Acta Linguistica Academica 69 (2022) 1, 128–159
DOI: 10.1556/2062.2022.00449

AKADÉMIAI KIADÓ

A typology of proportional quantifiers: Evidence from Polish partitives

MARCIN WĄGIEL*

Masaryk University in Brno

Received: November 28, 2020 • Revised manuscript received: January 22, 2022 • Accepted: January 25, 2022

ABSTRACT

In this paper, I investigate the distribution and semantic behavior of various proportional quantifiers (PQs) in Polish. Based on novel evidence including corpus data, I conclude that Polish PQs do not constitute a uniform category, but rather can be divided into four distinct classes based on the following properties: i) (in)compatibility with numerals and measure words, ii) (in)compatibility with approximative modifiers, iii) (in)compatibility with cumulative predicates and iv) (non)occurrence of spatial integrity effects. I propose that such a typology results from an interplay between more primitive semantic notions. In particular, the data call for combining degree semantics with a mereotopological approach to the meaning of PQs.

KEYWORDS

proportional quantifiers, partitive constructions, part-whole structures, mereotopology, degree semantics

1. INTRODUCTION

Since the early years of formal semantics a lot of research has been dedicated to the study of quantifiers, on the one hand, and part-whole relations, on the other. Yet, despite many important results certain properties of the class of proportional quantifiers (PQs) such as the English *part*, *half* and *most* have not achieved enough attention in the literature. In particular, the research so far has been mainly focused on the interaction of PQs with count plurals, while their other uses remain somewhat neglected (but see Moltmann 1997 and Korat 2016). In this paper, I will investigate non-trivial semantic differences between various types of PQs in Polish,

* Corresponding author. E-mail: marcin.wagiel@phil.muni.cz

which indicate that the overall picture is more complex than formerly assumed and that the previous approaches fail to capture a convoluted typology of the expressions in question.

It is standardly assumed that at its core the PQ simply designates a part considered in comparative relation to a whole. That part is typically defined in numerical terms, i.e., as a number of entities less than (or equal to) the total number of entities within a whole. Of course, various approaches differ in how the effect of proportional quantification is achieved compositionally. For instance, in the standard generalized quantifier approach, a PQ such as *half* or *most* is analyzed as a relation between sets of individuals such that the cardinality of the intersection of the denotation of the NP and the denotation of the VP is equal to or greater than 1/2 of the cardinality of the denotation of the NP (Barwise & Cooper 1981). On the other hand, Landman (1991) proposes that *half* maps a plurality of individuals onto subpluralities consisting of 1/2 of the number of individuals making up that plurality. Finally, Hackl (2009) argues that the proportional *most* is the superlative of the gradable modifier *many*, which targets pluralities that can be measured in terms of how many atomic parts they are composed of.

Despite the obvious differences, what all of the accounts above have in common is that the denotation of the nominal the PQ combines with is taken to be a collection of singular individuated objects (either a set or a plurality of individuals) and the output is considered again in terms of singular individuated objects (members of a set or atomic parts of a plurality) that, furthermore, remain in an unstructured, symmetric relation with respect to each other. These facts invite the question of what happens when the PQ combines with an expression denoting a singular individual, which lacks atomic parts, or an object of a different ontological type, e.g., a number or a measure. What is the relationship between all these uses and how they connect to standard assumptions concerning nominal semantics? The Polish data to be explored in this paper indicate that in order to capture the distributional and semantic properties of some of the PQs, postulating certain non-trivial restrictions within part-whole structures is required.

Similar to other Slavic languages, Polish has a rich derivational morphology in the domain of quantificational expressions. As a result, it has 8 different PQs corresponding to PART, see (2), QUARTER, see (3), HALF, see (4), and MOST, see (5). In this paper, I will explore their behavior and interpretation in partitive constructions of the form in (1), where the PQ assigns the genitive case to the embedded DP.[1] The meaning of such a construction can be typically paraphrased in English as 'PQ of a(n)/the NP' and sometimes as 'PQ a(n)/the NP' or 'NP PQ', e.g., depending on a context (4a) could be translated as 'half of an/the orange' or as 'half an/the orange', whereas (4c) as 'half of an/the orange' or as 'orange half'.[2]

(1) [PQ [DP.GEN]]

(2) a. część pomarańczy
part$_1$ orange.GEN
'part of an/the orange'

[1]Throughout the text, I will use the following abbreviations: gender: F – feminine, N – neuter; case: ACC – accusative, GEN – genitive, INS – instrumental, LOC – locative (in the glosses, I will ignore the nominative); other: ADJ – adjective, CL – classifier, PL – plural.

[2]The embedded DP needs to be either definite or specific, see Section 6.3.

b. cząstka pomarańczy
part$_2$ orange.GEN
'part of an/the orange'

(3) a. ćwierć pomarańczy
quarter$_1$ orange.GEN
'quarter of an/the orange'

b. ćwiartka pomarańczy
quarter$_2$ orange.GEN
'quarter of an/the orange'

(4) a. pół pomarańczy
half$_1$ orange.GEN
'half of an/the orange'

b. połowa pomarańczy
half$_2$ orange.GEN
'half of an/the orange'

c. połówka pomarańczy
half$_3$ orange.GEN
'half of an/the orange'

(5) większość pomarańczy
most orange.GEN
'most of an/the orange'

At first sight, different Polish PART, QUARTER and HALF PQs seem to be mere synonyms. However, closer investigation reveals that they exhibit different properties concerning both their distribution and interpretation. Though certain quirks related to agreement and interpretation of some of the Polish PQs have been recognized and analyzed (see Przepiórkowski 2006; Dziubała-Szrejbrowska 2016 for a syntactic analysis and Wągiel 2018, 2019 for a semantic treatment), the source of those differences remains surprisingly understudied. The main aim of this paper is to give firmer empirical footing for the study of PQs in Polish and to open up a new perspective on the research on such expressions from a broader theoretical perspective.

Based on a corpus study supplemented with a number of native speaker introspective insights, I will demonstrate that there are puzzling differences between the PQs of a given category in (2)–(5) with respect to their i) (in)compatibility with numerals and measure words, ii) (in)compatibility with approximative modifiers, iii) (in)compatibility with cumulative predicates and the iv) absence or presence of semantic effects relating to the physical integrity of referents. Under standard assumptions, the contrasts to be discussed are unexpected and I will argue that the evidence has far-reaching consequences that support degree-semantic accounts employing shifts between the domains of degrees and individuals, on the one hand, and

corroborate more fine-grained approaches to part-whole structures that are grounded in mereotopology and assume structured parthood, on the other.

The paper is outlined as follows. In Section 2, I will briefly discuss morphosyntactic properties of the PQs in question. In Section 3, I will present the results of a corpus study revealing some of their non-trivial distributional properties including (in)compatibility with numerals and measure terms, approximative modifiers and cumulative predicates. In Section 4, I will explore spatial integrity effects and present novel data concerning proportional partitives with nouns ambiguous between a physical-object and an abstract-object reading. In Section 5, I will provide a typology of Polish PQs based on the examined data. In Section 6, I will describe the theoretical background adopted for the analysis including the theories of degree semantics, approximatives, mereotopology and partitivity. In Section 7, I will propose that an interaction between degree-semantic and mereotopological properties of particular PQs leads to the typology given in Section 5. Finally, Section 8 will conclude the paper.

2. MORPHOSYNTACTIC PROPERTIES

Before I focus on the distribution and meaning of different classes of Polish PQs, let me discuss some of their formal properties. I will begin with examining the morphological make-up of each of the investigated expressions. The relevant morpheme orderings are given in (6)–(9). As one can see, particular PART PQs as well as QUARTER and HALF PQs are morphologically related, specifically each class shares the same root.

(6) a. część-∅
root-inflectional.marker
'part$_1$'

b. cząst-k-a
root-derivational.suffix-inflectional.marker
'part$_2$'

(7) a. ćwierć-∅
root-inflectional.marker
'quarter$_1$'

b. ćwiart-k-a
root-derivational.suffix-inflectional.marker
'quarter$_2$'

(8) a. pół
root
'half$_1$'

b. poł-ow-a
root-derivational.suffix-inflectional.marker
'half$_2$'

c. poł-ów-k-a
root-derivational.suffix$_1$-derivational.suffix$_2$-inflectional.marker
'half$_3$'

(9) większ-ość-∅
root-derivational.suffix-inflectional.marker
'most'

Notice that *pół* ('half$_1$'), see (8a), is somewhat defective in that it is uninflected and can only occur in contexts calling for the nominative and accusative forms that are in this case homophonous.[3] Furthermore, *cząstka* ('part$_2$'), *ćwiartka* ('quarter$_2$') and *połówka* ('half$_3$') are all derived by the same element, i.e., the derivational suffix *-k-*, as illustrated in (6b), (7b) and (8c), respectively. This morpheme is a polyfunctional nominalizer that is used to derive feminine nouns including, e.g., feminine occupational terms, diminutives and denumeral group nouns. Concerning the root of the PQ *większość* ('most'), it corresponds to the comparative form of the adjective *duży* ('big'), namely *większy* ('bigger').

All of the PQs in question allow for adjectival modification and license gender agreement, see (10)–(13). While *ćwierć* ('quarter$_1$') and *pół* ('half$_1$') trigger neuter agreement on adjectives and demonstratives, *część* ('part$_1$'), *większość* ('most') and forms derived with the suffix *-k-* are feminine. Furthermore, Polish PQs assign the genitive case to the NPs they c-command in partitive constructions. As witnessed in (10)–(13), the feminine noun *cytryna* ('lemon') appears in the genitive form *cytryny*.

(10) a. ta mała część cytryny
this.F.SG small.F.SG part$_1$.F lemon.GEN

b. ta mała cząstka cytryny
this.F.SG small.F.SG part$_2$.F lemon.GEN

(11) a. to drugie ćwierć cytryny
this.N.SG second.N.SG quarter$_1$.N lemon.GEN

b. ta druga ćwiartka cytryny
this.F.SG second.F.SG quarter$_2$.F lemon.GEN

(12) a. to drugie pół cytryny
this.N.SG second.N.SG half$_1$.N lemon.GEN

b. ta druga połowa cytryny
this.F.SG second.F.SG half$_2$.F lemon.GEN

c. ta druga połówka cytryny
this.F.SG second.F.SG half$_3$.F lemon.GEN

[3]Polish has also other uninflected quantifiers that can appear only in the nominative/accusative, e.g., *dużo* ('many/much') and *mało* ('few/little'). This is a general Slavic trait attested also, e.g., in Czech and Russian.

