mass. We then address portion readings. Partee and Borschev 2012 discussed portion readings as a subcase of measure readings. We argue, against this, that portion readings do not pattern with measure readings, because portion readings are count. We discuss three ways of deriving portion readings. This adds, for *three glasses of wine*, two new portion interpretations: a contents-classifier interpretation and a free portion interpretation. We show that, in the semantic framework given, all portion interpretations come out as count, setting them apart from measure interpretations. We show that the distinctions between measure interpretations and portion interpretations derived here hold cross-linguistically in a number of typologically distinct languages.

1 The disjointness principle

Rothstein 2010, 2011 and Landman 2011 develop theories of the mass-count distinction in which *disjointness*, non-overlap, is a characterizing property of count noun denotations, while mass nouns generally denote sets that allow overlap. Based on this, Landman 2013, 2015 develops a formal theory in which the mass-count distinction applies not just to lexical nouns, but to noun phrases in general.

In order to provide a setting for some of the later discussion in this paper, we briefly sketch here some aspects of this theory. Landman 2013, 2015 formulates a compositional mechanism which associates with the standard denotation of a noun phrase a *base* set, a set that generates this denotation under the sum operation $\sqcup$. For count nouns, the base set is the set in terms of which the members of the denotation are counted and to which distribution takes place. Since counting requires disjointness, for count nouns the base set is required to be (contextually) disjoint; *vice versa*, noun phrases whose base set is disjoint at every (relevant) world-time index are thereby classified as count noun phrases.

For example, for singular noun *cat* with denotation $CAT_{w,t}$, the base set is the set $CAT_{w,t}$ itself, and $CAT_{w,t}$ is required to be disjoint. The same disjoint set $CAT_{w,t}$ is the base set for the (non-disjoint) denotation $*CAT_{w,t}$ (the closure of $CAT_{w,t}$ under $\sqcup$) of plural noun *cats* (and it forms a partition within the set of parts of the denotation of *the cats*). For complex noun phrases like *pet cats* and *three pet cats* the base set derived is $CAT_{w,t} \cap PET_{w,t}$. Since $CAT_{w,t}$ is required to be a disjoint set, $CAT_{w,t} \cap PET_{w,t}$ comes out as disjoint as well. This means that the complex noun phrases *pet cats* and *three pet* *cats* also come out as count noun phrases. And this means that the pluralities in the denotation of *three pet cats* are correctly counted as *three* in relation to their parts in the set $CAT_{w,t} \cap PET_{w,t}$. It also means that *three pet cats* can combine with distributive predicates that require a plural *count* subject, as in (1), and the distribution is, for a plurality in the denotation of the subject noun phrase, to its parts in the set $CAT_{w,t} \cap PET_{w,t}$:

(1) *Three pet cats* should *each* have their own basket.

The above paragraphs function as an example of the kind of theory that we assume as a background for this paper: a semantic theory in which the mass-count distinction is based on disjointness and applies to all noun phrases. We need something like this here, because we are concerned with the interpretation and mass-count nature of classifier phrases and measure phrases, (subkinds of *pseudopartitives*), which are complex noun phrases. However, for the purposes of the present paper we need little of the background theory: the following principle regulating singular count interpretations of noun phrases will suffice for most of our purposes:

(2) **Disjointness Principle**:
If the interpretation set of a noun phrase is disjoint at to every (relevant) index, the noun phrase is singular count.

2 Classifier readings and measure readings

Rothstein 2011 gives a semantics for expressions like *three glasses of wine*, showing that they are ambiguous between a container classifier interpretation and a measure interpretation.

(3) a. […] and next to them, she would put *three glasses of wine*, three glasses of water, three sugar cubes and one golden coin. [Radomir Ristic, 'The great spirits of fate,' in: The Crooked Path Journal, issue 2, p. 45, 2008]
b. […] and just as you are going to roast, open the paste, pour in *three glasses of Madeira wine*, close the paste well, tie it up securely, roast it two hours […] [Alexis Soyer, *Gastronomic Regenerator, A Simplified and Entirely New System of Cookery*, 6th ed., 1849, Simkin, Marshall and. co., London]

(3a) shows the container classifier interpretation: *three glasses of wine* in (3a) means *three glasses containing wine*. (3b) shows the measure interpretation: *three glasses of wine* in (3b) means *wine to the amount of three glassfuls*.

