(Im)possible determiners

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Abstract

Determiners have been classified into, at most, the following categories based on whether the noun is count or not, i.e. mass: (e.g. Doetjes 1997; Chierchia 1998a): singular count (e.g. *each*), plural count (e.g. *several*), unrestricted (e.g. *the*), non-singular (e.g. *all*) and (the limited) mass (e.g. *much*). Two seemingly universal gaps are subsequent to this classification: no determiner occurs exclusively (a) with singular and plural count, and (b) with singular count and mass nouns. Using English and Spanish data, I show that this classification and the subsequent gaps need revising: count-only determiners are attested, and thus not a gap; purported mass determiners are elsewhere non-plural forms; there are no mass-only determiners. Building on the idea that count and mass nouns differ in their underlying syntax and feature composition, I argue that the D nodes instantiated by determiners fall into distinct natural classes based on the probing features (e.g. *u*Fs) that Ds bear. Assuming that *u*Fs on D must be valued by Agree (Chomsky 2000, 2001), the different categories of determiners follow from the features available in the extended projection of the NP. Similarly, the revised gaps are concomitants of (i) singular count and mass NPs not sharing any features and (ii) there not being a [MASS] feature: no probe can exclusively enter a dependency with the classes of nouns in question.

1 Introduction

The distribution of determiners seems to be conditioned by the grammatical properties of the nouns they occur with. For example, as shown in (1), *the* can occur with any type of noun, *this*

can only occur with non-plural marked nouns and *these* can only occur with plural-marked ones.

(1) a. The {mud / jewel / *jewels} b. This {mud / jewel / *jewels} c. These {*mud / *jewel / jewels}

However, determiners may not only be conditioned by the number-marking properties on the noun, but also by whether the noun is count or not count, i.e. mass. This is shown in (2): both *mud* and *jewel* are non-plural, and yet *every* is only grammatical with *jewel*. The difference between *mud* and *jewel* is generally attributed to the fact that the former is mass and the latter is count (e.g. Chierchia 1998a, 2010; Borer 2005a).

(2) every { *mud/ jewel/ *jewels}

According to Chierchia (1998a), the distribution of determiners tracks the count/mass distinction in non-arbitrary ways. In particular, Chierchia proposes that determiners may form at most four different natural classes depending on whether the noun they select is (a) singular count (e.g. *every*), (b) plural count (e.g. *several*), (c) mass and plural count (e.g. *more*) and (d) any type (e.g. *the*). He also speculates, based on the distribution of determiners such as *much/little*, and their Italian counterparts, that mass determiners are limited in natural language.

From Chierchia's generalizations, and proposed semantic analysis, one can conclude that certain determiner classes are to never be expected in the world's languages. I refer to these gaps as Chierchia's Gaps, formulated in (3).

(3) **Chierchia's Gaps**

a. There is no determiner that exclusively selects singular and plural count nouns to the exclusion of mass ones.

b. There is no determiner that exclusively selects for singular-count and mass nouns to the exclusion of plural-count nouns.

The goal of this paper is twofold. First, at an empirical level, I show that while (3b) is an actual gap, (3a) is in fact not: there are determiners that occur with singular and plural count nouns,

but not mass (e.g. *which*). I will also contribute by arguing that Quantity Determiners (e.g. *much, little, many, few, more* etc.) form a natural class and that what has been purportedly labeled as a mass determiner is not accurate: *much/little* are the elsewhere forms used when plural is not available in the morpho-syntactic representation. Thus, Chierchia's (1998a) conclusion about the limited distribution of mass determiners is best formulated as universal gap: there is no mass-only determiner. Outside of the realm of determiners, from the description of the data, it will follow that number-marking, namely plural, need not entail that the expression is unequivocally count.

Second, at a theoretical level, I argue that the determiner facts are best explained by a syntactic approach: the determiner is sensitive to the feature composition of the noun phrase. Building on the idea that count and mass nouns are featurally, and representationally, distinct, I argue that the underlying terminal nodes (i.e. D) instantiated by determiners are classified into five natural classes based on the probing features that they bear. Under the assumption that these probing features must be valued by Agree (Chomsky 2000, 2001), the different natural classes of determiners follow from the features available on the extended projection of the noun. Similarly, the gaps in the determiner systems are concomitants of (i) singular count and mass nominals not sharing any features and (ii) there not being a mass-specific feature. Therefore, there is no probe that can exclusively enter a dependency with the classes of nouns in question. I conclude by showing how this account makes more desirable predictions than others, such as the semantic approach by Chierchia (1998a) and the syntactic approach by Cowper and Hall (2014b).

2 A brief note on the count/mass distinction and the countable/non-countable distinction

Determining whether a noun phrase belongs to the class of 'count' or 'mass' expressions depends on a series of distributional properties that the expression in question has. We can outline the (un)availability of some of these properties as the two following 'yes/no' questions (see Pelletier 1975; Krifka 1989; Gillon 1992, 1999, 2012; Chierchia 1998a, 2010; Borer 2005a; Bale and Gillon 2020; Doetjes 2021, among others):[1]

[1]These are not the only properties. See references in text for more.

(a) does the expression mark a contrast between singular and plural number?

Yes: count/ No: mass

(b) does the expression allow modification by cardinal numerals?

Yes: count/ No: mass

Having these properties, i.e. a positive answer, is taken as evidence for the expression being 'count' whereas lacking them, i.e. a negative answer, is taken as evidence for the expression being 'mass'. The examples in (4) illustrate each of these properties in turn for English.

(4) a. The { jewel/ jewel-s; mud/ *mud-s; *fume/ fume-s; jewelry/ *jewelrie-s }

b. One { jewel; *mud; *fume(s); *jewelry }, two { table-s; *mud-s; *fumes; *jewelrie-s }

There is a difference between expressions such as *jewel* and those such as *mud*, *fumes* or *jewelry*. Only the former mark a contrast between singular (e.g. unmarked) and plural (e.g. *-s*) and allow modification by cardinal numerals. Based on these contrasts, we can conclude that expressions like *jewel(s)* are count whereas expressions like *mud*, *fumes* and *jewelry* are mass.

Mass nouns do not conform a heterogenous class, though. For example, *mud*-type and *jewelry*-type mass nouns of cannot be plural-marked.[2] But *fumes*-type mass are obligatorily plural-marked, lack a non-plural counterpart, e.g. (4a), and trigger obligatory plural agreement DP-internally and externally as in (5).

(5) a. { *This/ These } fumes

b. These fumes { *was/ were } produced by mixing chemicals

I will refer to these as 'plural mass nouns', e.g. McCawley (1979); Ojeda (2005); Acquaviva

[2]Some mass nouns of the *mud*-type like *water* or *beer* may occasionally be number-marked. These expressions are no longer mass, and have instead 'shifted' into a count syntax (e.g. Pelletier 1975; Bunt 1985; Bach 1986b): *we ordered {a water/ two waters}*.

(2008).[3] It follows from these examples that plural-marking on the noun does not entail count properties, contrary to what is often proposed (Chierchia 1998a, 2010; Borer 2005a)

Relatedly, the count/mass distinction is tightly connected to the notion of countability, i.e. measurement in terms of cardinality. While being count entails being countable, e.g. via cardinal numerals among other measure expressions, being mass does not entail being non-countable. As Bale and Barner (2009) observed, the interpretation of mass nouns under comparatives may differ. This is shown in (6).

(6) a. Robin saw more mud than Frank did. #cardinality, volume

b. Robin saw more more fumes than Frank did.[4] #cardinality, volume

c. Robin saw more jewelry than Frank did. cardinality, #volume

d. Robin saw more jewels than Frank did. cardinality, #volume

As opposed to the mass nouns in (6a-b), *jewelry*-type nouns are in fact countable, e.g. (6c). They share this property with (plural) count nouns, as seen in (6d). I will use the term 'object mass' to refer to this type of noun.

The picture that emerges is therefore summarized in Table 1, which serves as an important reminder that the two notions count/mass and countable/non-countable are not perfectly aligned. I will call mass nouns of the *mud*-type, which are neither plural nor object, 'unmarked mass'.

Table 1: The count/mass and countable/non-countable distinction

	countable	**non-countable**
count	singular and plural	*
mass	object	unmarked and plural

Having set the baseline for the count/mass and the countable/non-countable distinction, we can now discuss how these types of nouns affect the distribution of determiners, first in English and then in Spanish.[5]

[3] Some other examples include *dregs, suds, brains, goods* or *valuables*.

[4] Imagine the following context: Frank saw two small blobs of fumes, and Robin saw one big blob of fumes.

[5] The English judgments come from 20 native speakers of American English, and the Spanish judgments come

3 Classes of determiners based on the count/mass distinction

3.1 The case of English

Determiners may fall into different categories depending on (i) whether the noun is count or mass and (ii), if the former, whether it is singular or plural-marked (e.g. Chierchia 1998a; Borer 2005a; Cowper and Hall 2014b). For instance, some determiners such as *a, every* and *each* are only compatible with singular count nouns: (7).

(7) Exclusively singular count determiners: {*A, Every, Each*}

a. {A/ Every/ Each} jewel.
b. * {A/ Every/ Each} jewel-s.
c. * {A/ Every/ Each} mud
d. * {A/ Every/ Each} jewelry
e. * {A/ Every/ Each} fume-s.

Other determiners such as *several* are only compatible with plural-marked count nouns: (8). Plural-marked mass nouns are ungrammatical with *several*, e.g. (8e).

(8) Exclusively Plural Count determiners: {*Several*}

a. * Several jewel.
b. Several jewel-s.
c. * Several mud.
d. * Several jewelry.
e. * Several fume-s.

A third category of determiners includes those that occur with count nouns, both singular and plural-marked, but do not occur with mass nouns. In English, this group is limited to *wh*-determiner *which*, as illustrated in (9).[6]

from 20 native speakers of Peninsular Spanish.

[6]The distribution of *which* parallels *one*-substitution, a phenomenon which is also exclusive to (singular/plural) count nouns (e.g. Bloomfield 1933; Harley 2005; Payne et al. 2013; Bale and Gillon 2020).

(i) I talked about the brown { jewel/ jewel-s } and you talked about the black { one/ one-s }.

(ii) * I talked about the brown { mud/ fumes/ jewelry} and you talked about the black { one/ ones/ one }.

(9) a. Which { jewel/ jewel-s } are you talking about? (SG/PL-CT)

b. * Which { mud/ fume-s/ jewelry } are you talking about? (mass)

The difference in acceptability between (9a) and (9b) is due to the nouns being count in the former, but mass in the latter. In this regard, *which* differs from *wh*-determiner *what*, as illustrated in (10).[7] The observed contrasts between *which* and *what* cannot be reduced to the presence or absence of overt agreement on the determiner since the surface form of the determiner remains invariant in both cases. Therefore, *what* is unrestricted to the count/mass distinction.

(10) What {jewel(-s)/ mud/ fumes/ jewelry} are you talking about?

In addition to these three categories, the example above is indicative of a fourth one: determiners that are unrestricted, i.e. compatible with both mass and count nouns. Empirically, we should distinguish two types of said determiners based on their surface forms: determiners that are non-plural and those that are plural-marked.[8]

Non-plural determiners come into two guises. The first one is invariant non-plural determiners, i.e. the determiner has the same surface form across the count/mass paradigm regardless of number marking on the noun. This includes interrogative *what*, the definite article *the* and indefinites *no, some* and *any*: (11).

(11) Unrestricted determiners: non-plural invariant, e.g. {*The, Some, No, Any*}

a. { The/ Some } jewel.

b. { The/ Some } jewel-s.

c. { The/ Some } mud

d. { The/ Some } jewelry

e. { The/ Some } fume-s.

[7]The ungrammaticality of *which* with mass nouns is also found in relative clauses:

(iii) a. I saw the { mud/ fumes/ jewelry } (*which) you told me about.

b. I saw the { jewel/ jewel-s } (which) you told me about.

[8]What I mean by 'non-plural' is no plural agreement marker on the determiner.

The second type of non-plural determiner has a corresponding plural-marked allomorph: their non-plural form is restricted to contexts where plural is absent. These are the demonstratives: *these/those*+N_{PL}, *this/that* elsewhere. As illustrated in (12), neither the non-plural forms are restricted to singular count nouns, nor the plural-marked forms are restricted to plural count nouns.

(12) Unrestricted determiners: non-plural and plural-marked allomorphs, e.g. {*This/These*}

a. { This/ *These } jewel.
b. { *This/ These } jewel-s.
c. { This/ *These } mud
d. { This/ *These } jewelry
e. { *This/ These } fume-s.