(13) ta zdecydowana większość cytryny
this.F.SG decisive.F.SG most.F lemon.GEN

Concerning grammatical number, the PQs in (10)–(13) generally trigger singular agreement on their modifiers. Nonetheless, the situation is more complex than reported in (11a) and (12a). Based on corpus examples such as (14) with the plural demonstrative *te* ('these'), Przepiórkowski (2006) argues that *ćwierć* ('quarter$_1$') and *pół* ('half$_1$') are inherently plural.

(14) %Zaczną się niebawem prace polowe, więc te pół kilometra jest
will.begin REFL soon works field.ADJ so these half$_1$ kilometer.GEN is
konieczne.
necessary
'Field work will start soon so this half a kilometer (road) is necessary.' NCP

However, it should be noted that this agreement pattern seems to be attested only in constructions with numerals and measure terms and even in such constructions the verb agrees in the singular, e.g., see *jest* ('is') in (14) (though this may indicate the agreement with the noun and not the quantifier). Moreover, in modern Polish neuter singular demonstratives such as *to* ('this') are being gradually replaced by colloquial forms like *te* ('this'), which are homophonous to plural forms, e.g., *te* ('these'). Finally, for some speakers of Polish, sentences such as (14) are unacceptable and only singular agreement is possible.[4] Of course, this is not to say that there are no speakers who accept (14) since such examples are definitely attested (also in official registers); rather, it seems that there is some inter-speaker variation with this respect. In any case, I will remain agnostic with respect to the issue of grammatical number of *ćwierć* ('quarter$_1$') and *pół* ('half$_1$').

As for verbal agreement, Polish PQs display three patterns illustrated in (15). Expressions derived with the suffix *-k-* and *połowa* ('half$_2$') require feminine forms of the verb and the participle in (15a). On the other hand, *ćwierć* ('quarter$_1$') and *pół* ('half$_1$') trigger neutral agreement, see (15b), which is default agreement in constructions with nouns modified by higher (>5) numerals (Dziwirek 1990). Finally, as witnessed in (15c), *część* ('part$_1$') and *większość* ('most') feature both patterns.

(15) a. {Cząstka / Ćwiartka / Połowa / Połówka} dyni została zjedzona.
part$_2$ quarter$_2$ half$_2$ half$_3$ squash.GEN was.F.SG eaten.F.SG
'A part/quarter/half of the squash was eaten.'

b. {Ćwierć / Pół} dyni zostało zjedzone.
quarter$_1$ half$_1$ squash.GEN was.N.SG eaten.N.SG
'A quarter/half of the squash was eaten.'

c. {Część / Większość} dyni {została zjedzona / zostało zjedzone}.
part$_1$ most squash.GEN was.F.SG eaten.F.SG was.N.SG eaten.N.SG
'Part/Most of the squash was eaten.'

[4]This holds at least for the author of this paper as well as four other native speakers from various parts of Poland that have been consulted for the acceptability of (14) and similar examples.

Having briefly discussed morphosyntactic issues, let us now move on to the core of the data part of this paper. In the next section, I will discuss certain non-trivial aspects of the distribution of different types of Polish PQs.

3. DISTRIBUTIONAL PROPERTIES

In order to determine distributional properties of different types of Polish PQs, I have conducted a corpus study based on the National Corpus of Polish (NCP), which is a representative corpus of the Polish language containing more than 1.5 billion words (Przepiórkowski et al. 2012). I have examined a number of syntactic environments in which each of the PQs in question can occur. In particular, I have searched for occurrences of PQs with numerals and measure terms, see (16) for a schematic representation, approximative modifiers equivalent to *almost*, as in (17), and cumulative predicates such as plurals and mass nouns, see (18).[5] I have also collected most frequent collocations of each of the PQs under examination.

(16) PQ Num/MeasP.GEN (17) 'almost' PQ NP.GEN (18) PQ Pl/MassNP.GEN

The relevance of the corpus-based methodologies lies in that they can reveal distributional patterns in natural contexts and allow for discovering a preference of a given PQ to combine with a particular type of nominal predicates, which in turn can inform us on some non-obvious semantic properties of that PQ, e.g., a preference for plurals or NPs designating solid concrete objects that can be divided into pieces. However, in order to determine whether the fact that a particular combination of a PQ with another expression is unattested in the corpus sample happens to be accidental or rather results from the infelicity of that configuration, the corpus study was supplemented with a number of introspective insights and native speaker intuitions. I will begin with a short methodological comment.

3.1. Excluded idiomatic uses

Before I discuss the results of the corpus study, let me briefly note that there are a number of frequent idiomatic uses of some of the Polish PQs, which I have excluded from the analysis.[6] For instance, the noun *cząstka* is polysemous. Apart from the relevant quantifier meaning, i.e., 'part', it can also mean 'particle', as used in physics to refer to an extremely small constituent of matter. To make things even more complex, there are in fact two quantifier senses of *cząstka* ('part_2'). The one I will not analyze here is just a diminutive form derived from *część* ('part_1'), which often appears modified by the adjectives *mała* and *niewielka* (both 'small'). Its meaning can be

[5]Recall that a predicate is cumulative if and only if it holds that if that predicate is true of both of *a* and *b*, then it is also true of the sum of *a* and *b*. For instance, *juice* is cumulative since if *a* is juice and *b* is juice, then the sum of *a* and *b* is also juice. On the other hand, *orange* is not cumulative because if *a* is an orange and *b* is an orange, then it does not follow that *a* and *b* together are an orange. Instead, we need a different predicate, specifically *oranges*, to refer to that sum.

[6]The English paraphrases of the meanings given here are based on definitions provided in the following sources: *Wielki słownik języka polskiego* PAN (online: https://www.wsjp.pl/), *Słownik języka polskiego* PWN (online: https://sjp.pwn.pl/) and the Polish edition of *Wiktionary: The Free Dictionary* (online: https://pl.wiktionary.org/).

paraphrased simply as 'small part/portion'. The other two expressions derived by the suffix *-k-*, i.e., *ćwiartka* and *połówka*, also have additional lexicalized meanings, namely '0.25 l bottle of liquor' and '0.5 l bottle of liquor', respectively. Moreover, in sports commentary *ćwiartka* and *połówka* are sometimes used instead of much more common *kwarta* and *połowa* in reference to phases of a game, as in basketball and football. In addition, *ćwierć* is ambiguous between a PQ meaning and a name of an old measure unit of capacity for dry commodities, especially grain.[7]

The meanings mentioned above are interesting cases of lexicalization and closer investigation might shed some light on the process of how quantifier meanings can be utilized in the process of word formation. However, given space limitations in the following sections, I will simply ignore them and focus only on the relevant PQ meanings introduced already in Section 1.

3.2. Numerals and measure terms

The first finding regards the distribution of Polish PQs with respect to expressions that do not designate individuals, but rather abstract objects such as degrees and numbers. If all apparently synonymous PQs were semantic expressions of the same type, one would expect that they all should be either compatible or incompatible with such expressions. Yet, there is an asymmetry. Out of all of the examined PQs only two, namely *ćwierć* ('quarter$_1$') and *pół* ('half$_1$'), can and frequently do co-occur with numeral phrases and measure terms.[8] Some representative examples from the NCP corpus are given in (19) and (20), respectively.

(19) a. W ciągu trzech lat wojny zginęło ćwierć miliona
during three.GEN years.GEN war.GEN died quarter$_1$ million.GEN
ludzi. . .
people.GEN
'During the three years of war a quarter million people died. . .' NCP

b. . . . pół tysiąca [. . .] kibiców wychodziło ze stadionu z
half$_1$ thousand.GEN fans.GEN left from stadium.GEN with
markotnymi minami.
gloomy.INS faces.INS
'. . . five hundred fans were leaving the stadium with gloomy faces.' NCP

(20) a. . . .wiedzą, co znaczy ćwierć tony trotylu w rękach
they.know what means quarter$_1$ tonne.GEN TNT.GEN in hands.LOC
amatora.
amateur.GEN
'. . . they know what a quarter tonne of TNT in the hands of an amateur means.' NCP

[7]Four *ćwierć* units make up one *korzec* unit, hence the name.

[8]According to the NCP collocator, which is based on the data from the PELCRA search engine, the numerals *milion* ('million'), *miliard* ('billion') and *tysiąc* ('thousand') rank at the 3rd, 4th and 16th place, respectively, on the list of nominal collocation candidates within two-word collocations for the lemma *ćwierć* ('quarter$_1$') and at the 2nd, 14th and 25th place for the lemma *pół* ('half$_1$'). The rankings of selected measure terms are as follows: *wiek* ('century') 2nd for the lemma *ćwierć* ('quarter$_1$') and 13th for the lemma *pół* ('half$_1$'), *kilogram* ('kilogram') 7th/16th, *kilometr* ('kilometer') 9th/5th and *litr* ('liter') 12th/3rd.

b. Otwór jaskini leżał w odległości pół kilometra od wsi.
opening cave.GEN lied in distance.LOC $half_1$ kilometer.GEN from village.GEN
'The cave opening was located half a kilometer away from the village.' NCP

Crucially, replacing *ćwierć* ('$quarter_1$') and *pół* ('$half_1$') in constructions with numerals and measure terms with other PQs results in unacceptability. For instance, the use of PQs derived by the suffix *-k-* is infelicitous, as illustrated in (21a). Likewise, *połowa* ('$half_2$'), *część* ('$part_1$') and *większość* ('most') are incompatible with numeral and measure phrases, see (21b), (22a) and (22b), respectively.

(21) a. #W ciągu trzech lat wojny zginęła ćwiartka miliona
during three.GEN years.GEN war.GEN died $quarter_2$ million.GEN
ludzi.
people.GEN
Intended: 'During the three years of war a quarter million people died.'

b. #Połowa tysiąca kibiców wychodziła ze stadionu z
$half_2$ thousand.GEN fans.GEN left from stadium.GEN with
markotnymi minami.
gloomy.INS faces.INS
Intended: 'Five hundred fans were leaving the stadium with gloomy faces.'

