Between Mass and Count

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1. The issue

The present paper discusses a case where mass nouns appear to go together with singular count nouns rather than plural ones, contrary to the common situation in linguistic phenomena largely discussed in the literature. More precisely, we consider the case where uncountable and singular countable nouns combine with certain singular determiners, a combination predicted to be impossible by Chierchia (1998). However, this similarity concerns only a subset of uncountable nouns. Therefore, our aim will be to answer two separate questions, namely how to characterise the relevant subset of mass nouns, and how to account for its similarity with singular countables.

2. Mass and countable nouns

Traditionally, nouns are subdivided into COUNTABLE and UNCOUNT-ABLE or mass nouns. Most countable nouns are words for discrete entities that can be counted, like *apples* and *books*. Uncountable nouns are usually words for entities that are thought of as a quantity or a mass, like *milk* and *sand*.

In general, in the case of countable nouns, the default domain is made up of individuals or sets thereof; in the case of uncountable nouns, it is made up of parts (Link (1983), (1984), Krifka (1987), Landman (1991), Ojeda (1993)).

It is widely acknowledged that the count and mass distinction does not always correspond to the philosophical sortal and non-sortal distinction (Pelletier, 1979a), and that membership to one of these two groups is not mutually exclusive. Actually, depending on the context of use, some movement of members between the two groups is possible[1], and yet there are basic countability preferences (Allan, 1980). We will also assume that the difference between the two groups is linguistic in nature, at least as far as the topic of this paper is concerned, although preferences may be linked with extra linguistic considerations.

The possibility of changing group, also termed mass/count coercion, has been described in the following way in (Ojeda, 1993). One structure of the

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*   Thanks to Ruth Huart for discussions and her careful reading of a draft version.
1.   Devices such as the 'universal grinder' (Pelletier, 1979b) can be taken to characterise different interpretations/uses of nouns rather than different entries.

domain of denotation of a noun is associated with a lexical entry as primary selection. As just said, the discrete/atomised domain is the primary selection for countable nouns and the nonatomic for uncountable nouns, see (1a). A secondary selection for mass is a discretisation of the domain via the notion of species or kind. Different kinds of N identify different subdomains (Ojeda, 1993), so that they constitute the atoms of the entire domain, even when they denote subdomains of the atomless kind and can be atomless themselves. They represent the countable sense of the noun, see (1b).

(1) a.   Do you keep wine in your shop?
     b.   Do you use wine/wines in your cooking?

Similarities between mass and plural countable nouns have been repeat-edly studied (see Link (1983), (1984), Gillon (1992), Ojeda (1993), Bosveld-de Smet (1998), Chierchia (1998)). Most of these proposals are motivated by the observation that mass and plural countable nouns share the property of cumulative reference. This similarity has led to the use of similarly structured domains for the interpretation of both.[2]

As we have taken Chierchia's work as our starting point, because he de-votes particular attention to an analysis of determiners using a single model for describing the denotation of nouns, we summarise his proposal briefly. Drawing from Gillon, Chierchia builds a unique lattice model for the deno-tation of countable and uncountable nouns, under the name of Inherent Plu-rality Hypothesis. The main thesis behind his analysis is that mass nouns differ from count ones (only) insofar as they come out of the lexicon with plurality already built in. A singular countable noun is associated with a set of atoms, and the set-forming operator PL is used to enable us to talk about sets of them. The basic lexical entry of a mass does not single out the set of atoms, but a sublattice. In this case, the difference between singular and plural is neutralised, for the noun applies equally to atoms and sets thereof. The atomic texture is foregrounded in countable nouns, as by definition its extension singles out a set of atoms. On the contrary, in uncountable nouns this structure is present but only implicitly. This gives one a single structure for describing the denotation of countable and mass nouns.

3. *Nessuno* **and other 'special' singular determiners**

Chierchia (1998) assigns the Italian negative determiner *nessuno* (no) to the group of singular determiners, together with positive *qualche* (some) and English *every*. The class of singular determiners gathers together determiners that require a domain composed only of atoms.

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2.   See (Bosveld-de Smet, 1998) for a discussion on linguistic reasons supporting similarities of treatment.