The last attested category includes those determiners that are only compatible with plural count nouns and mass nouns, to the exclusion of singular count nouns. This category includes the universal *all* and the class of Quantity Determiners (QDs) in their positive, comparative and superlative forms such as *much/little, many/few, more/less/fewer* and *most/least/fewest*. The relevant examples are given in (13), excluding plural mass nouns for the moment.[9]

(13) Non-Singular determiners: {*all*, QDs}

a. * { All/ Much/ Many/ More } jewel.
b. { All/ *Much/ Many/ More } jewel-s.
c. { All/ Much/ *Many/ More } mud.
d. { All/ Much/ *Many/ More } jewelry.

As illustrated in (13a), none of the mentioned determiners is acceptable with singular count nouns. However, when the noun is count and plural-marked as in (13b) or mass as in (13c)-(13d), said determiners are acceptable. Focusing on the subclass of QDs, in particular their positive forms (e.g. *much* and *many*), there is a noticeable pattern depending on the presence or absence of plural marking on the noun: *many* is unacceptable when the noun is not plural-marked; *much* is acceptable elsewhere.

The English empirical landscape gets a bit more complicated once we consider plural mass nouns and the positive form of QDs, where variation in the choice of QD has been reported. For

[9]The same applies to *little/less/least few/fewer/fewest*.

instance, Solt (2009) reports that some speakers only accept the unmarked form of the QD, e.g. *much*. On the contrary, Smith (2021, ch.8) reports a corpus search showing that (i) few tokens with a plural mass noun accompanied by a QD were found, and (ii) of those tokens found, the QD was generally *many*. My own elicitations with native English speakers confirm this variation, as shown in (14).[10]

(14) {All/ %Much/ %Many/ More} fume-s.

Some speakers only accept *many* and some only accept *much* when the noun is both mass and plural-marked. Importantly, this variation with plural mass nouns only affects the surface form of the QD. It does not affect the interpretation, which remains non-countable. That is, speakers who accept *many fumes* and those who accept *much fumes* both understand the expressions to mean 'the volume of fumes is larger than some degree'.

At this point, it is worth explaining why I have not considered separating *much/little* from the rest of the QDs. After all, it has been proposed that these form their own category: only acceptable with mass nouns. Under this view, *many/few* belong to category of exclusively plural count determiners (e.g. Chierchia 1998a; Borer 2005a; Solt 2009, 2015). Consequently, *more, most* would comprise an even different category altogether: non-singular determiners, like *all*.

However, despite this empirical state of affairs being purportedly true, it fails to capture important empirical generalizations, some of which have been established independently of the count/mass distinction. For example, it has been argued that the surface forms of QDs are morpho-syntactically related, e.g. Bobaljik (2012); Dunbar and Wellwood (2016); Smith (2021); Cleani and Toquero-Pérez (2022). Thus, separating the QDs into three independent groups based solely on their surface form misses this underlying connection between them.

In addition, claiming that the *much/little* sequence exclusively selects for mass nouns is not empirically accurate either. The distribution of these surface forms is not restricted to mass nouns. For instance, in cases of imperfective telic predicates like (15a), which in fact have been argued to

[10] Variation does not seem to correlate with geographical variety or other factors such as age, though younger adults (under 40) seem to slightly prefer *many*.

roughly correlate with plural count nouns (Mourelatos 1978; Bach 1986a; Krifka 1989; Borer 2005b; van Geenhoven 2005; Wellwood et al. 2012), only *much/little* are acceptable. Note also that the comparative form of the QD has the same distribution as *much* in this context.

(15) a. Barney ran to the store {in/ *for} one hour.

b. Barney ran to the store as {much/ little/ *many/ *few} as Bill did.

c. Barney ran to the store in the past hour more than Bill did.

In addition, it is *much* and never *many* that surfaces in cases of adjetival ellipsis (e.g. Corver 1997), as in (16). As before, *more* is also grammatical in this context as well, which casts further suspicion on *much* being separate from other QDs.

(16) a. Barney is persistent; in fact, he is too { much/ *many } so.

b. Mary is not too persistent; in fact, she is very { little/ *few } so.

c. Of all persistent people, nobody is more so than Barney.

Taken together, the facts in (15) and (16) question (i) the exclusive mass nature of *much/little* and (ii) their separation from other QDs such as *many* or *more*.

Last but not least, separating *much/little* from the *many/few* misses the reported variation with plural mass nouns and an important language-internal generalization: the strong correlation between the surface form *many/few* and plural-marking.

3.2 The case of Spanish

We can extend these categories of determiners to other languages that have a count/mass distinction. For example in Spanish, nouns like *mueble* 'furniture piece' are count because they show singular/plural contrasts and can be modified by cardinal numerals as in (17).

(17) a. el mueble, lo-s mueble-s
the.M furniture.CT, the.M-PL furniture.CT-PL
'the furniture piece, the furniture pieces'

b. un mueble, dos mueble-s
one.M furniture.CT, two furniture.CT-PL
'one furniture piece, two furniture pieces'

Other nouns such as *barro* 'mud', *mobiliario* 'furniture' and *víveres* 'provisions' lack them, and are thus mass (e.g. unmarked mass, object mass and plural mass, respectively): (18).

(18) a. el { barro/ mobiliario/ *vívere}
the.M mud furniture provision
'the {mud/ furniture/ provision}'

lo-s { *barro-s/ *mobiliario-s/ vívere-s}
the.M-PL mud-PL/ furniture-PL/ provision-PL
'the {muds/ furnitures/ provisions}'

b. * un { barro/ mobiliario/ vívere(-s)}
one.M mud furniture provision-PL
'one {mud/ furniture/ provision(s)}'

* dos { barro(-s)/ mobiliario(-s)/ vívere-s}
two mud-PL/ furniture-PL/ provision-PL
'two {mud(s)/ furniture(s)/ provisions}'

With respect to the countable/non-countable distinction, Spanish behaves like English. Count nouns and object mass nouns are countable, unmarked and plural mass nouns are non-countable. This is shown in (19).[11]

(19) a. El camión rojo lleva más barro que el azul. #cardinality, volume
the truck red carries more mud than the blue.
'The red truck carries more mud than the blue one does'

b. El camión rojo lleva más vívere-s que el azul. #cardinality, volume
the truck red carries more provision-PL than the blue.
'The red truck carries more provisions than the blue one does'

[11] A possible context for (19b) is the following: the Spanish government and the US government both sent provisions to an affected town: the former sent a red truck with 60 kilos of provisions contained in 6 boxes; the latter sent a blue truck with 30 kilos contained in 10 boxes. If the relevant intended dimension of measurement was cardinality, as in the case of countable nouns, the sentence in (19b) would not be interpreted as true in said context.

c. El camión rojo lleva más mueble-s que el azul. cardinality, #volume
the truck red carries more furniture.CT-PL than the blue.
'The red truck carries more furniture pieces than the blue one does'

d. El camión rojo lleva más mobiliario que el azul. cardinality, #volume
the truck red carries more furniture than the blue.
'The red truck carries more furniture than the blue one does'

Determiners in Spanish are also sensitive to the noun being count and the number properties of the noun in question (Bosque 1999, ch.1). We can identify the same five categories of determiners that we did for English. Some determiners such as *cada* 'each' and *cualquier* 'any' belong to the exclusively singular count category: (20).[12] Others like *vari-o/a-s* 'several-M/F-PL' are only grammatical with plural count nouns: (21).

(20) Exclusively Singular Count determiners: *cada* 'each' *cualquier* 'any'.

a. { cada/ cualquier} mueble
each/ any furniture.CT
' {each/ any} furniture piece '

b. * { cada/ cualquier} mueble-s
each/ any furniture.CT-PL
' {each/ any} furniture pieces'

c. * { cada/ cualquier} barro
each/ any mud
' {each/ any} mud.'

d. * { cada/ cualquier} mobiliario
each/ any furniture
' {each/ any} furniture.'

e. * { cada/ cualquier} vívere-s
each/ any provision-PL
' {each/ any} provisions.'

(21) Exclusively plural count determiners: *vari-o/a-s* 'several-M/F-PL'

a. * vario-s mueble
several.M-PL furniture.CT
'Several furniture piece '

b. vario-s mueble-s
several.M-PL furniture.CT-PL
'Several furniture pieces'

c. * vario-s barro
several.M-PL mud
' Several mud.'

d. * vario-s mobiliario
several.M-PL furniture
'Several furniture.'

[12] *Cada* and *cualquier* do not inflect for gender. *Cualquier* should be understood as free choice *any*.

e. * vario-s vívere-s
several.M-PL provision-PL
'Several provisions.'

Count-only determiners are widely attested in Spanish. This category of determiners is comprised of existential indefinites such as *algún* 'some', *un* 'a', *ningún* 'no' and universal *todo* 'every'.[13] Some examples are in (22).[14,15]

(22) a. Algún/ Ningún/ Todo { mueble/ *barro/ *mobiliario } estaba en el
some.M.SG/ no.M.SG/ every.M.SG furniture.CT mud furniture was on the
suelo
floor
Lit.: 'Some/ No/ every {furniture piece/ *mud/ *furniture} was on the floor'
Int.:'A/ Not a single/ Every { furniture piece/ *mud/ *furniture} was on the floor'
(✓SG-count, *unmarked & *object mass)

b. Alguno-s/ Ninguno-s/ Todo-s { mueble-s/ *vívere-s } estaban en el
some.M-PL/ no.M-PL/ every.M-PL furniture.CT-PL provision-PL were on the
suelo
floor
Lit. ' Some/ No/ Every {furniture pieces/ *provisions} were on the floor'
Int. 'A few/ Not a single one of the/ Every single one of the {furniture pieces/
*provisions} were on the floor' (✓PL-count, *plural mass)

From (22), we can conclude that (i) not a single one of these determiners is acceptable with mass nouns and (ii) the differences in number marking on the determiner indicate whether the count noun is singular or plural.

[13]Postverbal *ningún* is a negative concord item subject to matrix negation (Bosque 1980; Vallduví 1994).

[14]Given that in English *a* is Exclusively Singular Count and *some* is unrestricted, translations of Spanish determiners *algún/un* will reflect their most idiomatic interpretation: 'a' when the noun is singular count, and 'a few' when it is plural count. In the singular, *todo* is best interpreted as 'every X' and *ningún* as 'not a single X'; for their plural variants, I will use a partitive expression '{every/not a} single one of the Xs'.

[15]For subtle semantic differences between *algún* and *un*, see Gutiérrez-Rexach (2001); Martí (2008, 2015); Alonso-Ovalle and Menéndez-Benito (2010, 2011).

In addition to the determiners in (22), Spanish *wh*-determiner *cuál* 'which' is sensitive to the count/mass distinction. Compare *cuál* in (23) with *wh*-determiner *qué* 'what' in (24). The latter, as we observed for English as well, is unrestricted.

(23) De lo que visteis 'of what you saw'

a. a cuál { mueble/ *barro/ *mobiliario } os referís?
DOM which.SG furniture.CT mud furniture CL.1PL refer.2PL
'Which {furniture piece/ mud/ furniture} are you referring to?'

b. a cuále-s { mueble-s/ *vívere-s } os referís?
DOM which-PL furniture.CT provision-PL CL.1PL refer.2PL
'Which {furniture pieces/ provisions} are you referring to?'

(24) a qué { mueble(-s)/ barro/ mobiliario/ vívere-s } os referís?
DOM what furniture.CT-PL mud furniture provision-PL CL.1PL refer.2PL
'What {furniture piece(s)/ mud/ furniture/ provisions} are you referring to?'

Determiners like the one in example (24) are unrestricted to the count/mass distinction. We should also distinguish between non-plural and plural-marked determiners within the unrestricted category. As before, there are non-plural invariant determiners, i.e. they appear across the board such as *qué*, and non-plural determiners that have a plural allomorph. The latter include definite articles and demonstratives. These non-plural allomorphs are limited to those environments where plural is absent. This is shown (25) with the masculine forms.

(25) Unrestricted determiners: demonstratives and definite article

a. { el/ este} mueble
the.M this.M furniture.CT
'{The/ This} furniture piece '

b. { lo-s/ esto-s} mueble-s
the.M-PL this.M-PL furniture.CT-PL
'{The/ These} furniture pieces'

c. { el/ este} barro
the.M this.M mud
' {The/ This} mud.'

d. { el/ este} mobiliario
the.M this.M furniture
'{The/ This} furniture.'

e. { lo-s/ esto-s} vívere-s
the.M-PL this.M-PL provision-PL
'{The/ These} provisions.'