With Rothstein 2011, we assume that the container-interpretation of *three glasses of wine* is derived by applying the interpretation of *glass* to that of *wine*, deriving NP *glass of wine*. This is pluralized and then modified by *three*. For this to be possible, the count noun *glass,* interpreted as disjoint set $GLASS_{w,t}$, shifts to a classifier *glass* with as interpretation a function from sets to sets.

With Landman 2015, we assume that the classifier interpretation is based on the interpretation of the noun *glass* and a *contents* function (Rothstein 2011 uses a containment relation):

(4) $\mathbf{contents}_{[P,Q,c]w,t}$ is a function that maps - relative to container property P contents property Q and context c - a P-container onto its relevant contents at index w,t.

We take this to mean that if $\mathbf{contents}_{[GLASS,WINE,c]w,t}(x) = y$, then x is presupposed to be a glass and y, the relevant contents of glass x, is the wine in glass x, on the condition that what is in the glass is standard enough to count. This means that the amount of wine in the glass should be within the normality range, relative to GLASS, WINE and c, and the contents should have a constitution which is normal for wine in context c; so, it can be mixed (say with water) if that is normal in the context, but it cannot be polluted, etc. We will suppress the property parameters here (they require an intensional formulation of the theory which is beyond the scope of this paper, see Landman 2015 for more discussion). We derive the following container classifier interpretations:

(5) a. $[_{\text{container classifier}}$ *glass* $] \rightarrow \lambda P\lambda x.\text{GLASS}_{w,t}(x) \wedge P(\mathbf{contents}_{w,t}(x))$
b. $[_{NP}$ *glass of wine* $] \rightarrow \lambda x.\text{GLASS}_{w,t}(x) \wedge \text{WINE}_{w,t}(\mathbf{contents}_{w,t}(x))$
The set glasses whose contents is wine.

Now we observe that, because *glass* is a count noun, its denotation $\text{GLASS}_{w,t}$ is required to be disjoint at every index w,t. Since the interpretation of the noun phrase *glass of wine* is defined at w,t through intersection with $\text{GLASS}_{w,t}$, it follows that the interpretation of *glass of wine* is disjoint at every index. Hence, with the Disjointness Principle:

(6) **Containers are count:** *Glass of wine*, with container classifier *glass*, is a singular count noun phrase.

We assume, with Rothstein 2011, that the measure interpretation of *three glasses of wine* is based on measure function $\mu_{[\text{GLASS,WINE,c}]w,t}$ which maps relative to parameters GLASS, WINE and context c, entities at index w,t onto real values on a measure scale. Here [GLASS,WINE,c] determines what measure amount is one glass in context c, when what is measured is wine. As before, for the **contents** function, we simplify and write $\mathbf{glass}_{w,t}$ for $\mu_{[\text{GLASS,WINE,c}]w,t}$.

Following Landman 2004 and Rothstein 2011, we assume that in the derivation of the measure interpretation of *three glasses of wine*, first the measure *glass* composes with the higher number predicate (λn. n=3), and then the result (*three glasses*) intersects with the complement *wine*. Thus the interpretation of the measure phrase *three glasses of wine*, based on measure *glass*, is:

(7) a. $[_{\text{measure}}$ *glass*$] \rightarrow \lambda N\lambda P\lambda x.(\mathbf{glass}_{w,t} \circ N)(x) \wedge P(x)$
b. *three + glass(es)* $\rightarrow \lambda P\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge P(x)$
c. $[_{NP}$ *three glasses of wine* $] \rightarrow \lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$
Wine to the measure of three glassfuls.

Now, first we observe that at a normal index w,t the set $\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$ is not disjoint (*normal* here means that we ignore borderline interpretations, like Ø). This, by itself, doesn't tell us much, because, after all, at a normal index w,t the interpretation of plural noun *cats*, $^*\text{CAT}_{w,t}$, is not disjoint either. But the latter has a disjoint base $\text{CAT}_{w,t}$.