Recall that in Chierchia's system, the function SG is used to check whether a predicate foregrounds a set of atoms or not. SG maps each possible noun denotation into its presupposed singularities. If A is already a set of singularities, then SG(A) = A. Otherwise, SG(A) is the set of atoms At that generates A via the set-forming operator PL, if such a set exists. Therefore, since SG(A) is undefined if A is the denotation of a mass noun, SG works as a tool for setting apart countable from uncountable nouns. It acts as domain regulator for determiners according to the schema in (2a), abbreviated as (2b).

(2) a. D(SG(X))(Y)
    b. D_{SG}(X)(Y)

Then, S is defined as a restriction of SG to atoms. It sets apart singular from plural countable nouns. For any subset X of the domain, S(X) = X if $X \subseteq$ At, and otherwise S(X) is undefined. Using S, Chierchia aims at capturing the distribution of singular determiners, see the definition of *every* in (3) and the data in (4).

(3) $EVERY_S$(X)(Y) = S(X)$\subseteq$ Y

(4) a. every student
    b. *every books
    c. #every wine

The data in (5) show that *nessuno* combines with singular count nouns but not with plurals or uncountables, and seem to offer support to its classification as a singular determiner.

(5) a. nessuno studente
        no student
    b. *nessun libri
        no books
    c. #nessun vino
        no wine

However, example (6) from (Tovena, to appear) contradicts a classification of *nessuno* as singular determiner.

(6) Non ha mostrato nessun coraggio
     she didn't show any courage at all

It appears that *nessuno* sometimes combines with a mass noun, as in (6), and sometimes does not, as in (5c). However, at a closer look, it can be seen that the behaviour of *nessuno* is not erratic. As a first approximation, we

can say that the line separating acceptable and unacceptable instances follows rather closely the abstract vs concrete divide, see (7). There is a preference for combining with abstract mass nouns. In general *nessuno* does not combine with concrete mass nouns, either of the substance mass type, e.g. 'milk' and 'water', or of the collective mass type, e.g. 'mail' and 'furniture'.

(7) a. *Non ha messo nessuno zucchero nella spremuta
         she didn't put any sugar in the juice

    b. *Non ha ricevuto nessuna posta
         she didn't get any mail

    c. Non ha nessun talento per la musica
        she is not talented at all in music

Before we attempt to refine the characterisation of mass nouns that combine with *nessuno*, it is worth mentioning that this is not the only determiner that exhibits a non homogeneous behaviour with respect to uncountable nouns, that splits this class into two groups, and clusters abstract uncountable nouns together with singular countable nouns. French provides more examples, as shown in (8) for the negative determiner *aucun* (no).

(8) a. Il n'a pris aucun livre
        he did not take any book

    b. Il n'a montré aucune pitié
        he didn't show any mercy

    c. *Il n'a vu aucun étudiants
         he didn't see any students

    d. *Il n'utilise aucun sable
         he uses no sand

Furthermore, this sensitivity to the typology of uncountable nouns is not a peculiarity of negative determiners. As shown in (9), the negative polarity and free-choice French item *le moindre*[3] (the least) behaves in the same way in this respect.

(9) a. Il n'a pas lu le moindre livre
        he did not read a single book

    b. Il connaît le moindre recoin du village
        he knows every last corner in the village

    c. Il n'a pas montré le moindre courage
        He did not show the least bit of courage

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3. For a discussion of the polarity sensitivity and free-choiceness of this item, see (Tovena and Jayez, 1999), (Jayez and Tovena, 2000).

    d.   *Il n'a pas lu le moindre livres/les moindres livres
          He didn't read any books

    e.   *Il n'a pas bu la moindre eau
          He did not drink a drop of water

As a first approximation, we have invoked the intuitive notion of abstract nouns in order to set apart the relevant subset of uncountable nouns. However, a characterisation of this notion is not a straightforward matter. Furthermore, the set of nouns under examination cannot be identified by referring to entities having no spatial dimensions, as done for abstract nouns in general (Flaux, Glatigny and Saiman, 1996). Indeed, the sentences in (10) are not acceptable.