Last but not least, QDs can occur with plural count nouns and all types of mass nouns, e.g. (26b-e). Singular count nouns, however, are not possible with these determiners, e.g. (26a).

(26) Non-Singular determiners: QDs (e.g. *mucho* 'much', *tanto* 'as/so much', *más* 'more')

a. * { mucho(-s)/ más} mueble
much.M-PL more furniture.CT
'{Much/ Many/ More} furniture piece'

b. { *mucho / mucho-s/ más} mueble-s
much.M much.M-PL more furniture.CT-PL
'{Much/ Many/ More} furniture pieces'

c. { Mucho/ *Mucho-s/ Más} barro
much.M much.M-PL more mud
'{Much/ Many/ More} mud.'

d. { Mucho/ *Mucho-s/ Más} mobiliario
much.M much.M-PL more furniture
'{Much/ Many/ More} furniture.'

e. { *Mucho / Mucho-s/ Más} vívere-s
much.M much.M-PL more provision-PL
'{Much/ Many/ More} provisions.'

While the comparative form of the QD, e.g. *más* 'more', is invariant with respect to number (and gender) features, the positive form must agree with the noun. This is so for plural count nouns and plural mass nouns. In this regard, Spanish slightly differs from English, where we observed some variation between surface forms *much* and *many*.[16]

[16]The same is also observed with *tanto(-s)* 'as/so much' and the interrogative counterpart *cuánto(-s)* 'how much':

(iv) a. tanto { barro/ mobiliario/ *vívere-s}, cuánto { barro/ mobiliario/ *vívere-s}
as.much.M mud furniture provision-PL how.much.M mud furniture provision-PL
Lit. 'as much {mud/ furniture/ *provisions}, how much {mud/ furniture/ *provisions}'

b. tanto-s { *barro/ *mobiliario/ vívere-s}, cuánto-s { *barro/ *mobiliario/ vívere-s}
as.much.M-PL mud furniture provision-PL how.much.M-PL mud furniture provision-PL
Lit. 'as many { *mud/ *furniture/ provisions}, how many { *mud/ *furniture/ provisions}'

4 Where do we stand?

The data presented so far has served to classify determiners into five empirically different categories depending on factors such as the type of noun (e.g. count/mass) and number-marking (e.g. singular, plural, unmarked). The findings are summarized in Table 2.[17]

Table 2: Categories of determiners based on the count/mass distinction

Category of Determiner	**Mass**			**Count**		**Selected examples**	
	Ø	PL	Object	SG	PL	English	Spanish
Exclusively SG-CT	*	*	*	✓	*	*each, every*	*cada, cualquier*
Exclusively PL-CT	*	*	*	*	✓	*several*	*varios*
CT-only	*	*	*	✓	✓	*which*	*todo(s), algún(os)*
Unrestricted	✓	✓	✓	✓	✓		
i. *non-plural: invariant*						*the, some, what*	*qué*
unmarked						*this, that*	*el, este*
ii. *plural-marked*						*these, those*	*los, estos*
Non-SG	✓	✓	✓	*	✓		
i. *non-plural: invariant*						*all, more*	*más*
unmarked						*much*	*mucho*
ii. *plural-marked*						*many*	*muchos*

Each category in Table 2 can be thought of as a descriptive natural class based on the distributional properties of the determiners, regardless of their surface realization. Establishing these descriptively adequate categories is the first step towards understanding the abstract representational properties that terminal nodes of type D(ETERMINER) have in common. At a formal level, the question is to uncover the underlying and abstract syntactic properties of Ds instantiated by each of these categories. From now on, I will be use the following labels: 'D' to refer to the abstract syntactic terminal DETERMINER; the lower case 'determiner' to refer to the surface realizations of D; 'category' to refer to the five descriptively different groups of determiners identified; and, Class for the abstract and model-theoretic natural classes of Ds.

The first three categories of determiners in Table 2 share the fact that the noun they occur

[17] SG = 'singular number-marking'; PL = 'plural number-marking'; CT = 'count'; Ø = unmarked for any number.

with must be count. They differ slightly with respect to the number-marking on the noun. Determiners that belong to the Exclusively SG-CT and the Exclusively PL-CT categories are the most discriminative: the former only occur with count nouns that are singular and the latter with count nouns that are plural; but determiners in the CT-only category are compatible with either count noun. Determiners in these categories may still be overtly marked plural if the relevant count noun is marked plural (e.g. Spanish).

Apart from these three, determiners in the Unrestricted category occur with any type of noun, regardless of the count/mass distinction. The determiners in this category may be further identified by the variation, or lack-thereof, in their surface form: non-plural and plural-marked. The former can either be invariant or the unmarked allomorph of a plural-marked counterpart.

Last but not least, determiners in the Non-SG category only discriminate singular count nouns. Within this category, we can also distinguish non-plural from plural-marked determiners. As before, the surface forms of the former may be invariant (e.g. *all* and comparative and superlative forms in English and Spanish), or the unmarked allomorph of a plural-marked counterpart (e.g. *much, mucho* vs. *many, muchos*).

Based on these categories, we can extract a series of generalizations regarding the underlying properties of the D terminal nodes.

(27) a. If D is sensitive to the noun being count, it will also be sensitive to number-marking.

b. If D is sensitive to plural-marking on the noun, it need not be sensitive to the noun being count.

c. If D occurs with mass nouns, it will also occur with count nouns.

(27a) captures the fact that some determiners track both the noun being count and it being number-marked (e.g. Exclusively SG-CT, Exclusively PL-CT and CT-only determiners). Besides, (27b) appropriately describes that the previous generalization is not a bidirectional relation. There are determiners that show sensitivity to plural but not necessarily to being count: Unresticted determiners (e.g. demonstratives and definite determiners in Spanish) as well as Non-SG determiners (e.g. QDs). This observation is related to the fact that plural count nouns are just a subset of

pluralizable nouns. From this, we can conclude (28), which goes against what is often presupposed (e.g. Chierchia 1998a, 2010; Borer 2005a).[18] Last but not least, (27c) is consistent with the observation that every determiner that occurs with mass nouns (of any type), i.e. Unresticted and Non-SG determiners, also occurs with count nouns, but not viceversa.

(28) ***The PL-marking generalization***

Plural-marking on the noun need not entail count and countable properties.

Relatedly, we can also concentrate on the classes of (count and mass) nouns identified, their relation to number-marking and the surface form of QDs. This is summarized in Table 3.

Table 3: Number marking and choice of QD by noun type in English and Spanish

	Langs.	**Agreement**		**QD form**	
Type of N		**singular**	**plural**	**Unmarked** (*much/mucho*)	**Marked** (*many/muchos*)
Ø Mass	*English*	✓	*	✓	*
	Spanish	✓	*	✓	*
Object Mass	*English*	✓	*	✓	*
	Spanish	✓	*	✓	*
PL Mass	*English*	*	✓	%	%
	Spanish	*	✓	*	✓
PL Count	*English*	*	✓	*	✓
	Spanish	*	✓	*	✓

Looking at Table 3, there seems to be a very strong correlation between plural-marking as instantiated on the noun, plural agreement on the verb or DP-internally, and the surface form of the QD. I summarize this descriptive generalization in (29).

(29) ***The QD-markedness Generalization***

The (plural-)marked forms of QDs (e.g. *many, few, muchos* etc.) are restricted to contexts in which the expression (e.g. the noun) is marked plural.

[18]The semantic effect that pluralization has (i.e. sum formation or grouping) needs to be separated from whatever grammatical mechanism is responsible for individuation, i.e. the introduction of discrete units that can be counted.

The generalization predicts that these marked forms are never permitted in non-plural environments. Thinking about *many* as the marked form and *much* as the elsewhere form is consistent with the hypothesis that the two QDs are different surface forms of the same underlying morpheme (e.g. Bobaljik 2012; Wellwood 2015; Dunbar and Wellwood 2016). Variation among English speakers can be thus indicative of the following: while inserting the marked vocabulary item is the default when the noun is plural-marked, failing to do so can be the result of Impoverishment (e.g. Bonet 1991, 2008; Arregi and Nevins 2007, 2012, 2013): a morphological rule deletes the relevant plural features before vocabulary insertion of the marked item. Variation can thus be reducible to the availability, or lack there-of, of such a rule.

Classifying determiners in this way is useful not only because we gain an understanding of the possible natural classes of Ds, but also because it sheds light on the ones that might be impossible. In this respect, the literature has identified the following Classes of Ds: Exclusively SG-CT, Exclusively PL-CT, Unrestricted and Non-SG (e.g. Doetjes 1997, 2021; Chierchia 1998a, 2010; Borer 2005a; Bale 2016). In fact, the purported universal gaps in (3) repeated below had been established since Chierchia (1998a).

(3) **Chierchia's Gaps**

a. There is no determiner that exclusively selects singular and plural count nouns to the exclusion of mass ones.

b. There is no determiner that exclusively selects for singular-count and mass nouns to the exclusion of plural-count nouns.

Against this background, the establishment of the CT-only category is a novel empirical contribution. The relevance of this contribution is not only its novelty, but more importantly the fact that it uncovers the prospect of Class of D that was purported to be a universal gap in natural language, e.g. (3a). Therefore, this category calls for a revision of the gaps in (3).

The data, however, continue to support (3b) as a gap in natural languages. What this can mean analytically is that mass nouns and singular count nouns have no exclusive properties (e.g.

a feature, pieces of structure) in common; and as a result, there is no D that can select both. In addition, speaking of both mass nouns and gaps, there seems to be no dedicated mass D. All this said, we can conclude that the actual gaps in the determiner systems are best stated as in (30).

(30) ***D-gaps***

a. There is no D that exclusively selects for singular-count and mass nouns to the exclusion of plural-count nouns. =(3b)

b. There is no D that exclusively selects for mass nouns.

In next section, I develop a proposal that captures the empirical generalizations formulated here and explains the D-gaps in (30).

5 Towards an analysis

I will propose an analysis based on the hypothesis that Ds are sensitive to the φ-features in the extended projection of the NP (i.e. xNP), as put forth by e.g. Chomsky (2000); Carstens (2000); Harbour (2007); Baker (2008b); Wiltschko (2009); Kramer (2010); Danon (2011). To pursue that line of reasoning, I propose that count and (the different types of) mass nouns differ in their underlying syntax. These syntactic differences in the structural and/or featural composition of NPs are reflected in the D-systems of natural languages.

I will be representing syntactic features as monovalent. Monovalency in feature values is not to be equated with privativity (e.g. [F] ~ Ø). Underlying this assumption is the *reductiō ad discrīmen* hypothesis in (31) put forth by Cowper and Hall (2014a, 161):

(31) the ability to search for systematic contrast in the linguistic input, by correlating differences at various levels, is the only mechanism required to account for the abstract building blocks that make up those mental structures: the formal features of grammatical systems.

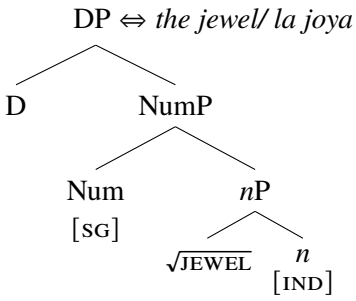
That is, determining the features – and values for said features – that a given language has is based on the contrasts that are available in the primary linguistic data. These contrasts are iden-

tified by various grammatical processes (e.g. agreement, selection, complementary/overlapping distributions, morphological exponence, etc.) in the data.

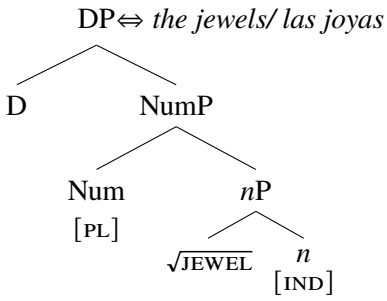
5.1 The basic pieces: count & mass nouns

Some of the hallmark properties of count nouns, as described in §1, include (i) countability, (ii) singular/plural contrasts and (iii) numeral modification. I propose that count nouns are marked for two features: [IND(IVIDUATION)] on the category *n* head and [SG/PL] on a Number head. The structure of a count nominal is in (32).[19]

(32) a. Singular count DP



b. Plural count DPs



The notion of 'inidividuation' as a syntactic property is not a novel idea, and has in fact been proposed to be encoded in different ways (e.g. Harley and Ritter 2002; Borer 2005a; Cowper and Hall 2009, 2012; Smith 2021). Here I am building on insights from Bale and Barner (2009) and Deal (2017), for who individuation happens at the 'lexical' level, which, within non-lexicalist approaches to morpho-syntax like Distributed Morphology (Halle and Marantz 1993), is as close to the root as possible; in this case, this is the categorizing head that the root adjoins to.[20] We can think of [IND] as a classificatory feature that, when applied to a root, makes said root countable, i.e. it introduces reference to atoms and sums of atoms. Therefore, markedness for [IND] entails

[19] I am not including gender features on the xNP. Nothing crucial hinges upon this decision. The representations relevant for Spanish could be easily enriched with a [GENDER] feature on *n* (Kramer 2015; Kučerová 2018).