(22) a. #Wiedzą, co znaczy część tony trotylu w rękach amatora.
they.know what means $part_1$ tonne.GEN TNT.GEN in hands.LOC amateur.GEN
Intended: 'They know what part of a tonne of TNT in the hands of an amateur means.'

b. #Otwór jaskini leżał w odległości większości kilometra od
opening cave.GEN lied in distance.LOC most.GEN kilometer.GEN from
wsi.
village.GEN
Intended: 'The cave opening was located most of a kilometer away from the village.'

Given the contrasts demonstrated above, the asymmetry between *ćwierć* ('$quarter_1$') and *pół* ('$half_1$'), on one hand, and the corresponding PQs *ćwiartka* ('$quarter_2$') and *połowa* ('$half_2$') and *połówka* ('$half_3$'), on the other, is remarkable. Different distribution suggests that, despite the apparent synonymy, in fact there is a non-trivial difference in the meaning of these expressions. Specifically, only *ćwierć* ('$quarter_1$') and *pół* ('$half_1$') can operate on abstract degree/number structures. This means that in order to capture the distinction in question a mechanism distinguishing between proportional quantification in the domain of individuals and in the domain of degrees/numbers is required.

3.3. Approximative modifiers

Another aspect in which particular types of Polish PQs differ, concerns the possibility to co-occur with approximatives such as *niemal* ('nearly') and *prawie* ('almost'). It turns out that the distribution of such modifiers is restricted and they are attested only with *ćwierć* ('quarter$_1$'), *pół* ('half$_1$'), *połowa* ('half$_2$') and *większość* ('most'), see (23).

(23) a. Niebawem ze starszym o prawie ćwierć wieku kolegą [...]
soon with older.INS by almost quarter$_1$ century.GEN friend.INS
połączył ją płomienny romans.
connected her passionate affair
'Soon, she had a passionate affair with a friend [...] almost 25 years older than her.' NCP

b. ... obie miały okulary automobilowe zakrywające niemal pół twarzy...
both had eyeglasses automobile.ADJ covering nearly half$_1$ face.GEN
'... they both had car goggles covering nearly half of the face...' NCP

c. Prawie połowa żywności jest importowana...
almost half$_2$ food.GEN is imported
'Almost half of the food is imported...' NCP

d. Niemal większość inwestycji [...] zrealizowano bez pozwolenia...
nearly most investments.GEN was.realized without permission.GEN
'Nearly a majority of investments [...] were realized without the permission...' NCP

On the other hand, partitives with *część* ('part$_1$'), *cząstka* ('part$_2$'), *ćwiartka* ('quarter$_2$') and *połówka* ('half$_3$') modified by approximatives are unattested in the NCP corpus. Moreover, attempts to construct felicitous examples do not give positive results, see (24). And though there seems to be a detectable contrast between sentences such as (24a) and (24b), on the one hand, and (24c) and (24d), on the other, the latter are still judged as somewhat strange. In any case, constructions with approximatives and the PQs in questions are degraded at best.

(24) a. #Niemal część arbuza zgniła.
nearly part$_1$ watermelon.GEN rotted
Intended: 'Nearly part of the watermelon got spoiled.'

b. #Niemal cząstka pomarańczy spleśniała.
nearly part$_2$ orange.GEN got.moldy
Intended: 'Nearly a part of the orange got moldy.'

c. ?Niemal ćwiartka chleba brzydko pachnie.
nearly quarter$_2$ bread.GEN badly smells
Intended: 'Nearly a quarter of the bread smells badly.'

d. ?Niemal połówka jabłka jest zielona.
nearly half$_3$ apple.GEN is green
Intended: 'Nearly a half of the apple is green.'

From the facts that natural occurrences of *część* ('part$_1$'), *cząstka* ('part$_2$'), *ćwiartka* ('quarter$_2$') and *połówka* ('half$_3$') are not attested in the NCP and the weirdness of the examples in (24), I conclude that these PQs are incompatible with approximative modifiers, while other Polish PQs are compatible with such expressions. At the same time, given the slight difference in judgments between (24a–b), on the one hand, and (24c–d), on the other, it is possible that the source of the incompatibility in the two cases is not the same. Hence, to account for the contrasts, one needs to identify what semantic features are necessary for the felicitous interaction with the meaning of approximatives.

3.4. Cumulative predicates

Corpus data reveals also that various types of Polish PQs differ with respect to the compatibility with cumulative predicates such as mass nouns and plurals. While *część* ('part$_1$'), *połowa* ('half$_2$') and *większość* ('most') take such expressions as their complements in partitive constructions, the other quantifiers do not. For instance, (25) and (26) give some of many corpus examples of constructions with plurals and mass nouns, respectively. All of them are ordinary well-formed Polish sentences.

(25) a. . . . część kierowców traktowała mnie jak spowiednika.
part$_1$ drivers.GEN treated me as confessor.GEN
'. . . some of the drivers treated me as a confessor.' NCP

b. . . . wywinął tylko ciupagą i połowa napastników padła na ziemię.
he.brandished only axe.INS and half$_2$ agressors.GEN fell on ground.ACC
'. . . he only brandished an axe and half of the agressors hit the ground.' NCP

c. Większość autokarów [. . .] kursuje zmienionymi trasami.
most coaches.GEN runs modified.INS routes.INS
'Most of the coaches [. . .] run on modified routes.' NCP

(26) a. . . . część drewna zawsze ulega zmarnowaniu podczas obróbki.
part$_1$ wood.GEN always undergoes waste during processing.GEN
'. . . some of the wood always gets wasted during industrial treatment.' NCP

b. Na początku XX wieku z Azerbejdżanu pochodziła
on beginning.LOC 20th century.GEN from Azerbaijan.GEN came
połowa ropy naftowej wydobywanej na całym świecie.
half$_2$ oil.GEN petroleum.ADJ.GEN extracted.GEN on entire.LOC world.LOC
'At the beginning of the 20th century half of the oil extracted
worldwide came from Azerbaijan.' NCP

c. Dlaczego większość wody tajemniczo znikła?
why most water.GEN mysteriously disappeared
'Why did most of the water mysteriously disappear?' NCP

On the other hand, *cząstka* ('part$_2$'), *ćwierć* ('quarter$_1$'), *ćwiartka* ('quarter$_2$'), *pół* ('half$_1$') and *połówka* ('half$_3$') appear to be incompatible with mass nouns and plurals. Such combinations

either do not occur in the NCP or occur only marginally and can be classified as noise.[9] Furthermore, the awkwardness of the sentences in (27) and (28) illustrates their infelicity with plurals and mass terms, respectively.

(27) a. #Cząstka kierowców traktowała mnie jak spowiednika.
part$_2$ drivers.GEN treated me as confessor.GEN
Intended: 'Some of the drivers treated me as a confessor.'

b. #Wywinął tylko ciupagą i pół napastników padło na ziemię.
he.brandished only axe.INS and half$_1$ agressors.GEN fell on ground.ACC
Intended: 'He only brandished an axe and half of the agressors hit the ground.'

c. #Ćwierć autokarów kursuje zmienionymi trasami.
quarter$_1$ coaches.GEN runs modified.INS routes.INS
Intended: 'A quarter of the coaches run on modified routes.'

(28) a. #Ćwierć drewna zawsze ulega zmarnowaniu podczas obróbki.
quarter$_1$ wood.GEN always undergoes waste during processing.GEN
Intended: 'A quarter of the wood always gets wasted during industrial treatment.'

b. #Na początku XX wieku z Azerbejdżanu pochodziło pół
on beginning.LOC 20th century.GEN from Azerbaijan.GEN came half$_1$
ropy naftowej wydobywanej na całym świecie.
oil.GEN petroleum.ADJ.GEN extracted.GEN on entire.LOC world.LOC
Intended: 'At the beginning of the 20th century half of the oil extracted worldwide came from Azerbaijan.'

c. #Dlaczego połówka wody tajemniczo znikła?
why half$_3$ water.GEN mysteriously disappeared
Intended: 'Why did half of the water mysteriously disappear?'

Importantly, the constraint on plurals does not seem to be syntactic, but rather due to a semantic restriction. In fact, in the NCP one can find examples of partitives with PQs derived with the suffix *-k-* taking pluralia tantum as their complements, as in (29). Crucially, however, in such constructions pluralia tantum are interpreted as referring to singular objects and not to pluralities. For instance, in (29a) the genitive form of the plurale tantum noun *usta* ('mouth') cannot be understood as designating a collection of mouths. Probably, an even better example is given in (29b) since in Polish the proper name for Hungary, namely *Węgry*, is a plural form lacking a singular counterpart.

[9]For instance, in the entire balanced NCP subcorpus, I have found only one occurrence of a partitive including *pół* ('half$_1$') with a regular plural noun referring to a plurality of entities. However, the attested example in (i) displays clear dialectal features and it has not been judged acceptable by any of the speakers of Standard Polish I have consulted.

(i) %A on mi pedział, że pół posłów to nie wie, o co się rozchodzi.
and he me told that half$_1$ congressmen that NEG know about what REFL is.about
'And he told me that half of the congresmen don't know what's that all about.'

(29) a. . . . uśmiechnęła się połówką ust.
she.smiled REFL $half_3$.INS mouth.PL.GEN
'. . . she smiled with half her mouth.' NCP

b. Do ich rodziców należą latyfundia, chyba niewiele mniejsze
to their parents belong latifundia probably not.much smaller
niż ćwiartka Węgier. . .
than $quarter_2$ Hungary.PL.GEN
'Their parents own latifundia, which are probably a bit smaller than a quarter of Hungary. . .' NCP

Based on the data discussed in this section, I conclude that *ćwierć* ('$quarter_1$'), *pół* ('$half_1$') as well as PQs derived by the suffix *-k-* can only combine with predicates denoting sets of singular objects, whereas other Polish PQs are also compatible with mass terms and plurals. Under standard assumptions about proportional quantification, this contrast is somewhat unexpected. Therefore, a proper treatment of Polish PQs has to involve a notion that would capture the distinction between part-whole structures of singular entities, on the one hand, and that of pluralities and masses, on the other, and explain why the semantics of certain PQs is sensitive to this distinction, whereas the semantics of others is not.