(10) a.   *Non ho nessun tempo
          I have no time

    b.   *Je n'ai aucun temps
          I have no time

Note also that (11) is not a counterexample to the idea of abstraction. It is the thing that is thick and extends in space, and not the thickness itself, which can still be considered as abstract. Thickness, as well as length for instance, does not have spatial dimensions.

(11) Questo foglio di carta non ha quasi nessuno spessore
     this sheet of paper has nearly no thickness

At this point, the situation from the point of view of the determiner is as follows.

- Chierchia's restriction S in the model as it stands does not seem to be appropriate for capturing the distribution of *nessuno*, because it rules out cases such as (6) where *nessuno* combines with mass nouns. The problem is that S cannot be defined in another way in the system as it is. Indeed, Chierchia claims that there are no functions restricted to singular count and mass noun denotations in natural language, and says that the existence of such a gap follows from his system because there is no natural domain regulator that would have the effect of restricting the left argument of a determiner in this way.

- Variations in the distribution of *nessuno*, which sometimes combines with a mass noun, as in (6), and sometimes does not, as in (5c), rule out the possibility of capturing its distribution by referring to a constraint expressed purely in terms of morphological number of N.

- The line separating acceptable and unacceptable instances of *nessuno* N_{mass} follows some sort of abstract vs concrete divide, see (7). However, this distinction cannot find a place in Chierchia's classification. His model is unable to distinguish among subtypes of uncountable nouns.

4. Intensive quantities

We propose that the relevant subclass of abstract nouns can be characterised via the notion of *grandeur intensive* IQ (intensive quantity)[4] (Van de Velde, 1996). The main characteristic of these entities is their possibility of undergoing continuous increase or contraction without a corresponding extension in space or time. As Kant says:

> Thus a certain expansion which fills a space, for instance, heat, and every other kind of phenomenal reality, may, without leaving the smallest part of space empty, diminish by degrees in infinitum, and nevertheless fill space with its smaller, quite as much as another phenomenon with greater degrees. (Kant, 1881, 153)

So, a lot of courage is not a bigger (extensive) quantity of courage, it may well be the same quantity at that, but it is a bigger intensive quantity, i.e. a higher degree of intensity of courage. Degrees are quanta that do not discretise the domain into individuals, nor into measurable parts.

There are several contexts where the subclass of IQs behaves differently from the rest of uncountables.

- wh- determiners
  The wh- determiner *quel* discriminates among types of nouns. When applied to countable nouns it singles out individuals. When applied to uncountable nouns it singles out species. As Van de Velde notes, it is awkward with IQ nouns.

  (12) a. Quel livre veux-tu lire?
            which book do you want to read
       b. Quel vin veux-tu boire?
            which wine do you want to drink
       c. $^{??}$Quel courage a-t-il eu?
            what courage did he show

  If acceptable, (12c) has only a rhetorical interpretation, where *quel* singles out a (low) degree of courage.

  The contrast in (12) prompts the following considerations. Assuming that *quel* requires an atomised domain, it exploits the possibility of a secondary

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4.   From Kant's *Critique of pure reason*, cf. the translation of 1881.

selection in the sense of (Ojeda, 1993) whenever it combines with a mass noun in general. This secondary selection appears not to be available for IQs in this case. On the other hand, IQs' primary selection does not seem to be the same as the rest of mass nouns, as shown by the availability of a 'degree' reading. The grammaticality contrast between (12a) and (12c) shows that degrees do not qualify as traditional atoms.

- 'such a'
  Van de Velde argues for the equivalence between quantity and quality in the case of IQs, and offers as supporting evidence the data in (13), which exemplify the possibility of replacing *un tel N, un N pareil* (such a N) with *autant de* (so much).

  (13) a. Il est rare de rencontrer une telle intelligence unie à une telle modestie
           it is rare to find such intelligence together with such modesty
       b. Il est rare de rencontrer autant d'intelligence unie à autant de modestie
           it is rare to find so much intelligence together with so much modesty

  The point of her observation is not that IQs can be qualified only via their degree, as we can say (14), for instance, whose prominent reading is a taxonomic one. Besides, the case in (14) is common to all mass nouns, cf. (15). Rather, her point is that in the absence of an explicit criterion for comparison, the comparison is made on the basis of the degree of intensity.