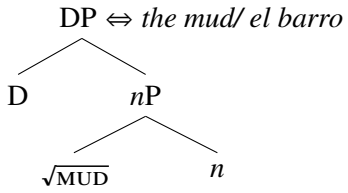
[20] For Bale and Barner (2009), there are two *n*s: one marked [COUNT] and the other unmarked. For Deal (2017) individuation is encoded via an abstract morpheme that is located between the root and Num terminals.

that the *n*P will be countable.[21]

In addition to this feature, and following Ritter (1991); Alexiadou (2004); Cowper (2005) among others, there is a Num(ber) head that hosts [SG/PL] features. Though [SG] is syntactically active, it is generally not mapped to a phonological exponent (e.g. Noyer 1992); [PL], however, is generally mapped to some exponent, and thus morphologically marked. Semantically, [SG] restricts the denotation of the noun to singularities and [PL] to pluralities, i.e. the sums, e.g. (Krifka 1989; Chierchia 1998a; Harbour 2007). Num, with these two features, is responsible for the availability of singular/plural contrasts as well as for enabling numeral modification. On the latter see e.g.Ritter (1991); Borer (2005a); Pancheva (2022, 2023); Toquero-Pérez (2023).[22]

With respect to mass nouns, I propose that the reason why mass nouns form a natural class is because of the absence of the Number projection (Borer 2005a; Harbour 2009; Mathieu and Dali 2021, for a similar idea). Given what was said above about the role of NumP, the unavailability of singular/plural contrasts and numeral modification follow from the absence of NumP. The structure of unmarked mass nouns like *the mud/ el barro* is in (33).

(33) Unmarked mass DP

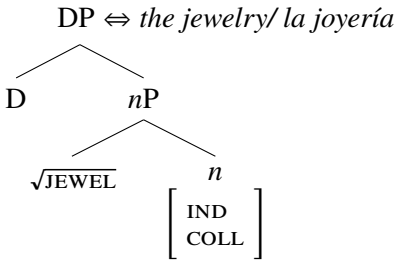


[21] Harley and Ritter (2002) propose a feature geometric account according to which INDIVIDUATION is the dominating number feature: [INDIVIDUATION] → {[MINIMAL]/ [GROUP]}. They describe the contribution of this feature as sorting "entities in the world according to their discourse independent properties, that is their quantity and class" (p.). This notion of [INDIVIDUATION], i.e. a classificatory feature that sorts the noun or expression into things that can be counted, is very much aligned with what I am proposing in the main text, and with the formalization in Bale and Barner (2009) and Deal (2017). [SG] and [PL], what Harley and Ritter (2002) call [MINIMAL] and [GROUP], are then dependents of [INDIVIDUATION]. Given that there are plural-marked nouns that are not necessarily countable or 'individuated', I have decided not commit to such a feature geometric relation.

[22] Whether numerals are introduced in the specifier of NumP or as the specifier of their own functional head is orthogonal for our purposes. See Scontras (2013, 2022); Pancheva (2022, 2023); Toquero-Pérez (2023) for the latter.

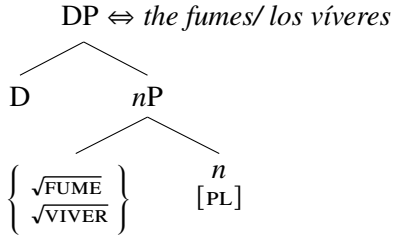
While the absence of NumP is what makes mass nouns a natural class, these nouns may differ in their featural make-up, leading to the distinct subtypes of mass nouns we identified. Object mass nouns, like count nouns, are countable, and thus must be marked for [IND]. In addition to [IND]-marking, and following De Belder (2013); Alexiadou (2015), I assume they are also marked for a feature called [COLL(ECTIVE)]. This feature is then spelled out as *-ery, -age, -ware* etc. in English, and as *-ería, -mento, -aje* etc. in Spanish.[23] Object mass nouns are represented in (34).

(34) Object mass DP



Regarding plural mass nouns, I take the source of plural-marking to be the *n* that the root adjoins to. That is, plural-marking is distributed in the xNP and these mass nouns are instantiations of 'low' or 'lexical' plurals, as proposed by Alexiadou (2004, 2011); Wiltschko (2008); Acquaviva (2008); Kramer (2016); Kouneli (2019). The representation of plural mass nouns is in (35).

(35) Plural mass DP



Support for the low position of [PL] with these nouns can be found in noun-noun compounds where only the head of the compound can be inflected for number. This restriction has been at-

[23] Object mass nouns and count nouns are morpho-syntactically related. The root morphemes that participate in the class of object mass NPs also participate in the class of count NPs giving rise to doublets (Toquero-Pérez 2024): *jewel* {*-ery* | *-s*}, *kitchen* {*-ware* | *-s*}. See also Cohen (2020) for Hebrew and French, and De Belder (2013) for Dutch. The [COLL] feature is overtly realized on determiners and numerals in languages like Czech, where it is different from [PL]-marking (Naughton 2005; Grimm and Docekal 2021; Toquero-Pérez 2024).

tributed to the fact that the non-head noun may be as large as an *n*P, but it does not include NumP (Wiltschko 2008; Harley 2009): (36)-(37).

(36) a. street dog(-s) b. *street-s dog(-s).

(37) a. perro(-s) policía b. *perro(-s) policía-s
dog -PL police dog -PL police-PL
'police dog(s)'

When the noun-noun compound has a plural mass noun as a non-head, plural-marking on the non-head survives: (38)-(39). This fact is predicted if [PL] on these plural mass nouns is not located on Number, but on *n*.

(38) a. fume-s filter(-s) b. *fume filter(-s)

(39) a. niño(-s) baba-s b. *niño(-s) baba
kid.M -PL drool-PL kid.M -PL drool
'drooling boy' (lit. 'drools boy', i.e. boy that has/does a lot of drooling)

This proposal for the count/mass distinction has a series of welcome consequences. First, we are able to explain the PL-marking generalization in (28). The source of plural may be low or high, and it is only in the latter case that it entails count and countable properties. Second, separating the roles of individuation and number-marking allows us to establish a natural class of countable nominal expressions, which differs from the natural class of plural-marked ones: (40).

(40) a. A noun *N* is in {Countable}, iff *N* is IND-marked.
{Countable} = {{count}, object mass}.

b. A noun *N* is in {Plural}, iff *N* is PL-marked.
{Plural} = {plural count, plural mass}

It thus follows that being count entails being countable but being mass does not entail being non-countable. In addition, the motivation to separate the two features calls into question analyses of plural as dependent on the individuation, whether for semantic reasons (e.g. Chierchia 1998a, 2010), syntactic reasons (e.g. Harley and Ritter 2002) or both (e.g. Borer 2005a).

5.2 Motivating the proposal: Ds, F(eatures) and Agree

Constituents in natural languages may show overt agreement with each other. For instance, in (41), the realization of person and number features on the verb are determined by the person and number features on the subject DP.

(41) a. The child { plays/ *play }. b. The children { *plays/ play }.

In order to capture the obligatoriness of this surface phenomenon, known as subject-verb agreement, the syntactic operation Agree has been proposed (Chomsky 2000, 2001). Agree defines a relation between two syntactic objects: a probe and a goal. Under the traditional modeling of the operation like that of Chomsky's, the probe consists of some unvalued (set of) features, which are uninterpretable [*u*F:_], and must receive a value [F] from another syntactic element, i.e. the goal. The probe initiates the search for a goal, restricts the criteria of said search (e.g. *uφ*, *u*Num, *u*Case etc.) and the domain of the search. In particular, in a sequence like (42), where P is a probe and G_1 and G_2 are potential goals, P will agree with the nearest one: G_1 is the nearest goal to P iff P c-commands G_1 and G_1 asymmetrically c-commands G_2.

(42) [P ... [G_1 ... [G_2]]]

X

Upon identifying a matching goal that meets the search criteria, the search is halted and the features on the matching goal are copied onto the probe, leading to the valuation of the probe's unvalued feature. Failure to provide a value for a *u*F will cause the derivation to crash.[24] This approach to Agree is schematized in (48).

(43) a. [α [*u*F:_] ... β [F]] $\xrightarrow[\text{probe valuation}]{\text{Agree}(\alpha,\beta)}$ [α [*u*F:F] ... β [F]]

b. [α [*u*F:_] ... β [G]] $\xrightarrow[\text{probe remains unvalued}]{\text{No Agree}(\alpha,\beta)}$ *[α [*u*F:_] ... β [G]]

[24] This approach of Agree as an infallible operation has been criticized by Preminger (2014).

Post-syntactically, once the relevant structure has been shipped off to PF, there are a series of morphological operations that can target the still hierarchically ordered structure (Halle and Marantz 1993; Embick and Noyer 2001; Embick 2007, 2010; Arregi and Nevins 2012). One of these operations is Vocabulary Insertion (VI) which maps terminal nodes (and their feature bundles) to some phonological content (i.e. the vocabulary item or exponent). The mapping from terminal node to phonological form is carried out via VI rules, which are sensitive to strict locality requirements and whose application is mediated by the Subset Principle (e.g. Halle 1997).

These VI rules have the format in (44), where α is the syntactic category of the terminal; [uF:$\underline{\text{F}}$] is the valued probe feature, F_n is an interpretable feature of α; X, to the right of the bidirectional arrow, represents the exponent; and the slash '/' indicates the context of application, which may be more or less specific (see Moskal 2015; Moskal and Smith 2016).

(44) $\alpha[u\text{F}:\underline{\text{F}}, \text{F}_n] \Leftrightarrow X(/\_\_\gamma)$ 'map the feature bundle on α to X (in the context of γ)'

Assuming this mechanics for Agree, the overt realization of grammatical properties such as person and number in verbs is straightforward: it depends on the set of probes that the verbal head (i.e. T) bears, the value that the relevant probes copy from the matching goal, and the VI rules that map those terminals to an exponent. In the case of (41a), this is illustrated in (45a).[25]

(45) a. $[_{\text{TP}}\ \text{T}_{[\text{PRES},\ u\varphi:\_]}\ [_{v\text{P}}\ \text{DP}_{[u\varphi:\ \underline{\text{SG}}]}\ [_{v'}v\ \sqrt{\text{PLAY}}\ ]]]$

b. T[PRES, $u\varphi$: $\underline{\text{SG}}$] $\Leftrightarrow$ /-*s*/ c. T[PRES] $\Leftrightarrow$ Ø

At the point of VI, there are two competing rules: the more specific one in (45b) and the elsewhere case in (45c). Given the Subset Principle, the VI rule in (45b) wins because it is specified for more features than the other eligible vocabulary items. T is thus realized as /-*s*/.

Lack of certain agreement distinctions across a paradigm does not entail that Agree has not occurred. There are many cases where the realization of features on a terminal node are not overt

[25] We can assume that third person is the underspecification for any person feature (e.g. Déchaine and Wiltschko 2002; Harley and Ritter 2002; Ackema and Neeleman 2018).

and yet that node must have participated in Agree. Take subject-verb agreement, again, in (46).

(46) a. {I/ you/ we/ they} play. b. * {I/ you/ we/ they} plays.

The syntax of these constructions is identical to (45a): T Agrees with a DP in Spec,*v*P. The difference must be in terms of exponence: the conditions for the rule in (45b) do not apply, and it is instead the elsewhere case in (45c) that is inserted, mapping T to a null exponent.

Determiners and nouns also display similar agreement patterns than those observed between DPs and verbs (e.g. Carstens 2000; Harbour 2007; Wiltschko 2009; Kramer 2010; Danon 2011). For example, in Spanish the gender property of the noun determines the choice of the determiner. Mismatched agreement between D and N results in an unacceptable string. This is shown in (47).

(47) a. { La/ *El } mujer list-a
the.F the.M woman.F smart-F
'The smart woman'

b. { *La/ El } hombre list-o
the.F the.M man.M smart-M
'The smart man'

Following the references cited above, we can analyze these cases in the same fashion as we did subject-verb agreement: as a result of Agree(D, NP). Consequently, the realization of φ-features (e.g. gender and number) in determiners depends on the set of probes that D bears, the copied value on the probes and the inventory of VI rules. For (47), this is illustrated in (48).