Landman 2015 argues that at normal indices w,t, the set $\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$ does not have a disjoint base: any base that is strong enough to generate $\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$ under $\sqcup$ will by necessity itself overlap (see Landman 2015 for details).

Without going into technicalities, we observe here that, due to the interpretation of the measure function, the overlap in $\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$ is *pervasive*. The measure function is real valued on the set of all parts of the wine; this means that the measure function assigns measure values r to very small, possibly unmeasurably small parts of the wine. Pick any of those, say z. Now take any two quantities of wine x_1 and x_2 that measure 3 – r and don't overlap z and don't overlap each other: $x_1 \sqcup z$ and $x_2 \sqcup z$ are going to be overlapping quantities of wine in $\lambda x.\mathbf{glass}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$. Note furthermore that the set $\lambda z.\mathbf{glass}_{w,t}(z)=r \wedge \exists x[\text{WINE}_{w,t}(x) \wedge z \sqsubseteq x]$ itself is not disjoint either.

The above informal discussion points at the reasonableness of the result:

(8) **Measures are mass:** *three glasses of wine* with measure *glass(es)* is a mass noun phrase.

And this is good, because, as Rothstein 2011 argues, measure phrases pattern with mass nouns. In (9a), the partitive predicate *of the two hundred croquette balls* (the famous Dutch *bitterballen*) is count, as shown by the infelicity of the combination with the mass determiner *much*. In (9b) the partitive predicate *of the six kilos of croquette balls* is felicitous, and hence mass, and it has a measure interpretation: croquette balls were eaten, and at the end of the party there's not much left of the huge pile that was on the table originally:

(9) a. #?***Much*** *of the two hundred croquette balls* was eaten at the party.
b. ✓***Much*** *of the six kilos of croquette balls* was eaten at the party.

So far we have derived a two-way ambiguity of *three glasses of wine*: if the complex noun phrase denotes glasses, it has a container classifier reading, if it denotes wine, a measure reading.
We get the same two interpretations for measure phrases like *three liters of wine*:

(10) a. We poured *three liters of wine* in the brew.
b. He arrived home and knocked on the door with *one liter of milk*. His mother said to him: "I asked you for two liters. Where is the second one?" Her son said to her: "It broke, mother." [Matilda Koén-Sarano (ed.), Folktales of Joha, Jewish Trickster, p. 22, The Jewish Publication Society, Philadelphia, 2003]

The measure interpretation in (10a) is derived in the same way as the measure interpretation of *three glasses of wine* above:

(11) $[_{NP}$ *three liters of wine*$]$ $\rightarrow \lambda x.\mathbf{liter}_{w,t}(x)=3 \wedge \text{WINE}_{w,t}(x)$ mass measure interpretation
Wine to the measure of three liters.

The container classifier interpretation is derived by shifting *liter* to a container interpretation.

(12) a. CONTAINER_c is a property that maps index w,t onto disjoint set $\text{CONTAINER}_{w,t}$, a set of containers at w,t whose nature is determined by context c.
b. $\mathbf{container_c} = \lambda P\lambda x.\text{CONTAINER}_{c,w,t}(x) \wedge P(\mathbf{contents}_{w,t}(x))$

We assume that implicit operation $\mathbf{container_c}$ can compose with the measure *liter* (applied to implicit number predicate **one** ($\lambda n.n=1$)):

(13) a. $[_{\text{container classifier}}$ *liter* $] \rightarrow \mathbf{container_c} \circ (\textit{liter}_{\text{measure}}(\mathbf{one}))$
$= \lambda P\lambda x.\text{CONTAINER}_{c,w,t}(x) \wedge P(\mathbf{contents}_{w,t}(x)) \wedge \mathbf{liter}_{w,t}(\mathbf{contents}_{w,t}(x))=1$
b. $[_{NP}$ *liter of wine*$]$ $\rightarrow$
$\lambda x.\ \text{CONTAINER}_{c,w,t}(x) \wedge \text{WINE}_{w,t}(\mathbf{contents}_{w,t}(x)) \wedge \mathbf{liter}_{w,t}(\mathbf{contents}_{w,t}(x))=1$
The set of containers whose contents is one liter worth of wine.