3.5. Collocations

The final piece of corpus-based evidence concerns frequent collocations of the examined PQs. Using the NCP collocator based on the PELCRA search engine, one can determine what nominal expressions follow immediately a given lemma in the corpus sample most frequently.[10] In this section, I briefly discuss most common complements of Polish PQs, as attested in the NCP.[11]

As already mentioned in Section 3.2, *ćwierć* ('$quarter_1$') and *pół* ('$half_1$') most frequently co-occur with numerals and measure words designating units of time, volume, length, etc. Though such expressions form the absolute majority of the partitive constructions headed by *ćwierć* ('$quarter_1$') and *pół* ('$half_1$'), other relatively frequent collocators include several container nouns as well as nouns denoting solid objects.[12]

On the other hand, *część* ('$part_1$'), *połowa* ('$half_1$') and *większość* ('most') frequently combine with various types of common nouns including concrete count nouns, abstract nouns, group nouns and mass nouns. Though all of those PQs can combine with both singulars and plurals, as demonstrated in Section 3.4, *część* ('$part_1$') seems to more often select for singulars, *połowa* ('$half_2$') appears to be more or less neutral with this respect and *większość* ('most') strongly prefers plurals.[13]

[10]I looked for nouns occurring immediately to the right of a given lemma with at least 5 occurrences in the sample of 10,000 tokens. Due to space limitations, I will ignore noise resulting from incorrect tagging.

[11]The generalizations are made with respect to the relevant PQ meanings ignoring other homophonous uses as well as idiomatic expressions, recall Section 3.1.

[12]For instance, *szklanka* ('glass') ranks 17th for the lemma *ćwierć* and 23rd for the lemma *pół*, whereas *bochenek* ('loaf') ranks 14th/26th.

[13]The highest ranking noun occurring in the plural in partitives headed by *część* is *kontynent* ('continent'), which ranks 20th, whereas out of the 20 highest ranking nouns for *większość* only one, namely *społeczeństwo* ('society') (ranking 4th) appears in the singular.

Finally, as already discussed in Section 3.4, PQs derived by the suffix *-k-* are only compatible with singular count nouns. Most frequently, they co-occur with nouns denoting solid objects with an internal structure composed of identifiable segments. According to the NCP collocator, the relevant uses of *cząstka* ('part$_2$'), *ćwiartka* ('quarter$_2$') and *połówka* ('half$_3$') most often combine with countable food terms.[14] Another class of expressions these PQs frequently co-occur with are nouns denoting solid artifacts.[15] What all those nouns seem to have in common is that they denote physical entities such that one can easily divide (or imagine diving them) into compact pieces.[16]

To conclude, the collocation study revealed that *ćwierć* ('quarter$_1$') and *pół* ('half$_1$') primarily combine with expressions denoting degrees and numbers. PQs derived with the suffix *-k-* select for singular count concrete NPs, whereas *część* ('part$_1$'), *połowa* ('half$_1$') and *większość* ('most') can co-occur with various types of nominals. In the next section, I will discuss two more respects in which Polish PQs differ from each other. Specifically, I will examine properties related to the internal structure of parts denoted by partitives with singular count NPs.

4. ADDITIONAL SEMANTIC PROPERTIES

The data discussed in the previous section revealed interesting contrasts in the distribution of particular Polish PQs. We saw that those contrasts are not syntactic in nature, but rather they seem to stem from certain non-trivial semantic differences between the PQs in question. In this section, I will discuss further intriguing effects related to the meaning of PQs derived by the suffix *-k-*.

4.1. Spatial integrity

Wągiel (2018, 2019) observed that the Polish PQ *połówka* ('half$_3$') has a property of imposing a remarkable constraint on the part-whole structure of entities in the denotation of the entire partitive. In particular, *połówka* ('half$_3$') restricts the relevant set by designating only those parts of a whole that constitute 50% of its volume and form a spatially contiguous object. In other words, it excludes arbitrary sums of portions of matter, which do not form a topologically compact configuration.

[14]For instance, the noun *pomarańcza* ('orange') ranks 8th for the lemma *cząstka*, 5th for *ćwiartka* and 1st for *połówka*; the noun *cytryna* ('lemon') ranks 2nd for the lemma *ćwiartka* and 3rd for *połówka*; *kurczak* ('chicken') ranks 9th for *ćwiartka*; *orzech* ('nut') ranks 7th for *połówka*, etc.

[15]For instance, the nouns *relikwia* ('relic') and *różaniec* ('rosary') rank 10th and 12th, respectively, for the lemma *cząstka*; the noun *papier* ('paper; sheet of paper') ranks 7th for the lemma *ćwiartka*; the nouns *papieros* ('cigarette') and *kamienica* ('house') rank 9th and 15th, respectively, for *połówka*, etc.

[16]Potential counterexamples to this generalization are several abstract nouns that frequently co-occur with *cząstka* ('part$_2$'), e.g., *prawda* ('truth') ranks 16th and *dusza* ('soul') ranks 22nd on the list of collocation candidates. Notice, however, that it is possible that in such examples the sense of 'small part/portion' is the salient one. In the worst case scenario, however, the analysis to be presented in Section 7 might not be able to explain those cases.

To illustrate the effect described above, let us consider the three sentences in (30), which differ only with respect to whether *pół*, *połowa* or *połówka* (all 'half') have been used in the partitive. At first glance, they seem to be utterly synonymous, but closer examination reveals that they differ in a non-trivial way. (30a) and (30b) would be true in both scenarios schematically depicted in Figs 1 and 2, where the dashed lines indicate 50% of the volume of the apple eaten by Marysia. Such weak truth conditions differ significantly compared to (30c), which would be true in a scenario represented in Fig. 1, but false in a scenario illustrated in Fig. 2. Wągiel (2018, 2019) proposes that this is because for an entity to count as *połówka jabłka* ('a half of the apple'), it needs to be perceived as a compact integrated portion of matter that can be individuated as an object in its own right. Since the spatial configuration in Fig. 2 does not facilitate such conceptualization, (30c) is infelicitous in that scenario.

(30) a. Marysia zjadła pół jabłka.
Marysia ate half_1 apple.GEN
'Marysia ate half the apple.' ✓CONTIGUOUS, ✓DISCONTIGUOUS

b. Marysia zjadła połowę jabłka.
Marysia ate half_2.ACC apple.GEN
'Marysia ate half the apple.' ✓CONTIGUOUS, ✓DISCONTIGUOUS

c. Marysia zjadła połówkę jabłka.
Marysia ate half_3.ACC apple.GEN
'Marysia ate a half of the apple.' ✓CONTIGUOUS, *DISCONTIGUOUS

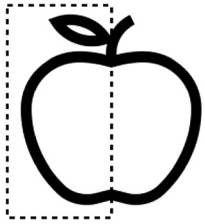

Fig. 1. Contiguous half

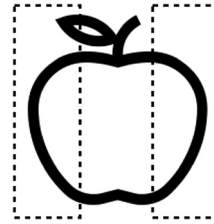

Fig. 2. Discontiguous half

The same contrast also holds between the basic quantifier *ćwierć* ('quarter_1') and the derived form *ćwiartka* ('quarter_2'). While the former imposes no topological restrictions on entities in the denotation of the partitive construction, the latter patterns with *połówka* ('half_3') in that it requires a part constituting 25% of a whole to be perceived as an integrated object that comes in one piece. For instance, (31a) would be true if Marysia simply ate 25% of the watermelon, whereas (31b) requires the portion eaten by Marysia to form an integrated piece.

(31) a. Marysia zjadła ćwierć arbuza.
Marysia ate quarter$_1$ watermelon.GEN
'Marysia ate a quarter of the watermelon.' ✓CONTIGUOUS, ✓DISCONTIGUOUS

b. Marysia zjadła ćwiartkę arbuza.
Marysia ate quarter$_2$.ACC watermelon.GEN
'Marysia ate a quarter of the watermelon.' ✓CONTIGUOUS, *DISCONTIGUOUS

Finally, the PQs *część* ('part$_1$') and *cząstka* ('part$_2$') display the same semantic behavior as discussed above. For instance, (32a) would be true if Marysia ate any portion of the orange irrespective of the fact whether it formed a contiguous or a discontiguous part. On the other hand, (32b) would be true only in a situation when an integrated part, i.e., an orange segment, was eaten by Marysia.

(32) a. Marysia zjadła część pomarańczy.
Marysia ate part$_1$.ACC orange.GEN
'Marysia ate part of the orange.' ✓CONTIGUOUS, ✓DISCONTIGUOUS

b. Marysia zjadła cząstkę pomarańczy.
Marysia ate part$_2$.ACC orange.GEN
'Marysia ate an orange segment.' ✓CONTIGUOUS, *DISCONTIGUOUS

The data discussed in this section provides strong evidence that Polish PQs derived by the suffix *-k-* restrict the denotation of the entire partitive construction to include only those parts that have a particular topological make-up. Specifically, they denote sets of portions of an entity that are perceived as constituting contiguous integrated parts of a whole.

4.2. Physical and abstract objects

Another data set concerns a class of nouns that systematically have (at least) two senses. Nouns such as *bank* can simultaneously refer to a concrete physical entity, e.g., a building, and to some abstract object, e.g., an institution. To illustrate this, let us consider the classical examples from the literature on co-predication in (33) (e.g., Pustejovsky 1995; Gotham 2017). The subject DP in (33a) designates a physical volume and its informational content at the same time. Likewise, the noun *school* can be used to simultaneously refer to a building and an educational community, see (33b), whereas *lunch* can mean both food and an eventuality of eating that food, as in (33c).

(33) a. The heavy book is easy to understand.

b. The school that caught fire was celebrating 4th of July when the fire started.

c. Lunch was delicious but lasted hours.

The phenomenon is cross-linguistically widespread and it is also attested in Polish. For instance, a good example of the noun in question is *książka* ('book'). As evidenced by (34a), it can simultaneously designate an informational object, i.e., the content authored by Olga Tokarczuk, and a physical entity, i.e., a volume that is lying on the table. Similarly, *posiłek* ('meal') in (34c) refers to both a physical object, i.e., cooked food, and an event of eating.

(34) a. Książka autorstwa Olgi Tokarczuk leży na stole.
book authorship.GEN Olga.GEN Tokarczuk lies on table.LOC
'A book by Olga Tokarczuk is on the table.'

b. Posiłek był przesolony i trwał do zmroku.
meal was oversalted and lasted to dusk.GEN
'The meal was oversalted and lasted until dusk.'

Before I investigate the behavior of nouns such as *książka* ('book') and *posiłek* ('meal') in proportional partitives in Polish, let us discuss a seemingly different, yet pertinent construction in Hungarian.