(48) a. [$D_{[\text{DEF, } u\text{GEN:\_}]}$ ... [$n_{[\text{MAS/FEM}]}$]] ⟶ [$D_{[\text{DEF, } u\text{GEN:}\underline{\text{MAS/FEM}}]}$ ... [$n_{[\text{MAS/FEM}]}$]]

b. D[DEF, *u*GEN:<u>FEM</u>] ⇔ *la* c. D[DEF, *u*GEN:<u>MAS</u>] ⇔ *el*

Building on insights from decompositional analyses of determiners such as Beghelli and Stowell (1997); Cowper and Hall (2014b, 2022); Espinal and Cyrino (2022) among others, I will be assuming that Ds can bear the interpretable features in Table 4.[26,27]

[26]The feature [DEM(ONSTRATIVE)] stands for what Cowper and Hall (2014b) call [SPECIFIC].

[27]One might wonder what the relevant contrasts available in the primarily linguistic input motivate [INDEF]. One said contrast is scope with respect to other operators, e.g. negation. NPs with non-definite determiners such as *algunos/unos* can take scope over negation, whereas non-definite bare NPs cannot (e.g. Carlson 1977; Wilkinson 1991;

Table 4: Inherent interpretable features on D heads

Feature	Meaning	Source
[DEF]	definite (referentially indexed in the discourse)	(Cowper and Hall 2014b)
[INDEF]	indefinite (existential not referentially indexed in the discourse)	
[DEM]	demonstrative (deictic specifying a particular location)	
[PROX]	proximal (near the point of attachment)	(Cowper and Hall 2022)
[DIST]	distal (situated away from the point of attachment)	(Cowper and Hall 2014b)
[UNIV]	universal (universal, not necessarily distributed)	(Beghelli and Stowell 1997)
[DISTR]	distributed (strongly distributed)	(Beghelli and Stowell 1997)
[GROUP REF]	group reference (existential denoting groups)	(Beghelli and Stowell 1997)
[WH]	*wh*-operator	(e.g. Chomsky 1977)
[DEG]	degree (introducing reference to degrees)	(e.g. Corver 1997)

Having established this, i.e. D probes are sensitive to the φ-features on the xNP and probe valuation is obligatory, my hypothesis regarding natural classes of determiners, is in (49). What counts as 'the same set' is defined in (50) – the definition of subset is from Bale and Reiss (2018).

(49) ***The D-Class hypothesis***

A natural class of determiners, i.e. D-Class, is characterized by D terminals that have the

McNally 2004; Martí 2008): (v).

(v) a. A la reunión no asistieron { alguno-s/ uno-s } profesore-s.
to the meeting NEG attended some-PL a-PL teacher-PL
'The meeting was not attended by some teachers'

¬ > ∃: it is not the case that any teachers attended the meeting'

∃ > ¬: there are some teachers that didn't attend the meeting'

b. A la reunión no asistieron profesores.
to the meeting NEG attended teacher.PL
'The meeting was not attended by teachers'

¬ > ∃: it is not the case that any teachers attended the meeting'

*∃ > ¬: there are some teachers that didn't attend the meeting'

The contrasts can be explained if the scope-taking DPs are marked for [INDEF], while non scope-taking DPs are truly unmarked for any (in)definiteness feature. Further evidence supporting the fact that true indefinites, i.e. [INDEF]-marked elements, are subject to certain syntactic properties such as movement, scope or clitic left dislocation, is found in e.g. Fodor and Sag (1982); Reinhart (1997); Kratzer (1998); Arregi (2003); Espinal and Cyrino (2022).

same set of probes.

(50) If X is a set of probes on a terminal node TN_α, and Y is a a set of probes on a terminal node TN_ω, TN_α and TN_ω have the same set of probes iff $X = Y$
$X = Y$ iff $X \subseteq Y$ and $Y \subseteq X$ (i.e. there is no $x \in X$ such that $x \notin Y$ and there is no $y \in Y$ such that $y \notin X$)

Given the definition in (50), two terminal nodes will count as having the same set of probes if the sets are identical: every probe in TN_α is also in TN_β, and viceversa. For instance, if there are three sets of probes, e.g. P_1 ={*u*F, *u*G}, P_2 ={*u*F, *u*G}, and P_3 ={*u*F, *u*G, *u*H}, P_1 and P_2 are identical, but P_3 is not. Identity in set membership also includes the empty set: if $P = \{\}$, and $P' = \{\}$, then there are no members of P that that are not in P' and viceversa. A D-Class is then a set such that for every D in it, D has $\{u\text{F}_1 ... u\text{F}_n\}$. Given the featural approach to the count/mass distinction sketched, we expect D-Classes to reflect those underlying differences.

In what follows, I draw on the distributional properties of the categories of determiners that I have identified to argue for the need of five distinct D-Classes. I show how the hypothesis in (49), paired with the proposal for the count/mass distinction, explains D-Classes and the gaps in (30).

6 D-Classes for the different categories of determiners

6.1 Exclusively SG/PL-CT and CT-only determiners

Some Ds seem to require a common property: the noun must be count. In the proposal advanced here, being count translates as markedness for [IND] and Number. The difference between these Ds, however, reflects the differences in Number-markedness on the count noun: SG, PL or any Number feature. I propose that these D-Classes have the set of probing features in (51).

(51) a. D-Class 1
$$\text{D}\left[\begin{array}{l} u\text{IND:\_} \\ u\text{SG:\_} \end{array}\right]$$

b. D-Class 2
$$\text{D}\left[\begin{array}{l} u\text{IND:\_} \\ u\text{PL:\_} \end{array}\right]$$

c. D-Class 3
$$\text{D}\left[\begin{array}{l} u\text{IND:\_} \\ u\text{Num:\_} \end{array}\right]$$

The commonalities across (51) stem from the fact that all three Ds in Class 1, 2 and 3 share a subset of probes: *u*IND. This feature already eliminates the possibility of Ds from occurring with unmarked and plural-marked mass nouns. Despite this commonality, the Ds in each class in (51) differ with respect to the granularity of the number probing feature that they bear.

The probes in D-Class 1 and D-Class 2 are relativized to a certain number feature: *u*SG and *u*PL respectively. However, Ds in D-Class 3 have a general *u*Num probe allowing them to occur with both singular and plural-marked count nouns. These probes will then search for a matching goal in their c-command domain. The relevant Agree dependencies are illustrated in (52), where thick lines indicate search and match, and dashed lines indicate the copying of values.

(52) a. $[_{DP}\ D_{[\ u\text{IND}:\_\ ;\ u\text{SG}:\_\ ]}\ [_{NumP}\ Num_{[SG]}\ [\ n_{[IND]}\ \sqrt{}\ ]]]$ ⇔ *each book, cada libro*

b. $[_{DP}\ D_{[\ u\text{IND}:\_\ ;\ u\text{PL}:\_\ ]}\ [_{NumP}\ Num_{[PL]}\ [\ n_{[IND]}\ \sqrt{}\ ]]]$ ⇔ *several books, varios libros*

c. $[_{DP}\ D_{[\ u\text{IND}:\_\ ;\ u\text{Num}:\_\ ]}\ [_{NumP}\ Num_{[SG/PL]}\ [\ n_{[IND]}\ \sqrt{}\ ]]]$ ⇔ *which book(s), cuál(es) libro(s)*

In all three cases, the Agree operation proceeds satisfactorily: each probe is able to find a matching goal and copy its features leading to a successful valuation.

This system also explains why certain D+NP_{count} sequences, such as **each books* or **several book*, are unacceptable. Merger of a D from D-Class 1 with a plural count noun will yield a syntactic violation, and so will merger of a D from D-Class 2 with a singular count noun. This is schematically represented in (53).

(53) a. * $[_{DP}\ D_{[\ u\text{IND}:\ \underline{val}\ ;\ u\text{SG}:\_\ ]}\ [_{NumP}\ Num_{[PL]}\ [\ n_{[IND]}\ \sqrt{}\ ]]]$ (*D-Class 1+$NP_{[PL]}$)

b. * $[_{DP}\ D_{[\ u\text{IND}:\ \underline{val}\ ;\ u\text{PL}:\_\ ]}\ [_{NumP}\ Num_{[SG]}\ [\ n_{[IND]}\ \sqrt{}\ ]]]$ (*D-Class 2+$NP_{[SG]}$)

While the *u*IND probe is able to find a goal in its c-command domain providing a matching value – both in (53a) and (53b) – neither the *u*SG probe in (53a) nor the *u*PL probe in (53b) can, which leaves them unvalued. Given our definition of Agree as a fallible operation, failure to value a probing feature leads to a derivational crash. The ungrammaticality of said expressions results from the *u*SG/PL probe's failure to establish an Agree-dependency.

Consequently, D-Class 1 is instantiated by Exclusively SG-CT determiners, D-Class 2 by Exclusively PL-CT determiners, and D-Class 3 by ct-only determiners. Before proceeding with the VI rules that generate the relevant vocabulary items for every member from each D-Class, iwe must consider the paradigms of English and Spanish CT-only determiners. These are given in Table 5 and Table 6 for each language respectively.

Table 5: Paradigm of English CT-only determiners

SG-marked N	**PL-marked N**
which	

Table 6: (Masculine) Paradigm of Spanish CT-only determiners

SG-marked N	**PL-marked N**
todo	*todos*
cuál	*cuales*
algún	*algunos*
un	*unos*
ningún	*ningunos*

Despite [PL] being generally mapped to an exponent, as opposed to [SG] (e.g. Nevins 2011; Bale et al. 2011; Toquero-Pérez 2025), [PL] is not overtly marked in English *which*. This leads to the syncretism observed in Table 5. On the contrary, plural is always overtly marked in Spanish, and there is no syncretism.

The invariance in surface forms in English, and the differences with Spanish, cannot be due to the underlying syntax of these terminals: in both languages, these determiners instantiate D-Class 3, and thus bear a *u*Num probe that must be valued via Agree. Instead, we can take the syncretic

forms to be the result of Impoverishment: a deletion operation, the target of which is typically language-specific, that removes a feature or set of features in a particular syntactic context before VI takes place (e.g. Bonet 1991, 2008; Noyer 1992; Arregi and Nevins 2007, 2012, 2013; Harley 2008). In particular, for the case of English, an Impoverishment rule deletes the valued plural feature in the context of a [DEF] feature. For the time being, this is formulated in (54), where α represents a variable over any feature:

(54) D[α, uPL:PL] → D[α]/D[α = DEF, __]

'delete a valued plural in the context of a definite D' (first attempt)

At the point of VI, the D terminals are spelled out as (55) for English and for Spanish.[28]

(55) VI rules for determiner exponence (I)

a. Exclusive SG-CT determiners (D-Class 1)

i. D[UNIV, uIND:IND, uSG:SG] ⇔ *every*

ii. D[DISTR, uIND:IND, uSG:SG] ⇔ *each*

iii. D[INDEF, uIND:IND, uSG:SG] ⇔ $a(n)$

iv. D[DISTR, uIND:IND, uSG:SG] ⇔ *cada*

b. Exclusive PL-CT determiners (D-Class 2)

i. D[GROUP REF, uIND:IND, uPL:PL] ⇔ *several*

ii. D[GROUP REF, uIND:IND, uPL:PL] ⇔ *varios*

c. CT-only determiners (D-Class 3)

i. D[DEF, WH, uIND:IND] ⇔ *which*

ii. D[DEF, WH, uIND:IND, uNum:SG/PL] ⇔ $cuál(es)$

iii. D[UNIV, uIND:IND, uNum:SG/PL] ⇔ $todo(s)$

iv. D[INDEF, uIND:IND, uNum:SG/PL] ⇔ $\{algun(os), un(os)\}$

[28] See Rullmann and Beck (1998); Beck and Rullmann (1999) for evidence that *which* is [DEF]. For differences between *every* and *each*, see Beghelli and Stowell (1997); Gagnon and Wellwood (2011).

v. D[INDEF, *u*NEG:NEG, *u*IND:IND , *u*Num:SG/PL] ⇔ *ningun*(*os*)

6.2 Unrestricted determiners

The group of Unrestricted determiners included those compatible with any noun, may it be count or mass. We distinguished between those determiners whose surface forms were non-plural and those that were plural-marked.

Using the conventional cell-uniting notation to indicate syncretisms, the paradigms of English and Spanish Unrestricted determiners look like Table 7 and Table 8 respectively. From the vocabulary items in both tables, the patterns of syncretism in (56) can be observed.