Clearly, the disjointness requirement on $\text{CONTAINER}_{w,t}$ makes this interpretation of *liter of wine* disjoint at every index w,t, and hence, by the Disjointness Principle:

(14) **Container-shifted measures are count:** *liter of wine*, with *liter* shifted to a container classifier, is a singular count noun.

3 Portion readings

So far we have two readings for *three α of wine*: a count container interpretation where it denotes sums of three α-containers, and a mass measure interpretation where it denotes wine to the measure of three α-*fuls*. And this suggests the diagnostics: when the complex noun phrase denotes (sums of) containers it's count, and when it denotes wine it's mass. While the first part of this equation is unproblematic, the second part is made more complex by the existence of portion readings. Portion readings were discussed by Partee and Borschev 2012. They discuss two kinds of portion readings: contents readings, which they relate (as we will) to container readings, and concrete portion readings - which we will rebaptize *free portion readings* -, which they regard as a subcase of measure readings. The status of and relations between contents readings and free portion readings stay a bit up in the air in Partee and Borschev's discussion. Our aim here is to show that developing the semantics for portion readings in a theory that formulates the mass-count distinction for complex noun phrases in terms of disjointness helps to clarify the status of portion readings:

(15) **Portion readings** of *three α of wine* are readings that are count even though the complex noun phrase denotes wine.

Case 1: Shape classifiers

We introduce portion readings by looking at shape classifiers like *hunk, slice, strand, drop, gulp*:

(16) a. A *hunk* of meat / two *slices* of sausage / many *strands* of hair / three *drops* of wine /each *gulp* of wine.
b. A hunk of meat is meat in the shape of a hunk – a drop of wine is a drop-shaped portion of wine.

As (16a) shows, shape classifier noun phrases, like *slice of sausage* and *drop of wine,* are count, like container classifier noun phrases. But shape classifier noun phrases have interpretations along the lines of (16b): like measure interpretations, they are intersective on the complement.

The basics of the semantics of shape classifiers is straightforward: they have the same semantics as intersective modifiers:

(17) a. $[_{\text{shape classifier}}$ *hunk*$] \rightarrow \lambda P\lambda x.\text{HUNK}_{w,t}(x) \wedge P(x)$ based on count noun *hunk*
b. $[_{\text{NP}}$ *hunk of meat*$] \rightarrow \lambda x.\text{HUNK}_{w,t}(x) \wedge \text{MEAT}_{w,t}(x)$
Meat in the shape of a hunk, meat that forms a hunk.

Since *hunk* is a count noun, $\text{HUNK}_{w,t}$ is a disjoint set. Hence also $\lambda x.\text{HUNK}_{w,t}(x) \wedge \text{MEAT}_{w,t}(x)$ is a disjoint set, and by the Disjointness Principle *hunk of meat* is a singular count noun phrase.

We see then that noun phrases like *hunk of meat* denote 'mass stuff', meat. But the meaning of the noun *hunk* tells you that meat in this denotation comes in the form of disjoint countable, separate portions (meaning, among others, that they are more than non-overlapping parts of a bigger body of meat, i.e. that you can pick them up and move them separately, etc.).

Case 2: Contents classifiers

We come back to *three glasses of wine.* With the interpretation of shape classifier noun phrases as our model for portion interpretations, we can show that Partee and Borschev's contents interpretation is a portion interpretation, and on that interpretation, *glass of wine* is a singular count noun phrase.

For this we only need to assume a very reasonable condition on the contents of containers:

(18) **Disjointness of Contents** (for normal situations w,t):
If $GLASS_{w,t}(x) \wedge GLASS_{w,t}(y) \wedge x \neq y$ then $\mathbf{contents}_{w,t}(x)$ and $\mathbf{contents}_{w,t}(y)$ are disjoint.