  (14) Elle a une intelligence éblouissante
       she has a sparkling wit
  (15) Il y avait une eau claire
       there was clear water

  Once again, we see that IQs' primary selection differs from the rest of mass nouns, despite the fact that they denote continuous entities.

- 'a certain'
  The indefinite determiner *un certain* (a certain) combined with continuous entities brings in discontinuity. In the general case, this discontinuity requires the presence of an adjective modifying the noun that offers the qualitative criterion for subdividing the domain into species. In the case of IQs, the discontinuity is based on the notion of degree. The presence of these discrete units, which are not qualities identified as traditional species, makes it possible to talk about undefined qualities, as done in (13) via *tel* and in (16a) via *certain* (Van de Velde, 1996). These qualities appear to be

interpreted in terms of degrees of intensity. The fact that IQs are compatible with *un certain*, while uncountable nouns aren't, suggests that a certain degree of default domain atomisation is possible for IQs, see (16).

(16) a.   un certain courage
          a certain courage
     b.   un certain livre
          a certain book
     c.   *une certaine eau
          certain water

- There are particular distribution effects also with adjectives. (Often) qualitative adjectives that modify IQ nouns contribute quantitative information, pointing at a high position on a scale.

(17) a.   un $\left\{\begin{array}{l} \text{gran} \\ \text{bel} \\ \text{vero} \\ \text{raro} \end{array}\right\}$ coraggio
          a great courage

     b.   un $\left\{\begin{array}{l} \text{profondo} \\ \text{acuto} \\ \text{sincero} \end{array}\right\}$ rispetto
          a great respect

This is not to say that the examples in (17) do not have a reading whereby the adjective is interpreted in its traditional qualitative use. However, first, there is also quantitative information carried by these NPs. Second, as noted in (Flaux, Glatigny and Saiman, 1996) for abstract quality names in general, these nouns denote entities that can only be conceptually detached from their support, but that are not autonomous, e.g. *courage* manifests itself through courageous acts of someone. So, the qualitative interpretations of the adjectives in (17) do not apply directly to the nouns they modify. For instance, what is rare is not the courage, but the manifestations of such a degree of courage. Similarly, it is the person feeling respect who is sincere, not the respect itself.

Note also that the piece of quantitative information points at a high position on an understood scale. This fact is linked with the following observation made by Van de Velde:

- relative/absolute interpretation
  We can say that a cat is *big* or *big for a cat* and the two expressions mean more or less the same. In fact this cat can be a small animal (Vendler, 1967). But in the case of an IQ noun, the dimension cannot be taken in a relative

sense. So, a *great courage* cannot be taken to mean a courage that is *great for courage*, nor can it be great in itself but small for an emotion. The adjective must be taken in an absolute sense. A *great courage* is a degree of courage far from the degree zero, on a scale interpreted as directed in a single direction, and not as a position which is high or low with respect to a norm.

This fact can receive an explanation within our hypothesis. The point we are trying to make in this section is that, although they are not traditional atoms, yet degrees are, somewhat, a way of discretising the domain of IQ nouns, and the nature of the units to which they correspond will be specified shortly. Now, if the degree of an IQ is not related to an external norm, as in the comparative analysis of adjectives mentioned above, but is positioned by the ordering relation of the lattice representing the denotation of the noun, then we see why the degree cannot be relativised. Their positioning depends on internal reasons. Then the identification of a high position would be due to the content of the adjective presumably in conjunction with pragmatic factors such as defined by the maxim of relevance, as shown by the marginality of (18).

(18) [??] Ha dato prova di un banale coraggio
     he showed trivial courage

- *nessuno, aucun*
  As discussed in section 3, IQ nouns combine with some singular determiners.

    All the observations made so far point towards the assumption that IQs can have a sort of discretised domain as primary selection. However, we have been very cautious about committing ourselves to their atomic nature. Other observations suggest that degrees cannot be plainly equated with individuals.