Table 7: Paradigm of English Unrestricted determiners

non-PL marked N			**PL-marked N**	
Ø mass	**object mass**	**SG-CT**	**PL mass**	**PL-CT**
the, some, no, any, what				
this, that			*these, those*	

Table 8: (Mascuilne) Paradigm of Spanish Unrestricted determiners

non-PL marked N			**PL-marked N**	
Ø mass	**object mass**	**SG-CT**	**PL mass**	**PL-CT**
qué				
el			*los*	
este, ese, aquel			*estos, esos, aquellos*	

(56) Patters of syncretism from Table 7 and Table 8

a. In both languages, the non-plural determiners do not contain [SG].

b. In English, [PL] is not marked in definite and indefinite determiners.

c. In Spanish, [PL] is not marked in the *wh*-indefinite determiner.

All non-plural determiners may occur with nouns that have no NumP or bear no number features, such as unmarked or object mass nouns. Thus, we can conclude that the Ds underlying

these surface forms cannot bear a number probing feature such as *u*SG or *u*Num. If they did, the D terminal underlying these forms would not be able to establish an Agree dependency with a singular count noun as well as an unmarked mass noun and object mass noun.

It also seems justified to conclude that a subset of the Ds underlying these surface forms must bear a *u*PL probe. First, some determiners show allomorphic variation triggered by [PL]. Second, the plural allomorph is ungrammatical with a non-plural marked noun: **these book, *los libro*. And third, the non-plural allomorph is ungrammatical with a plural-marked noun: **this books, *el libros*.

The key to understanding the category of Unrestricted determiners, while maintaining our formulation of Agree and our hypothesis about D-Classes as Ds sharing the exact same probes, is as follows. Unrestricted determiners are split into two D-Classes: the one in (57a) and the one in (57b). The former is the elsewhere case, found in non-plural environments (i.e. unmarked mass, object mass and singular count). The latter is is restricted to contexts where [PL] is part of the derivation.

(57) a. D-Class 4

D

b. D-Class 5

D[*u*PL:_]

In principle, nothing restricts the underspecified D in (57a) from occurring in plural environments: feature underspecification entails that there is no Agree dependency to be established, making D-Class 4 compatible with the superset of nouns. While seemingly a welcome result if we just focus on the syncretic surface forms in Table 7 and Table 8, it is in fact problematic: our model predicts that merger of a D from D-Class 4 with N_{PL} is acceptable, contrary to what the facts tell us, e.g. **this books* or **el libros*. In order to avoid this wrongful prediction, I assume that the condition in (58) must hold.

(58) Plural Licensing Condition (PluC)

[PL] must always be licensed via Agree.

The idea that certain interpretable features are subject to a licensing condition via Agree has

its roots in a tradition started by Béjar and Rezač (2003, 2009) for person and continued by Kalin (2018, 2019) for specificity (in differential object marking). What is more, the need for a licensing condition on [PL] has been argued independently by Fong (2021, 2023).[29] Applied to the cases at hand, the proposal is at work in (59) for the non-plural environments and in (60) for the plural environments.

(59) No Agree and no PluC application

a. $[_{\text{DP}}\ \text{D}\ [_{\text{NumP}}\ \text{Num}_{[\text{SG}]}\ [\ n_{[\text{IND}]}\ \sqrt{\text{JEWEL}}\ ]]]$

b. $[_{\text{DP}}\ \text{D}\ [\ n\ \sqrt{\text{MUD}}\ ]]]$

c. $[_{\text{DP}}\ \text{D}\ [\ n_{[\ \substack{\text{IND}\\\text{COLL}}\ ]}\ \sqrt{\text{JEWEL}}\ ]]$

(60) No Agree but *PluC

a. $*\ [_{\text{DP}}\ \text{D}\ [_{\text{NumP}}\ \text{Num}_{[\text{PL}]}\ [\ n_{[\text{IND}]}\ \sqrt{\text{JEWEL}}\ ]]]$

b. $*\ [_{\text{DP}}\ \text{D}\ [\ n_{[\text{PL}]}\ \sqrt{\text{FUME/VÍVER}}\ ]]]$

In the non-plural cases in (59), there is no Agree dependency and since there is no [PL], the PluC in (58) does not apply. As a result, the generated expressions are grammatical. However, in the plural cases in (60), the ungrammaticality is not due to a failed Agree dependency – there is none to be established – but due to the fact that the PluC fails to be satisfied: the interpretable plural features on Num in (60a) and on *n* (60b) are not agreed with by any probe.

Merger of D[*u*PL:_] yields the reversed grammaticality patterns, which is the desired result. That is, for a structure that has D[*u*PL:_] to be grammatical, the probe must be able to copy a [PL] value. The establishment of this dependency will satisfy the PluC. (61) schematizes the non-plural environments and (62) schematizes the plural ones.

(61) *Agree

a. $*\ [_{\text{DP}}\ \text{D}_{[\ u\text{PL:\_}\ ]}\ [_{\text{NumP}}\ \text{Num}_{[\text{SG}]}\ [\ n_{[\text{IND}]}\ \sqrt{\text{BOOK}}\ ]]]$

[29] I would like to note that the PluC does not pose any issues for the D-Classes analyzed in §6.1. This is so because Ds from D-Class 2 and D-Class 3 have either a plural or Number probe, respectively. This ensures that when [PL] is part of the syntax, it is always licensed.

b. * [$_{DP}$ D$_{[\ u\text{PL}:_\ ]}$ [n $\sqrt{\text{MUD}}$]]]

c. * [$_{DP}$ D$_{[\ u\text{PL}:_\ ]}$ [$n_{[\ \text{IND}\ /\ \text{COLL}\ ]}$ $\sqrt{\text{JEWEL}}$]]

(62) ✓Agree and ✓PluC

a. [$_{DP}$ D$_{[\ u\text{PL}:\underline{val}\ ]}$ [$_{NumP}$ Num$_{[\text{PL}]}$ [$n_{[\text{IND}]}$ $\sqrt{\text{BOOK}}$]]]

b. [$_{DP}$ D$_{[\ u\text{PL}:\underline{val}\ ]}$ [$n_{[\text{PL}]}$ $\sqrt{\text{FUME/VÍVER}}$]]

In (61) Agree fails because there is no matching. This failure leads to a syntactic violation. On the contrary, in (62), Agree(D$_{[u\text{PL}]}$, [PL]) is successful. This results in the licensing of the interpretable plural feature.

In (63), I provide a list of the vocabulary items that spell out the relevant D terminal nodes, as in the paradigms in Table 7 and Table 8.

(63) VI rules for determiner exponence (II): Unrestricted determiners (D-Class 4 and 5)

a. D[INDEF] ⇔ *some*

b. D[INDEF, NEG] ⇔ *no*

c. D[INDEF, *u*NEG:NEG] ⇔ *any*

d. D[INDEF, WH] ⇔ {*what*, *qué*}

e. D[DEF] ⇔ {*the*, *el*}

f. D[DEF, *u*PL:PL] ⇔ *los*

g. D[DEM] ⇔ {*this*, *este*}

h. D[DEM, *u*PL:PL] ⇔ {*these*, *estos*}

i. D[DEM, PROX] ⇔ *ese*

j. D[DEM, PROX, *u*PL:PL] ⇔ *esos*

k. D[DEM, DIST] ⇔ {*that*, *aquel*}

l. D[DEM, DIST, *u*PL:PL] ⇔ {*those*, *aquellos*}

There is a potential caveat of this analysis regarding the relation between the syntactic terminals and the vocabulary items they expone as indicated by the rules in (63). Namely, this is concerned with the syncretisms in (56b-c): why do English definite and indefinite determiners not expone the valued plural feature, as demonstratives do? Why does Spanish *wh*-indefinite not expone the valued plural feature either? While we seem to be invited to stipulate additional VI

rules for these items leading to accidental syncretism, we would loose an important generalization: these syncretisms hold for a particular feature in the languages, namely [PL].

Instead, and in concert with the analysis of the syncretism in §6.1 above, I propose that these syncretisms are also the result of Impoverishment. In fact, in English they could be handled by a more generalized version of the rule in (54), such as (64a). To handle the Spanish case, we need a rule that is for indefinite (and inanimate) *wh*-determiners. Said rule is in (64b).

(64) a. $D[\alpha, u\text{PL}:\underline{\text{PL}}] \rightarrow D[\alpha]/D[\alpha = (\text{IN})\text{DEF}, \_\_]$ (final version)

'Delete a valued plural feature in the context of a (in)definite D'

b. $D[\alpha, u\text{PL}:\underline{\text{PL}}] \rightarrow D[\alpha]/D[\alpha = \{\text{INDEF}, \text{WH}\}, \_\_]$

'Delete a valued plural feature in the context of an (inanimate) *wh*-indefinite D'

The rules will generate the syncretisms in Tables 7 and 8. By virtue of eliminating the valued plural feature in the specified contexts, the VI rules in (63a)-(63e) can now be applied. This has the additional welcome consequence that we achieve a uniform syntactic analysis of determiners across languages, despite their surface differences. For example, English and Spanish definite determiners only differ with respect to whether Impoverishment removes the valued probe blocking surface plural agreement on the vocabulary item.[30]

6.3 Non-SG determiners

This category of determiners seems to present a challenge to the proposed analysis of the count/mass distinction as well as to the hypothesis in (49). This is so because mass nouns and plural count nouns do not form a syntactic natural class: there is no common set of features between the two that excludes singular count. As a result, there is no set of said probing features on D either.

I propose that this is, in fact, reflected by the syntax, and that, in terms of their probing features, the Ds underlying Non-SG determiners are no different from the Ds underlying Unrestricted determiners in §6.2: they can be underspecified for any features, i.e. D-Class 4, and they can bear

[30] For a similar analysis of other syncretisms in determiner paradigms (e.g. pronouns), see Harley (2008).

[uPL:_], i.e. D-Class 5. Where they differ, however, is in whether the D terminals instantiated by these categories encode or not a cumulative restriction as part of their lexical semantics.[31]

Under this analysis, the Ds underlying Non-SG determiners are syntactically compatible with singular count nouns. This is shown in (65a) which is then compared to (unmarked and object) mass nouns in (65b)-in (65c), and plural (count and mass) nouns in (65d) and (65e).

(65) a. $[_{\text{DP}}\ \text{D}\ [_{\text{NumP}}\ \text{Num}_{[\text{SG}]}\ [\ n_{[\text{IND}]}\ \sqrt{\text{JEWEL}}\ ]]]$

b. $[_{\text{DP}}\ \text{D}\ [\ n\ \sqrt{\text{MUD}}\ ]]]$

c. $[_{\text{DP}}\ \text{D}\ [\ n_{[\ \text{IND}\ \text{COLL}\ ]}\ \sqrt{\text{JEWEL}}\ ]]$

d. $[_{\text{DP}}\ \text{D}_{[\ u\text{PL:}\underline{val}\ ]}\ [_{\text{NumP}}\ \text{Num}_{[\text{PL}]}\ [\ n_{[\text{IND}]}\ \sqrt{\text{JEWEL}}\ ]]]$

e. $[_{\text{DP}}\ \text{D}_{[\ u\text{PL:}\underline{val}\ ]}\ [_{n\text{P}}\ n_{[\text{PL}]}\ \sqrt{\text{FUME}}\ ]]$

D in (65a) has the same syntactic properties as it does with mass nouns in (65b) and (65c): since there are no probes, there is also no Agree. In the case of plural count nouns in (65d), D must bear the uPL probe, which finds a value and licenses the feature on Num. As before, merger of an underspecified D with an xNP that has [PL] is ruled out because it does not satisfy the PluC.

As shown in (65), nothing in the syntax prevents a structure with an underspecified D and [SG]-marked noun from converging. The ill-formedness of these expressions must stem from elsewhere in the grammar. We know that mass nouns and plural count nouns form a semantic natural class, to the exclusion of singular count ones: they are cumulative (e.g. Quine 1960; Cheng 1973; Link 1983; Bach 1986b; Krifka 1989; Chierchia 1998b,a, 2010; Borer 2005a): (66).[32]

(66) $\text{CUM}(P) = \forall x[P(x) \rightarrow \forall y[P(y) \rightarrow P(x \cup y)]]$

[31] See Deal (2016, 2017) for a similar analysis of cumulative quantifiers in Nez Perce.

[32] Mass nouns are cumulative because if x is water/furniture and y is also water/furniture, then their sum is also water/furniture. Similarly, plural count nouns like *books* are cumulative because adding books to books is still books. In contrast, singular count nouns are not cumulative: the sum of two separate books is not a book.

'A predicate P is cumulative if for every member in P, their sum is also in P.'