This says that, under normal circumstances, different glasses have disjoint contents. Disjointness of Contents makes the function $\mathbf{contents}_{w,t}$ a one-one function, so that the inverse function $\mathbf{contents}_{w,t}^{-1}$ is also defined. Above we analyzed, following Rothstein 2011, the container classifier reading of *glass of wine* along the lines of: *glass that has wine as contents*. With Partee and Borschev 2012, we assume that a contents-reading is also available, and we assume that it is based on the inverse contents function: *wine that is the contents of a glass*:

(19) a. $[_{\text{contents classifier}}$ *glass* $] \rightarrow \lambda P\lambda x.P(x) \wedge GLASS_{w,t}(\mathbf{contents}_{w,t}^{-1}(x))$
b. $[_{NP}$ *glass of wine* $] \rightarrow \lambda x.WINE_{w,t}(x) \wedge GLASS_{w,t}(\mathbf{contents}_{w,t}^{-1}(x))$
The set of wine-portions that are contents of glasses.

Now, if x_1 and x_2 are in the set (19b) and $x_1 \neq x_2$, then x_1 and x_2 are both the $\mathbf{contents}_{w,t}$ of a glass, and, because $\mathbf{contents}_{w,t}$ is a function, these glasses are different. It then follows from Disjointness of Contents that x_1 and x_2 are disjoint. The Disjointness Principle from Section 1 says that a noun phrase is count if its interpretation is disjoint at all *relevant* indices. We make the plausible assumption that relevant indices are restricted to indices that are *normal* with respect to the Contents Principle. With that, it follows that *glass of wine*, with contents classifier *glass*, is a count noun phrase.
An example showing the contents reading is (20):

(20) I drank *fifteen glasses of beer*, five flutes, five pints, and five steins. I drank five *of the fifteen glasses of beer* before my talk and the rest after it.

In (20), the container classifier reading is irrelevant (I didn't ingest the glasses), what I drank was beer. The relevant reading in (20) is not a measure reading either, because I did not drink 15 glassfuls of beer: one glassful is a contextually fixed amount, but (20) expresses that I drank portions of beer of different size. And the partitive predicate *of the fifteen glasses of beer* is count. So, the natural reading in (20) is the contents reading.

Case 3: Free portion interpretations

Portion interpretations can be implicit, as in the following example:

(21) Eén patat met, één zonder, en één met satésaus, alstublieft.
One french fries with [mayonnaise], one without, and one with peanut sauce, please.

For (21), we assume that the mass noun *patat* shifts with implicit operation $\mathbf{portion_c}$:

(22) a. $PORTION_c$ is a property whose content is determined by context c such that for all relevant indices w,t: $PORTION_{c,w,t}$ is disjoint.
b. $\mathbf{portion_c} = \lambda P\lambda x.P(x) \wedge PORTION_{c,w,t}(x)$
c. $[_{NP}$ *patat*$] \rightarrow \lambda x.PATAT_{w,t}(x) \wedge PORTION_{c,w,t}(x)$

In (21) and (22c) mass noun *patat* shifts to singular portion count noun phrase *[portion of] patat*.

Coming back once more to *three glasses/liters of wine*. We assume that the shifting operation $\mathbf{portion_c}$ adds one more interpretation possibility to the readings derived so far: we assume that implicit operation $\mathbf{portion_c}$ can compose with the measure interpretation of *glass* (applied to implicit number predicate **one** (λn.n=1)):

(23) a. [$_{\text{portion classifier}}$ *glass*] $\rightarrow$ $\mathbf{portion_c} \circ$ (*glass*$_{\text{measure}}$ (**one**))
b. [$_{\text{NP}}$ *glass of wine*] $\rightarrow \lambda x.\text{WINE}_{w,t}(x) \wedge \text{PORTION}_{c,w,t}(x) \wedge \mathbf{glass}_{w,t}(x)=1$
The set of portions of wine that each amount to one glass-ful.