4.2.1. Sortal classifiers in Hungarian. Hungarian is an optional classifier language (Beckwith 1992; Csirmaz & Dékány 2014). It has a number of sortal classifiers, which can appear in quantificational contexts though their occurrence is not mandatory, see (35).

(35) a. hét (fej) saláta
seven CL lettuce
'seven lettuces'

b. hét (szál) gyertya
seven CL candle
'seven candles'

However, what is of special interest here, is the interpretative difference between constructions with a classifier and those without it. As observed by Schvarcz & Wohlmuth (2021), the use of the general classifier *darab* gives rise to a non-trivial semantic effect in numeral phrases containing nouns of the type discussed in the previous section. Let us consider the semantic contrast illustrated in (36). Depending on a context, the Hungarian noun *könyv* ('book') in (36a) can have either of the two senses. Thus, the entire phrase can refer either to three physical volumes or to three informational objects, i.e., books individuated in terms of content. On the other hand, the classifier construction in (36b) can only designate physically distinct entities, i.e., it would be true of three separate volumes and false of, say, one volume containing three independent novels.

(36) a. három könyv
three book
'three books' ✓PHYSICAL, ✓ABSTRACT

b. három darab könyv
three CL book
'three books' ✓PHYSICAL, #ABSTRACT

Schvarcz & Wohlmuth (2021) propose that the semantic difference between (36a) and (36b) stems from the fact that the general classifier *darab* introduces certain restrictions on the denotation of the noun. Specifically, it rules out entities that are not conceptualized as physically distinct integrated objects.

4.2.2. Parallel with Polish quantifiers derived by *-k-*. Interestingly, a very similar effect to what has been reported with respect to the Hungarian general classifier *darab* arises in Polish partitive constructions with PQs derived by the suffix *-k-*. For instance, the phrase in (37a) can be used to refer both to a physical entity, i.e., half of a volume, and an abstract object, i.e., half of its content. However, the partitive construction in (37b) can only denote a part of an integrated physical book, i.e., a half of a volume.

(37) a. połowa książki
half$_2$ book.GEN
'half a book' ✓PHYSICAL, ✓ABSTRACT

b. połówka książki
half$_3$ book.GEN
'half of a book' ✓PHYSICAL, #ABSTRACT

The intuitions concerning the meanings of (37a) and (37b) discussed above are further corroborated by the fact that partitives involving PQs with the suffix *-k-* are infelicitous as complements of verbs calling for abstract arguments, as witnessed by the contrast in (38). Since reading is a cognitive process of decoding symbols to derive meaning, it is about processing abstract informational content rather than physical entities. Consequently, the transitive verb *przeczytała* ('read'), which designates reading events, requires a nominal expression that can denote a set of informational objects as its first argument, e.g., (38a). Since partitives with *połówka* ('half$_3$') always refer to physically distinct integrated entities, the sentence in (38b) is weird.

(38) a. Marysia przeczytała połowę książki.
Marysia read half$_2$.ACC book.GEN
'Marysia read half a book.'

b. #Marysia przeczytała połówkę książki.
Marysia read half$_3$.ACC book.GEN
Intended: 'Marysia read half a book.'

Another example concerns nouns that can simultaneously designate physical objects and abstract eventualities. For instance, let us compare the meanings of the phrases in (39). While (39a) can refer either to a material entity, i.e., some of the cooked food, or to a phase of an event of eating food, (39b) can only mean the former.

(39) a. część posiłku
part$_1$ meal.GEN
'part of a meal' ✓PHYSICAL, ✓ABSTRACT

b. cząstka posiłku
part$_2$ meal.GEN
'part of a meal' ✓PHYSICAL, #ABSTRACT

The interpretative asymmetry between (39a) and (39b) again results in the incompatibility of the latter with expressions denoting properties that can only be predicated of events. Hence, while (40a) is a felicitous sentence in Polish, (40b) is funny. This is because the VP *trwała do zmroku* ('lasted until dusk') designates a temporal property that is incompatible with material objects.

(40) a. Pierwsza część posiłku trwała do zmroku.
first part$_1$ meal.GEN lasted to dusk.GEN
'The first part of the meal lasted until dusk.'

b. #Pierwsza cząstka posiłku trwała do zmroku.
first part$_2$ meal.GEN lasted to dusk.GEN
Intended: 'The first part of the meal lasted until dusk.'

The data discussed in this section provide further evidence suggesting that Polish PQs derived with the suffix *-k-* restrict the denotation of the entire partitive construction to include only parts that are conceptualized as physically distinct integrated objects. This means that a proper account of the semantics of these expressions has to build on a mechanism that distinguishes between structured and unstructured parthood relations, i.e., parts that form integrated portions of stuff and parts that are arbitrary sums of stuff. Before describing theoretical tools I will use to derive this and other properties of Polish PQs discussed so far, let us summarize the data.

5. TYPOLOGY

In previous sections, we saw that Polish PQs do not constitute a uniform linguistic category. Instead, they differ in a number of semantic properties including: i) (in)compatibility with numerals and measure words, ii) (in)compatibility with approximative modifiers, iii) (in)compatibility with cumulative predicates and iv) absence or presence of semantic effects relating to the physical integrity of referents. Table 1 summarizes the findings.

As it can be seen in Table 1, based on the properties described above, one can divide Polish PQs discussed in this paper into four distinct classes. Class 1 consists of *ćwierć* ('quarter$_1$') and *pół* ('half$_1$'), which are the only PQs able to combine with numerals and measure terms. In addition, they can be modified by approximative modifiers equivalent to ALMOST but cannot

Table 1. Typology of Polish proportional quantifiers

	ćwierć 'quarter$_1$'	*pół* 'half$_1$'	*połowa* 'half$_2$'	*większość* 'most'	*część* 'part$_1$'	*cząstka* 'part$_2$'	*połówka* 'half$_3$'	*ćwiartka* 'quarter$_2$'
measure terms	✓	✓	*	*	*	*	*	*
approximatives	✓	✓	✓	✓	*	*	*	*
cumulative predicates	*	*	✓	✓	✓	*	*	*
integrity requirement	*	*	*	*	*	✓	✓	✓
CLASS	1		2		3	4		

occur with mass nouns and plurals and do not give rise to an obligatory physical integrity reading, i.e., the denotation of the entire partitive construction consists of both contiguous objects and arbitrary sums. Class 2 includes the PQs *połowa* ('half_2') and *większość* ('most'), which are the only expressions among the discussed ones that are compatible with both approximative modifiers and cumulative predicates. At the same time, they are infelicitous with number words and measure terms and do not give rise to the physical integrity effect. The sole representative of Class 3 is *część* ('part_1'), which can co-occur with plurals and mass nouns but fails to combine with numerals and measures as well as with approximatives. Similar to the PQs discussed so far, partitives headed by *część* ('part_1') can refer to both physical contiguous objects and other types of entities. Finally, the PQs *cząstka* ('part_2'), *ćwiartka* ('quarter_2') and *połówka* ('half_3'), which are all derived with the suffix *-k-*, constitute Class 4. Their defining property is that they restrict the denotation of the entire partitive construction to include only integrated portions of matter conceptualized as objects in their own right. This characteristic results in that they are incompatible with measure terms, approximative modifiers and predicates referring to scattered entities or arbitrary sums of things.[17]

The main claim of this paper is that the typology in Table 1 can be captured as an outcome of an interaction between various semantic properties encoded in the meaning of particular PQs. Specifically, I argue that it results from the interplay of degree-semantic and mereotopological features such as an ability to measure degrees and to designate a certain type of part-whole structure, respectively. I propose that Class 1 PQs have inherent degree semantics, which allows them to operate on numbers and measures. If required, such expressions can be shifted to operate on individuals. On the other hand, PQs in Classes 2 and 3 simply designate a part of an individual and impose no additional restrictions. Consequently, they can target singular, plural and mass part-whole structures and yield both spatially structured and unstructured parts. Classes 2 and 3 differ, however, in that the latter is semantically simpler and does not indicate (even vaguely) any value. This results in the incompatibility of Class 3 with approximatives. Finally, Class 4 consists of expressions that function as object forgers by imposing spatial conditions on entities they yield. Specifically, they take solid objects and return parts that can be conceived of as solid objects within the whole themselves.

In the remaining part of the paper, I will sketch the relevant theoretical framework and propose an analysis that will allow us to account for the facts represented in Table 1.

6. FRAMEWORK

Before I show how the typology of Polish PQs presented in the previous section can be derived, I will discuss a number of assumptions regarding certain aspects of the meaning of nominal expressions that are necessary for the analysis in Section 7. The first set of assumptions concerns degree semantics and is needed to explain the distribution of the PQs under examination with respect to numerals and measure terms as well as approximative modifiers. The second set of assumptions regards mereotopology, i.e., mereology augmented with topological notions, and is

[17]Interestingly, the typology in Table 1 is partially supported by the verbal agreement patterns discussed in Section 2, recall (15). Specifically, Class 1 PQs display neuter/default agreement, whereas Class 2–4 PQs either obligatorily trigger feminine agreement or can trigger feminine agreement (along with neuter/default agreement).

required for accounting for the contrast concerning the (in)compatibility with cumulative predicates and the spatial integrity requirement.

6.1. Degree semantics

In Section 3.2, I demonstrated that only the morphologically simplex PQs *ćwierć* ('quarter$_1$') and *pół* ('half$_1$) can combine with numerals and measure terms, recall (19)–(22). This fact calls for distinguishing typally between expressions that can operate on degree structures and those that cannot. Therefore, following a long tradition dating back at least to Cresswell (1976), I assume an ontology with degrees. Degrees are elements of totally ordered sets called scales (e.g., von Stechow 1984; Heim 1985; Kennedy 1997). Here, I take degrees to be points on a scale, i.e., abstract objects of the primitive type d, rather than intervals of a scale (as proposed, e.g., by Schwarzschild & Wilkinson 2002). Such points can be ordered along different dimensions giving rise to various types of scales, e.g., a scale of height, a scale of weight, etc. I also assume that numerals make reference to degrees on a cardinality scale.

6.1.1. Measure phrases. Following Kotek (2013), I assume that measure phrases denote sets of degrees, i.e., expressions of type $\langle d, t\rangle$. For instance, the meaning of the English expression *nine kilograms* can be represented as a function from degrees to truth values that yields True for any degree that equals 9 kg, see (41).