I hypothesize that the ill-formedness with [SG]-marked nouns results from a failure to satisfy a cumulativity requirement that some Ds lexically impose on their restrictor argument at LF. In particular, a subset of D-Class 4 and D-Class 5, i.e. the Ds instantiated by Non-SG determiners, require that their first argument (i.e. their restrictor) be cumulative. This requirement can be encoded via a presupposition, as in (67), where $\mathscr{D}$ stands for all potential domains.

(67) For any set $P \subseteq \mathscr{D}$, $[\![\mathrm{D}_{\text{Non-SG}}]\!](P)$ is defined if $\mathsf{CUM}(P) = 1$

At LF, the meanings of the syntactic representations in (65) are composed as in (68). When a $[\![\mathrm{D}_{\text{Non-SG}}]\!]$ composes with singular count argument as in (68a), the expression will not be defined: D's argument is not cumulative. This contrasts with (68b) and (68c): D's first argument is cumulative in both cases (i.e. a mass and plural count noun, respectively).

(68) a. $[\![\mathrm{D}_{\text{Non-SG}}]\!]([\![[\mathrm{Num}_{[\text{SG}]}[n_{[\text{IND}]}\sqrt{\text{JEWEL}}]]]\!])$ is not defined

b. $[\![\mathrm{D}_{\text{Non-SG}}]\!]([\![[n\sqrt{\text{MUD}}]]\!])$ is defined

c. $[\![\mathrm{D}_{\text{Non-SG}}]\!]([\![[\mathrm{Num}_{\text{PL}}[n_{\text{IND}}\sqrt{\text{JEWEL}}]]]\!])$ is defined

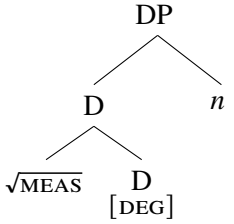
7 QDs: variation in the surface form

The last set of generalizations to be explained is concerned with the distribution of the surface forms of QDs. In §4, I concluded that, despite the surface variation observed in English, the (plural-)marked form of QDs was restricted to contexts in which the noun is plural marked, e.g. (29), supported by e.g. Wellwood (2018, 2019); Smith (2021); Cleani and Toquero-Pérez (2022).

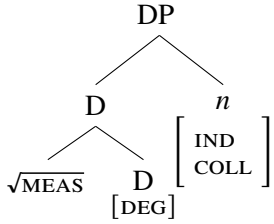
QDs are Non-SG determiners, and such they are split into D-Class 4 (i.e. underspecified) and D-Class 5 (i.e. specified for a plural probe). I interpret the facts about the distribution of QDs as evidence for the hypothesis that the surface form of the QD is sensitive to [PL]. In particular, just like *muchos* is the surface form of a terminal node and a [PL] feature, so is *many/few*. The surface forms *mucho* and *much/little* are thus the unmarked or elsewhere cases, which explains their wider distributions, beyond non-sg nouns (e.g. 15 and 16).

I assume that QDs are internally complex: they consist of a lexical part, e.g. a measure root $\sqrt{\text{MEAS}}$, and a functional part, e.g. a cumulative D head specified for [DEG]. The relevant syntactic structures for unmarked and object mass nouns are as in (69), and the VI rules are as in (70) for English and in (71) for Spanish.[33]

(69) a. QD + unmarked mass



b. QD + object mass



(70) VI rules for $\{\sqrt{\text{MEAS}}, \text{D}\}$ (English)

a. $\sqrt{\text{MEAS}} \Leftrightarrow$ *many*/_D[DEG, *u*PL: PL]

b. $\sqrt{\text{MEAS}} \Leftrightarrow$ *much*

(71) VI rules for $\{\sqrt{\text{MEAS}}, \text{D}\}$ (Spanish)

a. $\sqrt{\text{MEAS}} \Leftrightarrow$ *mucho*

b. [*u*PL: PL] $\Leftrightarrow$ *−s*

In the case of unmarked and object mass nouns, the flavor of D is the one that is underspecified for any features. Otherwise, merger of a D[*u*PL:_] would result in a failed Agree-relation. As a result, and according to the VI rules, the vocabulary item inserted in English is the one in (70b). In Spanish, this means that plural is not realized as an affix on the measure root.

When D bears a plural probe, as in (72a) and (72b), said probe is valued against the [PL] matching feature in its c-command domain.[34] This triggers suppletion of the measure root in

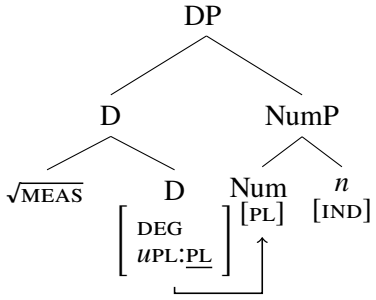
[33]The idea that some surface forms which do not correspond to 'lexical' items are comprised of a root/lexical element and a functional head can be found in Lowenstamm (e.g. 2015); De Belder and van Craenenbroeck (e.g. 2015); Gouskova and Bobaljik (e.g. 2022). For QDs, see Dunbar and Wellwood (2016). What I am representing as a measure root here is what they represent as an abstract morpheme MUCH.

[34]I am assuming that roots are adjoined in the syntax; roots then undergo some post-syntactic operation that makes them local to the relevant categorizing head (e.g. Matushansky 2006; Harley 2014; Merchant 2019; Folli and Harley 2020). Thus, when Agree occurs, the structure is as in (vi), where the root is an adjunct to DP:

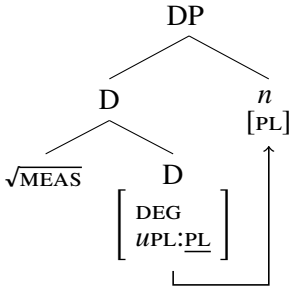
(vi) $[_{\text{DP}}\ \sqrt{\text{MEAS}}\ [_{\text{DP}}\ \text{D}_{[u\text{PL:\_}]}\ [_{\text{NumP}}\ \text{Num}_{[\text{PL}]}\ ...]]]$

English, per the VI rule in (70a). In Spanish, the valued plural feature surfaces as an agreement marker on the determiner, as it generally does.

(72) a. QD + plural count



b. QD + plural mass



As they stand, the structures and the VI rules predict the following: in both Spanish and English [PL] univocally triggers the (plural-)marked form of the QD. While this is the desired outcome for Spanish, it does not predict the observed variation with plural mass nouns in English. I propose that we can still maintain the uniform representations and VI rules, while still accounting for said variation if Impoverishment for the valued plural feature, once again, occurs. More specifically, the Impoverishment rule in (73) deletes the plural feature on the [DEG]-marked D in the context of a low plural.

(73) $\text{D}[\alpha, u\text{PL:}\underline{\text{PL}}] \rightarrow \text{D}[\alpha] / \text{D}[\alpha = \text{DEG}, \_]]\ n[\text{PL}]]$

'delete the valued plural feature in the context of a degree D that is local to a plural feature on *n*'

The rule in (73) is not universally shared across English speakers. Those speakers who have this rule as part of their grammar will apply (73) after the structure is sent to PF. Impoverishment will then block the application of the more specific rule in (70a), and trigger the application of the elsewhere rule in (70b) instead. As a result, the QD surfaces as *much*. For those speakers who lack the rule altogether, no additional post-syntactic process occurs and the more specific VI rule in (70a) will win over. This variation can be summarized in Table 9.[35]

[35] We can speculate that possibly the specific Impoverishment rule in (73) is a subcase of the more generalized Impoverishment rule in (64a). That is, the following unidirectional entailment might hold: the availability of the

Table 9: Variation in $\sqrt{\text{MEAS}}$-exponence (English)

Grammar	Agree(uPL, PL)	Impoverishment	VI rule
$\mathbb{G}1$	✓	✓	(70b) = *much*
$\mathbb{G}2$	✓	*	(70a) = *many*

The analysis of QDs proposed has several advantages. First, it derives the QD-markedness generalization as well as the facts summarized in Table 3. Second, it pushes the variation away from the lexicon: the surface form of QDs is not lexically determined (Chierchia 1998a; Borer 2005a; Solt 2009, 2015) but morpho-syntactically so based on the presence of [PL] (e.g. Wellwood 2018, 2019; Bale 2016; Smith 2021; Cleani and Toquero-Pérez 2022); third, it opens the possibility that variation in surface forms may be subject to very fine-grained conditions on how certain terminal nodes are lexicalized.

8 Accounting for the gaps

I started by motivating that determiners fall into five empirically distinct categories, summarized in §4. After proposing a feature-based account of the count/mass distinction in §5.1, I argued that those categories of determiners may instantiate different natural classes of determiners, i.e. D-Classes: D terminals that share the exact same probes. Depending on the set of probes that they bear, Ds are classified into D-Classes. Each D-Class and its corresponding empirical categories are given in Table 10.

By virtue of count nouns being marked for two features, i.e. individuation and singular/plural

rule in (73) in a grammar $\mathbb{G}$ would be dependent on the availability of the more general rule in (64a), but not the opposite. Taking an approach to (synchronic and diachronic) variation in terms of dependent hierarchies (e.g. Baker 2008a; Roberts 2012, 2019, 2022), having/not having the general rule can be thought of a as a higher level parameter regulating overt surface realizations of agreement across a large set or naturally definable class of functional heads: definites and indefinites. On the contrary, having/not having the less general rule can be conceived of a low level (e.g. micro) parameter, which does not affect a large set of functional heads, but it is restricted to a small and lexically definable subclass: measure roots. It is this very restricted distribution that is responsible for the 'instability' of the phenomenon, making it more likely to be subject to variation.

Table 10: D-Classes: their properties and correspondences with categories of determiners

D-Class	*u*IND	*u*SG	*u*PL	*u*Num	**Category of Determiner that instantitates** D-Class
Class 1	✓	✓	–	–	Exclusively SG-CT
Class 2	✓	–	✓	–	Exclusively PL-CT
Class 3	✓	–	–	✓	CT-only
Class 4	–	–	–	–	Unrestricted & Non-SG (non-plural)
Class 5	–	–	✓	–	Unrestricted & Non-SG (plural)

on Number, we can explain the categories of count determiners: the Ds underlying these determiners must probe for both types of features. The differences follow from the granularity in the Number probe: singular, i.e. D-Class 1, plural, i.e. D-Class 2, or general, i.e. D-Class 3.

D-Class 4 includes those Ds that are underspecified for any probing features and D-Class 5 includes those Ds that are specified for a plural probe. These natural classes are both instantiated by Unrestricted and Non-SG determiners. It is this identity with respect to their probes that the analysis and the Table 10 are aiming to capture. Despite their syntactic homogeneity, there is a subset of D-Class 4 and D-Class 5 terminals that lexically encode a cumulative restriction. The category of Non-SG determiners instantiates this subset of Ds. This explains the distributional differences between the definite article, for example, and QDs: only the latter belong to the cumulative subset of Ds form Class 4 and 5.

From this table, we can also derive the empirical generalizations in (27). First, every D that is specified for a *u*IND probe is also specified for some number probe (e.g. *u*SG, *u*PL, *u*Num). But, the opposite entailment is not true: bearing a *u*PL probe is not indicative of also bearing *u*IND probe. Thus, we have Ds that track being plural but not being count, which reinforces the hypothesis that plural marking need not entail count syntax (and semantics), (cf. Chierchia 1998a; Borer 2005a, among others). Last but not least, if a D is underspecified for any probes it will occur with both (unmarked and object) mass and singular count nouns, e.g. Class 4; similarly, if a determiner is specified for just a plural probe, it will occur with both plural mass and plural count nouns, e.g. Class 5. Therefore, this observation follows: if a D occurs with a mass noun, it will also occur with a count one.

Equally important is to explain why some D-Classes are not attested. I identified these gaps in (30), which seem to be cross-linguistically robust (e.g. Doetjes 1997, 2021; Chierchia 1998a; Borer 2005a; Bale 2016). Both gaps follow from the fact that none of the groups of nouns identified by the gaps form a featural natural class.

The first of these gaps is concerned with the absence of Ds that occur with singular count and mass nouns, to exclusion of plural count nouns. The proposed theory explains this gap in a straightforward manner: there is no feature that singular count nouns and any mass nouns share. As a result there is no potential combination of probes on D that would restrict the search to these particular nominals.

The second gap was concerned with Ds that only occurred with mass nouns. This gap is also explained away: there is no [MASS] feature. In fact, mass nouns form a rather heterogeneous class, which is best understood as the absence of a Number projection. Since there is no [MASS]-marking, there is no probe on D either that can search for said feature. This conclusion is consistent with the robust cross-linguistic observations that few grammatical markers, if any, track or encode 'mass'. Being mass seems to be better understood as the absence of count properties.