- exclamatives
  As we can see in (19), adapted from (Van de Velde, 1996), in exclamative expressions IQs cross over the quantity/quality distinction—which suggests that degrees do not qualify as traditional quanta and are not like measures that map parts into numbers.

    (19) a.   quanto coraggio! = che coraggio!
            what courage
        b.   quanto burro! ≠ che burro!
            what a lot of butter ≠ what (good) butter

- We have pointed out above that IQs are only indirectly quantised. For instance, 'courage' is a property expressed via 'courageous acts', which,

in turn, are quantised into eventualities instantiating them. Similarly, the quantum 'instantaneous state' proposed by Chierchia (1998) for abstract nouns applies to 'honest behaviour', i.e. a manifestation of 'honesty', and not to honesty itself.

- There is a dependency between intensive quantities and a subject/agent. For instance, strength is not an entity independent from the agent who is strong. This observation takes us back to the traditional idea that abstract nouns are characterised by an inherent dependency (Flaux, Glatigny and Saiman, 1996).

- IQ nouns do not combine with some singular determiners, e.g. Italian *qualche* (some) in (20). Even if the domain exhibits some sort of atomisation, it is not like that of countable nouns and it is not always visible.

(20) *qualche coraggio
     some courage

In conclusion, IQs seem to correspond to a type of noun that should be classified somewhere in between countable and mass.

5. Between countable and mass

5.1. Informal proposal

The hypothesis we are going to make is that there are several levels of discretisation in the domain of denotation of a noun. More precisely, we are going to posit strongly discrete units and weakly discrete ones, besides the possibility of the absence of units. The former units correspond to traditional atoms, and they occur through the stipulation of the lexical entry. Thus, they are present in the domain of countable nouns but absent from the domain of uncountables in general. The latter units correspond to units that are found in the domain of IQs and that can be 'seen' in particular conditions.

Strongly discrete units are used classifying the basic structure of a domain of denotation. One can tell to which group a noun belongs on the basis of information on strongly discrete units. In this way, we get the traditional bipartition into countable and uncountable nouns. We derive the fact that IQ nouns belong to the group of uncountable nouns from their nature as continuous entities. Their lexical entry is not directly associated with atoms in the denotation.

At the same time, from the observations above we can also derive the distribution of IQs. We accommodate the distribution of these nouns in contexts of quantification using information also on weakly discrete units. In fact, manifestations, such as courageous acts, are sort of occurrences of the

property, if the idea of occurrence of a quality makes sense. A high degree and any other given degree of courage are different types of courage. It is the ordering that allows us to talk about subtypes, because we cannot distinguish them in any other way. But this ordering does not translate into entities that can be precisely measured. So, we can say that the domain of IQ is discretised into degrees that are a sort of ordered species. These degrees are weakly discrete units. For countable nouns the default way is a discretisation by individuals. For the rest of uncountable nouns, the default strategy is by parts, defined with respect to units of measure, and by species only as a secondary selection that applies to rescue a phrase.

For intensive quantities, no units of measurement are available, because measures apply to extensions. The first way of quantizing is via degrees, this produces quanta that can be used in quantification. But since degrees identify types and not instances of intensive quantity entities—recall the quantity and quality equivalence seen in examples such as (19)—then we see why IQ nouns are mass nouns.

5.2. The *nessuno* issue

It appears that the level of discreteness provided by weakly discrete units is enough to satisfy the requirement of a singular determiner such as *nessuno* and *aucun*. On one hand, degrees provide a partitioning into inherent weakly discrete units that can be exploited by the domain restrictor S. On the other hand, strongly discrete units are not needed because we are dealing here with negative quantifiers, whose witness set (Barwise and Cooper (1981), Szabolcsi (1997)) is empty by definition. Hence, at no stage in the interpretation will it be necessary to single out a particular occurrence. Therefore, the acceptability of (6) and (8b) is the result of the interaction between a weakly discretised domain and a determiner whose denotation can be represented by a total function.

The situation changes if the determiner is a partial function. In the case of the positive Italian determiner *qualche*, for instance, which is also classified as singular in (Chierchia, 1998), some occurrences would have to be singled out despite the fact that they are not lexically accessible, because the witness sets have cardinalities greater than zero. As a result the quantified NP cannot be built, cf.(20) above.