(41) $[\![\text{nine kilograms}]\!] = \lambda d[d = 9 \text{ kg}]$

Similar to predicates of individuals of type $\langle e, t\rangle$, measure phrases (type $\langle d, t\rangle$) can be shifted to singular terms (type d) by means of standardly assumed machinery. Specifically, the ι-operator, existential closure as well as a choice function can be applied. The fact that degree expressions are treated on a par with nominals denoting sets of individuals will allow for capturing Class 1 PQs as inherent measures that can target both degree and individual part-whole structures, as discussed in Section 3.2.

6.1.2. Contextually conditioned measure functions. Furthermore, the fact that PQs in Classes 2 and 3 can operate on different types of part-whole structures within the domain of individuals, recall Section 3.4, calls for a notion that would explain why the very same PQ can quantify either in terms of cardinality or in terms of volume, depending on what predicate it combines with. Therefore, building on the system developed by Bale & Barner (2009) to account for cross-categorial uses of *more*, I postulate a generalized measure function μ along with the mechanism of contextual conditioning, as defined in (42).

(42) m is interpreted as one of the measure functions m_z in the series $\langle m_1, m_2, m_3 \ldots m_n\rangle$ such that the argument for m is in the range of m_z; furthermore contextually m_z is preferred to m_y if $z < y$

Provided that a cardinality measure function devised to count individuated objects is ranked higher than measure functions measuring in terms of volume, (42) guarantees that μ yields

different measures for different nominal expressions. This is because the measure functions that are ranked higher in the ordering are favored over those ranked lower. In particular, it returns a number for DPs denoting sets of pluralities of individuated entities and volume for other types of nominals. To illustrate, the very same expression *more* would trigger counting singular oranges in the phrase *more oranges* and quantification in terms of volume in *more orange juice*. This mechanism will be employed to account for the quantificational behavior of Class 2 and 3 PQs with singular, mass and plural NPs.

6.1.3. Polysemy of measurement. Rett (2014) observes that quantificational expressions can be ambiguous between an individual and a degree reading. For instance, in (43a) the numeral phrase *four pizzas* denotes a plurality of entities such that the property of being vegetarian can be predicated thereof. On the other hand, the very same string in (43b) is naturally interpreted as referring to a particular quantity rather than to a collection of objects.

(43) a. Four pizzas are vegetarian.

b. Four pizzas is more than we need.

In order to account for the polysemy, Rett proposes covert measure operators M-OP$_e$ and M-OP$_d$, see (44a) and (44b), respectively, where μ is a measure function and D is a variable over sets of degrees. These operations apply at the level of the NP. While M-OP$_d$ takes a predicate of degrees as an argument and simply measures a set denoted by it, M-OP$_e$ functions somewhat as a shift between entities and degrees by yielding a degree corresponding to the measure of an individual having the property denoted by the nominal M-OP$_e$ applies to.

(44) a. $[\![\text{M-Op}_e]\!] = \lambda P \lambda d \lambda x[P(x) \wedge \mu(x) = d]$

b. $[\![\text{M-Op}_d]\!] = \lambda D \lambda d[\mu(D) = d]$

Though one can imagine other ways of capturing the polysemy in (43), in this paper I will not go into speculations about technical details of an alternative solution. I will simply assume a mechanism in the spirit of (44) in order to capture the fact that Class 1 PQs are compatible both with expressions denoting sets of individuals and with expressions denoting sets of degrees, as demonstrated in Section 3.2.

6.1.4. Approximative modifiers. The final assumption regarding scalarity concerns the meaning of Polish approximative modifiers such as *prawie* ('almost') and *niemal* ('nearly'), recall Section 3.3. The fact that these expressions are infelicitous with the vague quantifier *część* ('part$_1$') as well as with the PQs derived by the suffix *-k-*, as shown in (24), requires an explanation. I assume that what is of key relevance regarding the restriction on the use of approximatives is an (in)ability of the modified expression to provide a particular type of scale the approximative could operate on.

Here, I adopt Penka's (2005) analysis of cross-categorial uses of *almost*. The core idea behind this approach is that *almost* refers to scalar alternatives. Specifically, it evaluates alternatives that are 'close by' to an original value on the ordered scale. The semantics of *almost* is given in (45), where

$\approx$ stands for the CLOSE-BY relation as well as for the corresponding restrictor variable ranging over scales of propositions. In prose, when *almost* is applied to a proposition p, the resulting expression is true if and only if p is false in the actual world, but there is a true alternative to p that is close by and also happens to be ranked lower than p, as guaranteed by the second conjunct in (45).

(45) $[\![\text{almost}_{\approx}]\!] = \lambda w \lambda p_{\langle s,t\rangle}[\exists q[q \approx p \wedge q(w)] \wedge \neg p(w)]$

Given the semantics above, let us consider an example in which the scale is provided by the sequence of natural numbers, e.g., the sentence in (46a). Assuming that what counts as 'close by' are the values within a deviation of 10% with respect to the value introduced by the numeral, we obtain the truth conditions in (46b). Thus, the number of students who passed the exam ranges from 45 to 49.

(46) a. Almost fifty students passed the exam.

b. n students passed the exam, $45 \leq n \leq 55 \wedge \neg$(50 students passed the exam)

A straightforward consequence of this approach is that quantifiers that indicate a precise value on a scale can be modified by *almost*, see (47a). On the other hand, vague quantifiers such as *some* and *many* do not correspond to exact values on a scale, and thus it is impossible to establish what part of the scale is close by. As a result, they are incompatible with the semantics of *almost*, as witnessed by the infelicity of (47b).

(47) a. Almost {half/all} of the students passed the exam.

b. #Almost {some/several/many} students passed the exam.

All of the assumptions adopted in this section are pretty standard in contemporary semantic theory. In the next section, I will discuss notions that are slightly more controversial as they call into question mainstream approaches to part-whole structures in natural language.

6.2. Mereotopology

The second set of assumptions I adopt in order to derive the typology of PQs in Polish concerns the way parts relate to a whole and to each other. Since Link (1983), mainstream accounts of the meaning of nominal expressions have been grounded in mereology. As such, they distinguish between singular entities and sums thereof, i.e., pluralities. Typically, the two are associated via the PARTHOOD relation $\sqsubseteq$, which relates parts and wholes formed from the parts. This allows to model part-whole relations in various linguistic expressions including plurals and conjunctions. Consequently, the mereological enterprise has proved very successful and led to a number of influential theories extending our understanding of nominal semantics (e.g., Krifka 1989; Landman 2000; Champollion 2017 to name just a few).

However, one drawback of such a purely mereological approach is that it reduces a whole to the mere sum of its parts, and thus neglects the arrangement of parts within the part-whole structure. And yet, as discussed in Section 4.1, the data concerning the spatial integrity inference triggered by

Polish PQs derived by the suffix *-k-*, demonstrated in (30c), (31b) and (32b), call for a framework that would allow for distinguishing between arbitrary sums and structured configurations of entities.

6.2.1. Augmenting mereology with topology. Recent research on the semantics of nouns has demonstrated that pure mereology is insufficient in capturing the meaning of at least some types of nominals. This is because there are a number of natural language expressions that seem to be sensitive to the manner in which parts of a whole are arranged. For instance, Grimm (2012) shows that referents of aggregate nouns such as *gravel* as well as collective number forms in languages like Welsh, e.g., *cacwn* ('hornets (perceived as a swarm)') ~ *cacyn-en* ('hornet'), are best analyzed as clusters, i.e., bundled entities conceptualized as forming a particular spatial configuration. Moreover, Scontras (2014) analyzes expressions such as *grain*, as in *grain of rice*, as atomizers individuating aggregate entities in terms of integrated pieces. Finally, Lima (2014) shows that one needs to distinguish between different spatial configurations in order to account for quantity judgments concerning notional mass nouns in Yudja.

In order to provide background for capturing the effects discussed in Section 4, I adopt a version of mereotopology that takes mereology as the basic component of the theory and extends it with the topological component (Casati & Varzi 1999; Varzi 2007; see also Grimm 2012). The crucial topological notion for our purpose is CONNECTEDNESS (C). This relation is introduced in such a way that it interacts with other definitions and axioms of standard mereology. It is reflexive and symmetric and it is introduced as being implied by OVERLAP (O).

6.2.2. Defining integrated objects. Given such an extension, a number of mereotopological properties can be defined in order to enable us to draw subtle distinctions between different spatial configurations that entities may be in. A key notion that allows for capturing the concept of an integrated object, i.e., an entity that is conceptualized as coming in one piece, as opposed to an arbitrary collection of parts, is the property of SELF-CONNECTED (SC), as defined in (48). In prose, an individual is self-connected if any two parts that form the whole of that individual are connected to each other.

(48) $\mathrm{SC}(x) \stackrel{\mathrm{def}}{=} \forall y \forall z[\forall w[\mathrm{O}(w, x) \leftrightarrow (\mathrm{O}(w, y) \vee \mathrm{O}(w, z))] \rightarrow \mathrm{C}(y, z)]$

Though the notion of self-connectedness is an important concept, it is not enough to model an integrated whole since it does not rule out configurations of externally connected objects, i.e., objects that merely touch each other. This can be achieved by the property of STRONGLY SELF-CONNECTED (SSC), see (49) where INT stands for INTERIOR, i.e., the sum of internal parts of an object. The definition in (49) states that an individual is strongly self-connected if it is self-connected and its interior is self-connected.

(49) $\mathrm{SSC}(x) \stackrel{\mathrm{def}}{=} \mathrm{SC}(x) \wedge \mathrm{SC}(\mathrm{INT}(x))$

Finally, a proper treatment of integrated wholes should accommodate both topological integrity and mereological maximality. Also, integrity should be evaluated relative to a property. Hence, the notion of being MAXIMALLY STRONGLY SELF-CONNECTED (MSSC), see (50), provides the final mereotopological definition of what an integrated whole is. In prose, if an

entity satisfies MSSC, then it is the largest strongly self-connected entity satisfying the relevant property.

(50) $\text{MSSC}(P)(x) \stackrel{\text{def}}{=} P(x) \wedge \text{SSC}(x) \wedge \forall y[P(y) \wedge \text{SSC}(y) \wedge \text{o}(y,x) \rightarrow y \sqsubseteq x]$

With this tool in hand, we can distinguish between integrated wholes and other types of entities. Thus, the notion of MSSC will allow for capturing the distributional constraints regarding singular count concrete NPs as well as the spatial integrity requirement, recall Section 3.4, 4.1 and 4.2. The final set of assumptions concerns the structure and interpretation of partitive constructions in general.