While it is true that some have argued that QDs like *much* are mass-only determiners, I argued at length that this was not empirically accurate. QDs are better understood in terms of unmarked or elsewhere forms (i.e. D-Class 4) and (plural-)marked forms (i.e. D-Class 5). In fact, this markedness division is a widely attested phenomenon beyond the languages discussed, including but not limited to Greek (Tsoulas 2006, 2009; Alexiadou 2011; Kouneli 2019), Norwegian (Cleani and Toquero-Pérez 2022) and Telugu (Smith 2021). Therefore, the cases where the distinction has been neutralized in the surface need not be taken as evidence (i) for a distinction that considers the two morphemes as lexically independent from each other (one mass and the other count) and (ii) for the view that mass determiners are attested, but limited.

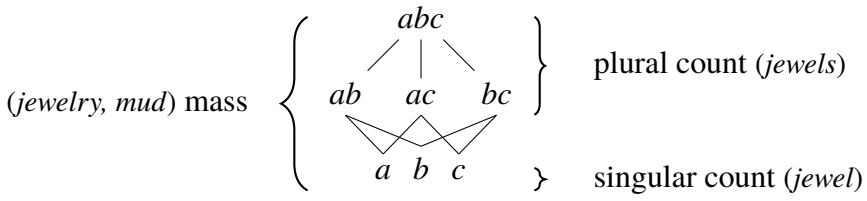
9 Previous approaches

9.1 Chierchia (1998a)

Chierchia (1998a) proposes an analysis of the count/mass distinction that is built (i) on the assumption that the denotations of singular count nouns, plural count nouns and mass nouns differ and (ii) on the hypothesis that mass nouns are inherently plural; it is this property, i.e. denoting a plurality, that they have in common with plural count nouns.

Assuming an algebraic semantics, as established by Link (1983), these denotational differences are best illustrated in Figure 1, which represents a complete join semi-lattice. In a model where there are three distinct elements a, b and c, the extension of singular count nouns like *jewel* is a singularity: a set of atoms that have no smaller subparts. The PL morpheme applies to that set of atoms and returns just the sums of those atoms. The extension of a mass noun like *mud* or *jewelry* is an inclusive plurality, i.e. a set that is true of minimal elements, not necessarily atoms, and their sums. In other words, mass nouns have minimal parts, like singular count nouns, and their sums, like plural count nouns. The difference between count and mass noun denotations lies in that the latter "do not single out a set of atoms, but a whole, qualitatively homogeneous sublattice" (Chierchia 1998a, p.68). This homogeneity, or lack of atomic granularity, cannot provide a basis for counting and it is the reason why numerals – and by extension cardinality measurement – are disallowed with mass nouns. Chierchia takes the inherent plurality of mass nouns as the source for their incompatibility with PL.

Figure 1: The denotations of singular & plural count, and mass nouns from Chierchia (1998)



On the basis of this analysis, Chierchia then proposes that determiners may lexically encode

one of the three functions in (74). $\mathscr{D}$ is all potential domains, '*' is Link's (1983) sum-closure operation and AT is the set of atoms in $\mathscr{D}$.

(74) a. Singular function: S is a function from subsets of $\mathscr{D}$ to truth values, such that for any set X, $S(X) = 1$ iff $X \subseteq \text{AT}$

b. Plural function: P is a function from subsets of $\mathscr{D}$ to truth values, such that for any set X, $P(X) = 1$ iff for some $Z \subseteq \text{AT}$, $(^*Z - Z) = X$.

c. Non-Singular function: $\cup$ is a function from subsets of $\mathscr{D}$ to truth values, such that for any set X, $\cup(X) = 1$ if from some $Z \subseteq \text{AT}$, $P(Z) = X$ or if $^*X = X$.

Exclusively SG-CT determiners (e.g. *every, each*) encode the singular function in (74a), and are defined only if their restrictor denotes a set of atoms. Exclusively PL-CT determiners (e.g. *several*) encode the plural function in (74b) and are defined only if their restrictor denotes a set of sums of atoms. Non-SG determiners encode the Non-Singular function in (74c), and are defined only if their restrictor denotes sums. Determiners that do not encode any of these functions are always defined, and thus unrestricted (e.g. *the, some*). Chierchia's gaps in (3) follow as a consequence of this theory: there is no determiner that encodes a function defined iff the noun's denotation is a set of atoms or a set of minimal parts and their sums; and there is no determiner that encodes a function defined iff the noun's denotation has atoms or sums of those atoms.

However, there are some issues with this theory as it stands. With respect to D-Classes, while able to explain why there is no determiner that selects mass and singular count nouns only, the theory does not predict D-Class 3: Ds that require the NP to be (singular/plural) count. In addition, by virtue of assuming that *much* and *many* are lexically independent of each other, the theory fails to explain the relationship between plural-marking, the distribution of marked QD forms and the lack of mass determiners.

Beyond the domain of determiners, it cannot be the case that PL requires its (syntactic) complement and (semantic) argument to be to a SG-marked count noun: (i) plural count nouns are just a subset of plural-marked nouns and (ii) PL does not entail being countable either, e.g. (40). From

(i), it also follows, as a consequence, that the inherent plurality of mass nouns is independent of their (in)compatibility with plural marking. Relatedly, (ii) and the fact that object mass nouns are countable leads us to question the hypothesis that mass nouns cannot be counted because they do not single out individual atoms. If counting requires atomic reference, object mass nouns must have it contrary to Chierchia's (1998a, 71) claims.

9.2 Cowper and Hall (2014b)

Cowper and Hall (2014b) propose a theory of the count/mass distinction based on different number features. Singular count NPs are unspecified for any features, while mass and plural count NPs form a natural class: they are both [Non-Atomic]. To further distinguish between mass NPs and plural count NPs they propose that the latter are also marked for the dependent feature [Discrete]. The bundle [Non-Atomic: Discrete] spells-out plural on the N and the D heads. [Non-Atomic] is in charge of introducing the property of cumulativity, something that both mass and plural count NPs share (Cheng 1973; Krifka 1989), and [Discrete] makes sure that the NP has separable individuals (i.e. atoms) that can be counted. A schematic representation of the feature distribution is in (75) from Cowper and Hall (2014b, p.69, ex: 10).

(75)

a. Singular Count	b. Mass	c. Plural Count
Ø	[Non-Atomic]	[Non-Atomic: Discrete]

This proposal also suffers from several issues. With respect to the D-Classes, it undergenerates. [SG] is syntactically absent, given their privative feature system, and thus, it is impossible for a probe on D to enter an Agree-dependency with a potential SG-goal. Consequently, D-Class 1 is universally ruled out, and so are SG-marked Class 3 Ds. In fact, since singular and plural count nouns do not form a natural class, Class 3 is ruled out. Their approach also does not distinguish, empirically or formally, between the categories of Exclusively SG-CT and Unrestricted determiners: it predicts that the Ds underlying these determiners are both underspecified, i.e. Class 4.

Additional concerns include the following. If [Discrete] is what makes an NP countable, object mass nouns should not only be marked for [Non-Atomic] but also for [Discrete]. But that would entail that object mass nouns are feature indistinguishable from plural count nouns, which wrongly predicts that their syntactic properties must be the same. In fact, if the bundle [Non-Atomic: Discrete] spells out plural on N and D, we expect expressions like *furnitures* to be grammatical, and yet they are not. While they do not discuss plural mass nouns, their non-countable properties and their being plural-marked seem to be at odds with their system as well.

10 Conclusion

This paper has focused on the distribution of determiners as illustrated by the count/mass distinction. In particular, building on e.g. Doetjes (1997, 2021); Chierchia (1998a); Borer (2005a), it has aimed at (i) establishing the empirical categories of determiners that can be observed across languages, and (ii) at uncovering what constitutes a possible and an impossible determiner expression. In other words, using the count/mass distinction as a probe into the underlying properties of natural languages, what can we conclude about the internal syntax of determiners and the abstract natural classes that these determiners may belong to based on their internal syntax?

At an empirical level, I established that determiners fall into different categories: exclusively singular count, exclusively plural count, count only (regardless of number-marking), unrestricted and non-singular determiners. In addition to the empirical categories that are attested, equally important are those that are not. Namely, there is no singular count and mass determiner, and no mass determiner either. While some of the attested categories had already been described in the literature, the uncovering of the count only category is a novel empirical contribution. In fact, its existence goes against previous analyses from which it is concluded that said category of determiners is predicted to not exist (e.g. Chierchia 1998a; Bale 2016).

As to the categories that are not attested, the absence of a determiner that occurs with both singular count and mass nouns only had already been established (e.g. Chierchia 1998a), and the findings in this paper serve as further confirmation for its accuracy. Regarding the lack mass de-

terminers, the observation builds on previous claims that exclusive mass determiners are limited. These claims were largely based on the distribution of *much/little*, which as I have shown here are not limited to mass – and also non-countable – contexts. In fact, I observed that variation in the surface forms of Quantity Determiners, of which *much/little* are a subset, is strongly connected to plural-marking; this leads to the conclusion that *much/little* are not mass determiners, but really the elsewhere or unmarked surface forms when plural is not available in the morpho-syntactic representation. Thus, cases where the markedness contrasts has been neutralized (on the surface) need not be taken as evidence for the availability of determiners that are exclusively mass only.

In order to explain these categories and these gaps, I started out by motivating that the grammatical properties of count nouns include markedness for [IND] on *n* and [SG/PL] on Number, whereas mass nouns are best understood as the absence of Number. My hypothesis is that the terminal nodes lexicalized by determiners, i.e. D, reflect the differences in the syntactic composition of the nominal expressions. In particular, under the assumption that D has unvalued probing features that must receive a value from an available feature in the extended projection of the NP (e.g. Chomsky 2000, 2001; Carstens 2000; Harbour 2007), Ds will cluster into distinct natural classes as long as they share the exact same probing features. I proposed that there are (at least) five natural classes of Ds, called D-Classes, depending on the set of probes they bear.

Each of these classes is instantiated by some category of determiners: D-Class 1 with [*u*IND, *u*SG] is instantiated by Exclusively SG-CT determiners (e.g. *each*); D-Class 2 with [*u*IND, *u*PL] is instantiated by Exclusively PL-CT determiners (e.g. *several*); D-Class 3 with [*u*IND, *u*Num] is instantiated by CT-only determiners (e.g. *which*); D-Class 4 with no probes is instantiated by Unrestricted and Non-SG determiners that are non-plural (e.g. *this, much*); D-Class 5 with [*u*PL] is instantiated by Unrestricted and Non-SG determiners that are obligatorily plural (e.g. *these, many*).

Two notes are in order. First, D-Class 4 and D-Class 5 have a subset of Ds that, apart from their probing features, encode a lexical semantic requirement that their restrictor argument must be cumulative. The subset of Ds with said lexical semantic property is instantiated solely by non-singular determiners. This entails that said Ds are syntactically compatible with a singular count

noun, but at LF their composition is precluded. This reminds us that the representations built by the syntax affect the interfaces, which may in turn rule out structures that are not interpretable. Second, the surface form of some determiners that instantiate both Class 4 and Class 5 is invariant (e.g. *the*). The reason behind this surface invariance is the application of Impoverishment removing the valued plural feature on D before VI takes place. As a result, some Class 4 and Class 5 Ds are targeted by the same VI rule, leading to the same exponent.

The proposal, based on the feature composition of NPs and the probing features on D, also makes the following prediction regarding a potentially available D-Class: Ds that only probe for [*u*IND]. This class would be instantiated by determiners that occur only with countable nouns; that is, a determiner that occurs with both singular/plural count nouns and object mass nouns, to the exclusion of unmarked and plural-marked mass nouns. In pseudo-English, this would look like this: *det* { *jewel, jewels, jewelry*/ **mud, fumes*}. The class is predicted to exist given that countability is marked via [IND] on the *n*P.

Furthermore, the proposal predicts and, more importantly, explains the two empirical gaps as well. Singular count and mass nouns share no feature in common. Similarly, there is no [MASS] feature. Consequently, there will exist no probe, or combination of probes, that will search for those relevant goals. What is more, if the account of the count/mass distinction motivated here is on the right track, the attested, and predicted, D-Classes constitute grammatically possible Ds. Languages may only instantiate a subset of the possible classes, but this should not be taken as evidence against the proposal. Variation could be the result of (a) idiosyncratic differences in the inventory of features that D can inherently bear and/or (b) differences in the conditions that need to be satisfied at the interfaces, both in terms of externalization and interpretation. The gaps, on the contrary, are predicted to be universal across the determiner systems of natural languages.

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