The interpretation of *glass of wine* derived is a *portion* interpretation, it is *count* (since $\text{PORTION}_{c,w,t}$ is disjoint, and hence the interpretation derived is disjoint as well); but it is not a contents interpretation, since the portions in the interpretation are *free*, they are not linked to containers. This interpretation we find in (24):

(24) The instructions are to pour *three cups of soy sauce* in the brew, the *first* after 5 minutes, the *second* after 10 minutes, the *third* after 15 minutes. I have a good eye and a very steady hand, so I pour *them* straight from the bottle.

In (24), when I pour, the soy sauce is never in a cup. But I count what I pour: *them* refers to countable cup-size portions.

We see that formulating the analysis in terms of disjointness allows us to clarify portion readings beyond the discussion of Partee and Borschev. We started out with Rothstein's container classifier reading and measure reading for *three glasses of wine*. We have added to that two portion readings:

-the contents reading relates to the container interpretation of *glass*: take the inverse of the contents function;

-the free portion reading relates to the measure interpretation of *glass*: compose with the portion operation. Both readings derived are portion readings and count.

4 Cross-linguistic evidence

If measure interpretations are mass and portion interpretations count, we expect portion interpretations to occur in contexts where measure interpretations are excluded, In this section we point out that this distinction seems to be supported cross-linguistically.

Case 1. Dutch

As argued in Doetjes 1997 and Rothstein 2011, measures in Dutch are uninflected for number; when a measure occurs with plural inflection, it gets a classifier interpretation. Thus, *vijftien liter water/*fifteen liter[-] of water has a measure interpretation, but *vijftien liters water/*fifteen liter[plur] of water only has a classifier interpretation. (25a,b) show that measure phrases are mass: (25a) has the uninflected form *liter*, it has a measure interpretation, and it is only compatible with the mass determiner *het meeste/*most[sing]: (25a) expresses mass comparison, comparison in terms of volume:

(25) a. ✓*Het meeste* van de vijftien *liter* water was weggelekt. measure - mass
Most [sing] of the fifteen liter[-] water had leaked away.
b. #*De meeste* van de vijftien *liter* water waren weggelekt.
Most[plur] of the fifteen liters[-] water had leaked away.
c. *De meeste* van de vijftien *liters* water waren weggelekt. portion - count
Most [plur] of the fifteen liter[plur] water had leaked away.

The plural on *liters* in (25c) indicates a classifier reading, which in this case is a portion reading (derived by shifting *liter* to *liter-container* and taking the contents interpretation of the latter).

(25c), with count-determiner *de meeste/*most[plur], expresses count comparison, comparison in terms of *number* of portions.

Case 2. Hungarian

Schvarcz 2014 argues that Hungarian suffix *–nyi* is an operator which takes nouns and shifts them to measures (similar to *–ful* and*–worth* in English, but more general and more productive). The continuation in (26a) triggers a portion interpretation of *Három pohár bort*/*three glasses of wine*: the expression *refilled twice* points at *three* separate portions:

(26) a. ✓*Három pohár bort* ittam a parti-n, a pincér kétszer töltötte újra a poharam.
three glass wine drink on the party the waiter twice fill again my glass
I drank three glasses of wine at the party, the waiter refilled my glass twice.

b. #*Három pohár-nyi bort* ittam a parti-n, a pincér kétszer töltötte újra a poharam.
three glass-ful wine drink on the party the waiter twice fill again my glass
I drank three glass-fuls of wine at the party, the waiter refilled my glass twice.

When we replace *pohár/*glass by measure *pohár-nyi/*glass-ful, the portion reading disappears: the continuation in (26b) is infelicitous. If portion readings are a special case of measure readings, the infelicity of *-nyi* in the data in (26) is completely unexpected (notice that there is nothing *per se* wrong or 'unportionlike' about drinking three glassfuls of wine). On the analysis given here these data neatly fall into place.