6.3. Partitivity

Following Barker (1998), I model the part-of relation in terms of mereological PROPER PARTHOOD ($\sqsubset$).[18] Though it is typically postulated that in English partitive constructions this relation is expressed by the preposition *of*, cross-linguistically there are various ways in which it can be encoded, e.g., via case marking (de Hoop 2003). Therefore, I propose an abstract element PART introducing $\sqsubset$, as defined in (51), which can be expressed by various formal exponents. For the purpose of this paper, I will assume that PART is encoded in Polish PQs themselves as part of their semantics.

(51) $[\![\text{PART}]\!] = \lambda y \lambda x[x \sqsubset y]$

Another assumption concerns the so-called Partitive Constraint (Jackendoff 1977). According to the semantic explanation of this restriction, the embedded DP in the partitive construction needs to be entity-denoting, i.e., either definite or specific (de Hoop 1997). I assume the standard maximization plus uniqueness (MAX) and choice function (CF) treatment for definiteness (cf. Sharvy 1980) and specificity (cf. Reinhart 1997), respectively. In both cases, the denotation of the NP is turned into type *e*. While in languages such as English MAX and CF are overtly marked, Polish lacks articles, and thus they are often covert.

Given the assumptions above, the interpretation of the partitive construction in Polish is as provided in (52). Of course, depending on a particular PQ the structure can be augmented with some additional semantic information concerning, e.g., the ratio of the quantity of a part compared to that of a whole.

(52) $[\![[\text{PART}[\text{MAX/CF}[\text{NP}]]]]\!] = \lambda x[x \sqsubset [\![\text{MAX/CF}([\![\text{NP}]\!])]\!]]$

With every tool in place, let us now move on to derive the differences in the meaning of the Polish PQs under discussion.

[18] But see Marty (2019) for argumentation for the non-proper parthood relation in partitive constructions such as *three of the lawyers*.

7. DERIVING THE TYPOLOGY

Having introduced all the necessary machinery, let us now demonstrate how various properties of Polish PQs can be accounted for. The core of my claim is that the typology described in Section 5 results from an interaction between degree-semantic and mereotopological features. In particular, I propose that the relevant properties are the following ones. First of all, a PQ either does have or does not have an inherent degree semantics that would enable it to take arguments of type *d*, i.e., numbers and measures. Secondly, for a proposition denoted by a sentence containing a given PQ either there are or there are not available true weaker alternatives that make it compatible with approximative modifiers. Thirdly, when combining with an entity-denoting expression, a PQ does require or does not require the referents of that expression to be perceived as integrated wholes, e.g., via a special presupposition. Finally, a PQ either does introduce or does not introduce a mereotopological restriction on the referents of the entire partitive construction, specifically a constraint that would exclude entities that are not compact objects.

In order to see how the properties postulated above interplay, let us consider Table 2. As one can see, the combination of the proposed features gives rise to four distinct classes in a straightforward way.

Table 2. Semantic properties of Polish proportional quantifiers

	ćwierć 'quarter$_1$'	*pół* 'half$_1$'	*połowa* 'half$_2$'	*większość* 'most'	*część* 'part$_1$'	*cząstka* 'part$_2$'	*połówka* 'half$_3$'	*ćwiartka* 'quarter$_2$'
degree semantics	✓	✓	×	×	×	×	×	×
true alternatives	✓	✓	✓	✓	×	×	×	×
presupposes MSSC	✓	✓	×	×	×	✓	✓	✓
introduces MSSC	×	×	×	×	×	✓	✓	✓
CLASS	1		2		3	4		

With the big picture in mind, let us now discuss each of the PQs in question.

7.1. Class 1: Inherent measures

Let us start with the semantics for Class 1 PQs in Tables 1 and 2 represented by *ćwierć* ('quarter$_1$') and *pół* ('half$_1$'). I propose that underlyingly they are simply measures that can combine either with degree- or entity-denoting expressions. Due to this underspecificity they are the only PQs in Polish that can take measure words and numerals as their complements, recall Section 3.2. In such a case, the entire partitive construction denotes a set of degrees which can be then shifted to type *d*, if needed. For instance, the phrases *ćwierć tony* ('quarter of a tonne') and *pół miliona* ('half a million') get the interpretations in (53a) and (53b), respectively.

(53) a. $[\![\text{ćwierć tony}]\!] = \lambda d[d = 1 \text{ tonne} \times 0.25]$

b. $[\![\text{pół miliona}]\!] = \lambda d[d = 1{,}000{,}000 \times 0.5]$

Importantly, however, due to their underspecified status, Class 1 PQs can also combine with entity-denoting nouns provided that they are not cumulative predicates, recall Section 3.4. This restricted distribution can be explained by postulating that *ćwierć* ('quarter$_1$') and *pół* ('half$_1$') introduce a special restriction concerning the type of part-whole structures they can combine with. In particular, let us assume that singular count nouns denote sets of MSSC individuals (Grimm 2012), i.e., entities conceptualized as integrated objects, as in (54).

(54) $[\![\text{cytryna}]\!] = \lambda x[\text{MSSC}(\text{LEMON})(x)]$

Then, the distribution of Class 1 PQs can be captured by proposing that they encode an MSSC presupposition, which would allow them to combine only with nominals referring to singular individuals. The measure function μ in (55a) and (55b) yields 25% and 50% of the volume of such an object, respectively.

(55) a. $[\![\text{ćwierć cytryny}]\!] = \lambda x[x \sqsubset \text{MAX}([\![\text{cytryna}]\!]) \wedge \mu(x) = \mu(\text{MAX}([\![\text{cytryna}]\!])) \times 0.25]$

b. $[\![\text{pół cytryny}]\!] = \lambda x[x \sqsubset \text{MAX}([\![\text{cytryna}]\!]) \wedge \mu(x) = \mu(\text{MAX}([\![\text{cytryna}]\!])) \times 0.5]$

To conclude, Class 1 PQs are inherent measures. When they combine with a degree-denoting expression, they simply give a measure of that degree. On the other hand, in entity-denoting constructions, they require their arguments to refer to singular objects.

7.2. Classes 2 and 3: Part designators

Classes 2 and 3 differ from Class 1 in that *połowa* ('half$_2$'), *większość* ('most') and *część* ('part$_1$') simply designate parts within an encoded part-whole structure of an entity denoted by the embedded DP, irrespective of the fact whether it is a singular or a plural individual. As such, they introduce no topological constraints concerning nominal denotations they combine with, and thus are compatible with count singulars, plurals and mass nouns. At the same time, the fact that they take only entity-denoting arguments explains why they do not co-occur with numerals and measure terms.

The contextually conditioned μ measures in terms of volume when applied to a singular object and in terms of number of objects when applied to a plurality. The formulae in (56) and (57) give denotations of partitives with plural DPs, where μ measures in terms of cardinality.

(56) a. $[\![\text{połowa cytryn}]\!] = \lambda x[x \sqsubset \text{MAX}(^*[\![\text{cytryna}]\!]) \wedge \mu(x) = \mu(\text{MAX}(^*[\![\text{cytryna}]\!])) \times 0.5]$

b. $[\![\text{większość cytryn}]\!] = \lambda x[x \sqsubset \text{MAX}(^*[\![\text{cytryna}]\!]) \wedge \mu(x) > \mu(\text{MAX}(^*[\![\text{cytryna}]\!])) \times 0.5]$

(57) $[\![\text{część cytryn}]\!] = \lambda x[x \sqsubset \text{MAX}(^*[\![\text{cytryna}]\!])]$

The proposed semantic properties of Classes 2 and 3 discussed above account for most of their distribution and semantic behavior. However, as discussed in Section 6.1.4, the two types of PQs differ with respect to their (in)compatibility with approximative modifiers such as *prawie* ('almost') and *niemal* ('nearly').

7.3. Distinguishing between Classes 2 and 3: Scalar alternatives

The crucial difference between Class 2 PQs and *część* ('part$_1$') is that the latter is semantically simpler. Unlike other PQs, it merely encodes parthood and introduces no specific information regarding what exact proportion of a whole a given part constitutes, compare (56) and (57). As a result, partitives headed by *część* ('part$_1$') are true of any (proper) part of an entity denoted by the embedded DP, be it a plurality or a singularity.[19] Consequently, the closest alternatives for (58a) and (58b) are that no students passed the exam and that no part of the watermelon got spoiled. But those alternatives are false, and thus the meaning of the approximative modifier cannot be applied.

(58) a. #Prawie część studentów zdała egzamin.
almost part$_1$ students.GEN passed exam.ACC
Intended: 'Almost some students passed the exam.'

b. #Prawie część arbuza zgniła.
almost part$_1$ watermelon.GEN got.spoiled
Intended: 'Almost part of the watermelon got spoiled.'

As a result of the semantic incompatibility of Class 3 with approximative modifiers, the composition fails, and thus sentences such as (58a) and (58b) are infelicitous.

7.4. Class 4: Object forgers

The last class, Class 4, consists of the PQs derived by the suffix *-k- cząstka* ('part$_2$'), *ćwiartka* ('quarter$_2$') and *połówka* ('half$_3$'), which both presuppose and assert the MSSC semantics. Similar to Class 1 PQs, via an MSSC presupposition they require that a DP they combine with denotes a singular object. This explains their restricted distribution, in particular the incompatibility with cumulative predicates. Yet, what distinguishes Class 4 from all other PQs in Polish is that they also assert that parts in the set denoted by the entire partitive are MSSC individuals, i.e., entities conceptualized as integrated objects, recall Section 4.

I propose that the semantic effects of Class 4 PQs are due to a special mereotopological partitioning operation encoded in their semantics. Specifically, MSSC$_{\text{PART}}$ in (50) restricts the denotation of the entire partitive to a set of non-overlapping integrated proper parts of the relevant entity (see Wągiel 2018). This explains spatial integrity effects as well as forcing physical object interpretations discussed in Section 4. Arguably, MSSC$_{\text{PART}}$ is introduced by the suffix *-k-* which would also explain Class 4's derivational uniformity.

[19]In the case of pluralities, parts are defined in terms of individual parthood, whereas in the case of singularities, they are defined in terms of material parthood.