In conclusion, by assuming that the mass/count distinction is based on strongly discrete units, and that quantifiers may be satisfied with weakly discrete units in certain cases, one can rescue Chierchia's domain restrictor S. However, his description of the interaction of the determiner system with the mass/count distinction is confirmed to be insufficient for a proper classification of determiners.

The line of reasoning we have put forth seems promising also with respect to the problem raised by sentences such as (21), predicted to be impossible by Chierchia's account.

(21) She still had every confidence in him as a mathematician.

In this case, the quantified NP has a unique witness set that includes the whole denotation of the noun. Such a set may be identified without making use of strongly discrete units as it doesn't partition the noun denotation.

With respect to *le moindre*, although this determiner is not a constant function, strictly speaking, it points at an end-of-scale position and can be equated to a universal or negative quantifier depending on the direction of the inferences on the scale.

5.3. Towards a more formal proposal

In an attempt to express our hypothesis in a more formal way, we can use the distinction between unity and identity argued for in work on ontologies and information systems, see (Guarino and Welty, 2000). The notion of identity is intuitively linked with the issue of how complete is the description of an entity. The notion of unity is closely tied with that of parthood. Guarino and Welty show how these notions complement each other under the general notion of individuality. This latter notion is seen as the sum of the two. A COUNTABLE PROPERTY is a property that carries both identity and unity conditions. So, not only the property 'apple' is a countable property, but also *apple piece*, at least when 'piece' is intended as an undetached self-connected part of something. This means that countable nouns and noun phrases formed by a classifier and a mass noun go together.

Traditional mass, such as 'apple food', carry no unity conditions, as the parts of something that is 'apple food' can be arbitrarily scattered. They do carry identity conditions, based on the mereological extensionality of food, i.e. two amounts of food are the same if they have the same parts (Guarino and Welty, 2000).

We propose characterising mass properties by the absence of one of the two conditions, instead of taking as a crucial factor the absence of a specific condition, e.g. unity. Our proposal is supported by the consideration that the absence of one of the two conditions result in the absence of individuality. This move allows us the possibility of generalising over mass nouns, but at the same time we can get two distinct subcases, as either unity or identity conditions can be enforced.

We have claimed that IQs' weakly discretised domain is composed of units that partition the domain, hence it is composed of entities that carry a

unity condition. We have also claimed that degrees do not qualify as individuals, this means that the domain is composed of entities that do not carry an identity condition.

Then, we have suggested that a discretisation via degrees can come as primary selection. This means that the domain used to describe the denotation of an IQ noun has its own type of structure. We propose to characterise the structure induced by degrees as a non-free join semilattice, as done in (Szabolcsi and Zwarts, 1993) for measures. However, this would be the default structure of the domain of these nouns, and not one induced by the presence of another lexical expression, as in the case of measure phrases, or by a secondary reading, as for the discretisation in types brought about by the taxonomic reading.

Finally, the similarities between kinds in taxonomic readings and degrees might suggest that degrees identify subdomains that can be non atomic.

6. Summary

In this paper we have discussed a subset of mass nouns, identified as Intensive Quantities, that can pair with singular count nouns rather than plural ones and the rest of mass nouns in certain quantificational contexts.

Following the literature, we have started from the assumption that the structure of the domain of countable nouns contains atoms. Similarly, for mass nouns, we have assumed that they denote continuous entities. However, we have added the new hypothesis that there is a third type of domain/level, made of weakly discrete units, between the non atomic domain of masses and the traditionally atomised domain, for which we introduce the expression of strongly discrete units.

Next, we have argued that the domain of IQs contains weakly discrete units, in the sense that they can be quantified over in particular contexts. IQs are continuous entities, hence the structure of their domain does not contain strongly discrete units. Weakly discrete units, that in IQs are understood as degrees, are grounded in the entry and do not correspond to a simple use of the lexical item.

As a result, the basic ontology for common nouns is left untouched, but the finer grained classification of mass nouns allows us the possibility of predicting systematic different grammatical statuses for given det+N combinations.

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