Case 3. Russian

In Russian, the incremental theme of imperfectives is a context in which measure phrases are infelicitous (Koševel 1996, see also Khrizman 2014):

(27) a. #Ivan sidit na divane i pʹët *dva s polovinoj litra vodki.*
Ivan is sitting[IMP-PRES] on the sofa and drinking [IMP-PRES] *two and a half liter of vodka.*

b. ?✓Ivan sidit na divane i pʹët *stakan čaja.*
Ivan is sitting[IMP-PRES] on the sofa and drinking [IMP-PRES] *a cup of tea.*

While examples like (27b) are not perfect, there is a strong contrast with cases like (27a), which are completely impossible. Now, the infelicity observed by Koševel's means that we (and everybody else) must assume that in the context of (27a) measures cannot shift to non-measure interpretations. By the same reasoning, the improved felicity of (27b) means that the interpretation of *stakan čaja/*a cup of tea on which the felicity improves is not a measure interpretation. Since the container interpretation is again irrelevant, the interpretation in question will be a portion interpretation. Thus, the contrast in (27) shows that also in Russian, portion interpretations do not pattern with measure interpretations.

Case 4. Hebrew

Rothstein 2009 argues that in Hebrew, measure interpretations are only available if the number predicate can form a *constituent* with the putative measure. She argues that in double construct states the number predicate does *not* form a constituent with the measure. Thus, the double construct state in (28) only allows the first syntactic structure, not the second:

(28) *šlošet bakbukey* hayayin.
three bottle wine[def] [= the three bottles of wine]
✓[*šlošet* [*bakbukey* hayayin]] #[[*šlošet bakbukey*] hayayin]

The infelicity of (29a) (from Rothstein 2009) shows that double construct states do not allow measure interpretations. But double construct states *do* allow portion interpretations, as shown in (29b):

(29) a. hizmanti esrim orxim ve- hexanti esrim ka'arot marak be sir gadol. rak šiva-asar orxim higiu,
I invited twenty guests and I prepared twenty bowls (of) soup in a big pot. Only seventeen guests came,
#ve- *šaloš ka'arot ha- marak ha- axronot* nišaru ba sir.
and [three bowls DEF soup DEF last] remained in the pot.
and [the last three bowls of soup] remained in the pot.
b. ✓šatinu et (kol) *šlošet bakbukey hayayin* še-hu hevi.
We drank (all) *the three bottles (of) wine* that he brought.

Similarly, Rothstein 2009 argues that free genitive constructions, as in (30a), do not allow measure interpretations (see Rothstein 2009 for extensive discussion). But, again, free genitive constructions *do* allow portion interpretations, as shown in (30b):

(30) a. *sir šalem* šel marak.
pot full of soup [= a pot full of soup]
b. zarakti *sir šalem šel marak*, ve- az šatafti et ha-sir.
I threw away *a full pot of soup,* and then I washed out the pot.

Case 5. Yudja

Lima 2014 argues that Yudja does not grammatically distinguish between mass nouns and count nouns and does not have null classifiers. She argues that nouns denote kinds and that count readings come in through a shift to what she calls 'maximally self-connected instantiations of the kind.'

(31) a. Txabïu apeta pe.
Three blood dripped.
b. Txabïu y'a a'i.
Three water are here.

The numerical phrases in (31) denote *free* portions of blood/water: they need not be the contents of any container, they need not be of any standardized shape, and the context determines what counts as a portion. But: portions of blood are *counted* in (31a).

We argued above for shifting operation $\mathbf{portion}_c$, which produces separable countable portions, but has no further inherent 'lexical' content, meaning that what counts as a portion is determined completely contextually. But: $\mathbf{portion}_c(\mathrm{BLOOD}_{w,t})$ is count.

It seems that the operation $\mathbf{portion}_c$ is exactly the operation needed to account for the Yudja facts in question, and here again, what is used is the fact that portion interpretations are count.

5 In sum

We started out with a theory of the mass-count distinction for noun phrases which links count nouns to disjointness. We derived, for *three glasses of wine*, a count container classifier interpretation (three glass-containers filled with wine) and a mass measure interpretation (wine measuring three glass-fuls). We then discussed three ways of forming portion interpretations, which added two portion interpretations for *three glasses of wine*: a contents-classifier interpretation (three wine-portions that are wine-glass contents) and a free portion interpretation (three wine-portions that each measure one glass-ful). We showed that, unlike measure interpretations, which are mass, all portion interpretations are count. Finally we showed that this holds cross-linguistically.

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