(59) a. $[\![\text{cząstka cytryny}]\!] = \lambda x[\text{MSSC}_{\text{PART}}([\![\text{część cytryny}]\!])(x)]$

b. $[\![\text{ćwiartka cytryny}]\!] = \lambda x[\text{MSSC}_{\text{PART}}([\![\text{ćwierć cytryny}]\!])(x)]$

c. $[\![\text{połówka cytryny}]\!] = \lambda x[\text{MSSC}_{\text{PART}}([\![\text{pół cytryny}]\!])(x)]$

Finally, the reason why Class 4 PQs are incompatibile with approximative modifiers is simply because there are no scalar alternatives involved to begin with, and thus there is no 'close by' alternative approximative modifier could evaluate. This is because partitives headed by PQs derived by the suffix *-k-* denote sets of parts of an object that are integrated entities themselves and as such they are conceptualized as independent objects rather than a quantity of matter.

While (60a) is an ordinary felicitous Polish sentence, (60b) is at least degraded because the entity denoted by the partitive construction *połówka arbuza* ('a half of the watermelon') is not viewed as a plurality of material parts whose volume makes up 50% of the whole but more like an object in its own right. This makes it similar to infelicitous examples such as (60c).[20]

(60) a. Prawie pół arbuza zgniło.
almost half_1 watermelon.GEN got.spoiled
'Almost half of the watermelon got spoiled.'

b. ?Prawie połówka arbuza zgniła.
almost half_3 watermelon.GEN got.spoiled
Intended: 'Almost a half of the watermelon got spoiled.'

c. #Prawie arbuz zgnił.
almost watermelon got.spoiled
Intended: 'Almost a watermelon got spoiled.'

Class 4 provides interesting evidence for the relevance of the notion of integrity in natural language. I conclude that the interaction of the proposed scalar and mereotopological properties allows us to derive the typology of Polish PQs given in Tables 1 and 2.

8. CONCLUSION

In this paper, I investigated certain non-trivial semantic differences between various Polish proportional quantifiers (PQs), specifically *część*, *cząstka* (both 'part'), *ćwierć*, *ćwiartka* (both 'quarter'), *pół*, *połowa*, *połówka* (all 'half') and *większość* ('most'). The results of the investigation show that Polish PQs do not constitute a uniform category, but rather fall into four distinct classes. Based on corpus data as well as additional semantic evidence from native speaker intuitions, I determined a typology of Polish PQs. The typology results from their (in)compatibility with i) numerals and measure phrases, ii) approximative modifiers and iii) cumulative

[20] I ignore here a coerced non-quantificational reading on which the meaning of *prawie arbuz* could be paraphrased as 'a thing that is almost a watermelon'.

predicates as well as iv) absence or presence of semantic effects relating to spatial integrity. I proposed that the typology can be derived as an effect of an interaction between scalar and mereotopological properties of PQs in each class. The data open new perspectives on the research on PQs and call for combining degree semantics with a mereotopological approach in the nominal domain. It turns out that there is much more to learn about proportional quantification than typically assumed.

ACKNOWLEDGMENTS

I would like to thank the audiences at the SinFonIJA 13, FDSL 14 and Olinco 5 conferences as well as two anonymous reviewers for their helpful questions and comments. Special thanks go to Nina Haslinger and Viola Schmitt as well as Adam Przepiórkowski. I am also grateful to Éva Dékány for her help and patience as an editor. All errors are, of course, my own responsibility. I gratefully acknowledge that the research was supported by a Czech Science Foundation (GAČR) grant to the Department of Linguistics and Baltic Languages at the Masaryk University in Brno (GA20-16107S).

REFERENCES

Bale, Alan C. and David Barner. 2009. The interpretation of functional heads: Using comparatives to explore the mass/count distinction. Journal of Semantics 26(3). 217–252.

Barker, Chris. 1998. Partitives, double genitives and anti-uniqueness. Natural Language & Linguistic Theory 16(4). 679–717.

Barwise, Jon and Robin Cooper. 1981. Generalized quantifiers and natural language. Linguistics and Philosophy 4(2). 159–219.

Beckwith, Christopher I. 1992. Classifiers in Hungarian. In I. Kenesei and C. Pléh (eds.) Approaches to Hungarian 4: The structure of Hungarian. Szeged: JATE. 197–206.

Casati, Roberto and Achille C. Varzi. 1999. Parts and places: The structures of spatial representation. Cambridge, MA: MIT Press.

Champollion, Lucas. 2017. Parts of a whole: Distributivity as a bridge between aspect and measurement. Oxford: Oxford University Press.

Cresswell, Max J. 1976. The semantics of degree. In B. H. Partee (ed.) Montague grammar. New York, NY: Academic Press. 261–292.

Csirmaz, Aniko and Éva Dékány. 2014. Hungarian is a classifier language. In R. Simone and F. Masini (eds.) Word classes: Nature, typology and representations. Amsterdam: John Benjamins. 141–160.

de Hoop, Helen. 1997. A semantic reanalysis of the partitive constraint. Lingua 103(2–3). 151–174.

de Hoop, Helen. 2003. Partitivity. In L. Cheng and R. Sybesma (eds.) The second glot international state-of-the- article book: The latest in linguistics. Berlin: Mouton de Gruyter. 179–212.

Dziubała-Szrejbrowska, Dominika. 2016. Aspects of morphosyntactic constraints on quantification in English and Polish. Poznań: UAM.

Dziwirek, Katarzyna. 1990. Default agreement in Polish. In K. Dziwirek, P. M. Farrel and E. Majías-Bikandi (eds.) Grammatical relations. Standford, CA: CSLI Publications. 147–161.

Gotham, Matthew. 2017. Composing criteria of individuation in copredication. Journal of Semantics 34(2). 333–371.

Grimm, Scott. 2012. Number and Individuation. PhD dissertation. Stanford University, Stanford, CA.

Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: 'most' versus 'more than half'. Natural Language Semantics 17(1). 63–98.

Heim, Irene. 1985. Notes on comparatives and related matters. Unpublished manuscript. University of Texas, Austin, TX.

Jackendoff, Ray. 1977. X-bar syntax: A theory of phrase structure. Cambridge, MA: MIT Press.

Kennedy, Christopher. 1997. Projecting the adjective: The syntax and semantics of gradability and comparison. PhD dissertation. University of California, Santa Cruz, CA.

Korat, Omer. 2016. Singular quantified terms. In M. Grubic and A. Mucha (eds.) Proceedings of the Semantics of African, Asian and Austronesian Languages 2. Potsdam: Universitätsverlag Potsdam. 36–51.

Kotek, Hadas. 2013. Degree relatives, definiteness and shifted reference. In S. Kan, C. Moore-Cantwell and R. Staubs (eds.) NELS 40: Proceedings of the 40th Annual Meeting of the North East Linguistic Society. Scotts Valley: CreateSpace. 29–43.

Krifka, Manfred. 1989. Nominal reference, temporal constitution and quantification in event semantics. In R. Bartsch, J. van Benthem and P. von Emde Boas (eds.) Semantics and contextual expression. Dordrecht: Foris Publications. 75–115.

Landman, Fred. 1991. Structures for semantics. Dordrecht: Kluwer.

Landman, Fred. 2000. Events and plurality: The Jerusalem lectures. Dordrecht: Kluwer Academic Publishers.

Lima, Suzi. 2014. The grammar of individuation and counting. PhD dissertation, University of Massachusetts, Amherst, MA.

Link, Godehard. 1983. The logical analysis of plural and mass nouns: A lattice–theoretical approach. In R. Bäuerle, C. Schwarze and A. von Stechow (eds.) Meaning, use, and interpretation of language. Berlin: Mouton de Gruyter. 302–323.

Marty, Paul. 2019. On the source of proper partitivity. In M. T. Espinal, E. Castroviejo, M. Leonetti, L. McNally and C. Real-Puigdollers (eds.) Proceedings of Sinn und Bedeutung 23. Barcelona: Autonomous University of Barcelona. 143–160.

Moltmann, Friederike. 1997. Parts and wholes in semantics. New York, NY: Oxford University Press.

Penka, Doris. 2005. Almost: A test? In P. Dekker and M. Franke (eds.) Proceedings of the Fifteenth Amsterdam Colloquium. Amsterdam: ILLC. 179–184.

Przepiórkowski, Adam. 2006. O inherentnej liczbie mnogiej liczebników 'ćwierć', 'pół' i 'półtora' [On the inherent plural number of the fractional numerals ćwierć ('quarter'), pół ('half') and półtora ('one and a half')]. Poradnik Językowy 9. 78–87.

Przepiórkowski, Adam, Mirosław Bańko, Rafał Górski and Barbara. Lewandowska-Tomaszczyk. 2012. Narodowy Korpus Języka Polskiego [The National Corpus of Polish]. Warsaw: PWN.

Pustejovsky, Języka. 1995. The generative lexicon. Cambridge, MA: MIT.

Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. Linguistics and Philosophy 20(4). 335–397.

Rett, Jessica. 2014. The polysemy of measurement. Lingua 143. 242–266.

Schvarcz, Brigitta and Kata Wohlmuth. 2021. An MSSC-approach to Hungarian classifiers. Acta Linguistica Academica 68(3). 257–273.

Schwarzschild, Roger and Karina Wilkinson. 2002. Quantifiers in comparatives: A semantics of degree based on intervals. Natural Language Semantics 10(1). 1–41.

Scontras, Gregory. 2014. The semantics of measurement. PhD dissertation. Harvard University, Cambridge, MA.

Sharvy, Richard. 1980. A more general theory of definite descriptions. The Philosophical Review 89(4). 607–624.

Varzi, Achille C. 2007. Spatial reasoning and ontology: Parts, wholes, and locations. In M. Aiello, I. E. Pratt-Hartmann and J. van Benthem (eds.) Handbook of spatial logics. Berlin: Springer. 945–1038.

von Stechow, Arnim. 1984. Comparing semantic theories of comparison. Journal of Semantics 3(1). 1–77.

Wągiel, Marcin. 2018. Subatomic quantification. PhD dissertation, Masaryk University in Brno, Brno.

Wągiel, Marcin. 2019. Partitives, multipliers and subatomic quantification. In M. T. Espinal, E. Castroviejo, M. Leonetti, L. McNally and C. Real-Puigdollers (eds.) Proceedings of Sinn und Bedeutung 23. Barcelona: Autonomous University of Barcelona. 445–462.