

Ratios as distributive relations over matching events

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1. *per/de* as distributive prepositions We will be looking at the prepositions *per* in Italian and *de* in Romanian, as found in the construction [Card N₁ Prep N₂], where N₂ is a sortal noun, Card conveys cardinality and N₁ is a noun. English *per* has similar semantic properties (see translation (1c) below), but it will not be addressed directly, since it has a wider distribution including measure nouns as N₂, e.g. *20 cakes per hour*, unlike the Italian and Romanian prepositions. The account proposed here is meant for constructions with a sortal noun as N₂.

- (1) a. James Bond a mâncat două măslinē de martini. (Romanian)
James Bond has eaten two olives DE martini
b. James Bond ha mangiato due olive per martini. (Italian)
James Bond has eaten two olives per martini
c. James Bond ate two olives per martini.

We assume that It. *per* and Rom. *de* belong to the class of specialized markers of distributivity, among which are key marker English binominal *each* (Champollion 2017), and share marker Tlingit suffix *gáa* (Cable 2014). What is special about *per/de* is that they are share-key relators, where the share is N₁ and the key is N₂, and the construction is best described as a ratio (Tovenă 2016). Moreover, the key provides the unit, for instance, the ratio of olives to martinis is 2 to 1 in (1). We also note that N₂ is constrained to be interpreted as participant in some event—distinct from the main clause event (eating in (1))—which may be either overt or covert (presumably a drinking event). Furthermore, the construction induces a one-to-one matching effect between the key and share events.

2. The matching effect. Unlike other forms of distributivity, the key entity is introduced within the share DP in *per/de* constructions, and is not related to the main event by a thematic role, i.e. martinis are not eaten in (1). A closer look at the distribution of *per/de* constructions indicates that key retrieval is determined by event retrieval. World knowledge makes drinking events to be the relevant key events easily retrievable in (1). In the case of Rom. (2), the event is supplied overtly by a participle. In the absence of this eventive modifier, the sentence is quite degraded.

- (2) Funcționarul a înregistrat două plângeri de telefon ??(pierdut). (Romanian)
Clerk-DEF has filed two complaints DE telephone lost
'The clerk filed two complaints per lost telephone.'

Filing and losing matching events must form unique pairs, as required in a one-to-one matching. Yet, recycling may be possible for the entities, as the same phone might be lost twice in (2), as well as share entities, in suitable examples. The distribution of Italian *per*—and Romanian *de* to an even larger extent—is heavily constrained by event retrieval. Example (3) is marginal even in the context where we are preparing for a dinner, because no obvious event is associated with *masă*.

- (3) ??Vom pune două beri de masă. (Romanian)
Will.1pl put two beers DE table
'We will put two beers per table.'

3. Our proposal. Taking the well-formed version of (2) as an illustration, we assume that syntactically *per/de* combines with the distributive key, but semantically it relates a plurality of key events (losing in (2)), each with an atomic key participant (*telephone*), to a plurality of share events (filing in (2)), each with a share participant (2 *complaints*). The telephone-losing events work as the key. The events that are matched are singled out via their participants, i.e. via the key property (*telephone*) and share property (*complaints*), with their cardinality specification (a covert 1, and overt 2, respectively). Thus, key and share events and entities are selected by the preposition, see (4) and the entry in (5).

$$(4) \quad \begin{array}{ccccccc} \text{[filed} & [_{DP} & 2 \text{ complaints} & [_{PP} & \text{per} & [_{DP} & \text{ONE} [_{NP} & \text{[lost [telephone]]]]]]]] \\ E_{share} & \theta_{share} & & \text{MATCH}(E_{share})=E_{key} & & E_{key} & \theta_{key} \end{array}$$

The *per/de*-phrase is assumed to be adjoined to the share DP, and the key event variable is a modifier of the key noun phrase. Even in cases in which no modifier is present we assume a covert eventive modifier of the key NP, e.g. in the case of (1), (*drunk*) *martini*. Therefore, the entry for *per/de* in (5) below will also apply to (1). Also, we assume a silent cardinal ONE in the key.

$$(5) \quad \begin{array}{l} [[\text{per}]] = \lambda Q_{\langle et \rangle} \lambda S_{\langle vt \rangle} \lambda e'_v \lambda P_{\langle et \rangle} \lambda n_d \lambda e_v \lambda V_{\langle vt \rangle} [* \text{match}(e) = \oplus e' \wedge \\ e \in * \lambda e'' [* V(e'') \wedge * P(* \theta_{share}(e'')) \wedge \mu(* \theta_{share}(e'')) = n \wedge \\ S(* \text{match}(e'')) \wedge * Q(* \theta_{key}(* \text{match}(e'')) \wedge \mu(* \theta_{key}(* \text{match}(e'')))) = 1]] \end{array}$$

The preposition selects the key nominal property *Q* (*telephone*), the key verbal property *S* (*lost*), the key event *e'* (losing(s) of the telephone), a share nominal property *P* (*complaints*), a cardinal *n* corresponding to the number of complaints in each share subevent, a share event *e* (filing(s)) and the verbal property *V* corresponding to the share event (*file*). It then requires that the sum of key events *e'* be in a matching relation to a plurality of main events *e*. The second line in (5) specifies that this plurality is made up of share subevents *e''* that are *V*-events, and have a thematic role for the share NP that satisfies the nominal property *P* and cardinality *n* (the thematic role is Theme in (2); the Theme of filing is in the extension of **complaint* and has cardinality 2). The third line expounds the conditions on the key subevents, identified as the matches for the share subevents. These events must be in the extension of *S*, have Themes that satisfy the nominal property *Q* (*telephone*), and have cardinality 1.

4. Discussion The matching function adopted here is a one-to-one mapping function over pairs of events reminiscent of what is used by Rothstein (1995), Landman (2004), and Champollion (2017), in their analyses of sentences such as (6), which do not allow a scenario where the bell rings two times, after which Mary opens the door once. One finds the same one-to-one mapping in (1) and (2). Moreover, note that the key events are not existentially bound, but uniquely identified by the key entity description and the matching function. As for the entity, telephones matter as long as they are lost in (2). In short, the key is not a discourse accessible set of telephones, but a set of telephone-losing events picked up by a function over complaint-filing events. This contrasts with the referential status of the key in standard distributive cases such as *Each telephone rang*.

(6) Every time the bell rang, Mary opened the door.

One difference between *per* and *every time* sentences is that only the latter are bi-clausal, hence temporal specifications over the key event are present in (6) and simply missing in (1). Another important difference is that, in *every time* sentences, the participants in the events play no role in the specification of the matching function, while the *per* construction relates not only events, but also share and key entities. Finally, the accounts in the literature which have taken event dependency to be crucial in explaining the semantic behavior of distributive markers, have only looked at markers which relate share and key entities as co-participants in the same events, or where one is a participant and the other an event. Given the matching effect recorded in ratio expressions, accounts of distributivity

involving plural operator * on events (Champollion 2017), post-suppositions (Henderson 2014), or variable assignment constraints (Farkas 2015), do not carry over to the preposition discussed here.

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