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On Prepositional Phrases inside Numeral Expressions in Polish[1]

1. Introduction

This paper argues for a syntactic model of Polish numeral expressions in which numerals such as *pięć* 'five' are interpreted as heading a functional projection in the region between the Determiner Phrase (DP) and the Noun Phrase (NP). We will refer to that projection as QP (Quantifier Phrase). This general model will form the basis for our analysis of a specific numeral construction which has not yet been discussed in the generative literature on Polish quantified expressions, namely the construction of the following form: NUMERAL + *na* 'out of' + NUMERAL (for example, *dwie na pięć* 'two out of five'). We will argue that, underlyingly, this construction consists of two separate DPs, one of which is embedded in a Prepositional Phrase (headed by the preposition *na* 'out of'). Therefore, in most cases, surface numerical constructions such as *dwie na pięć* 'two out of five' should not be analysed as forming one syntactic unit. We propose that they are base generated as the following string containing two occurrences of the quantified noun: [DP [QP NUMERAL [NP NOUN [PP *na* [DP [QP NUMERAL [NP NOUN]]]]]]]. We explain the fact that only one noun is present in the surface structure of such phrases as a result of a PF-deletion process. We will also show that, in some contexts, the NUMERAL + *na* 'out of' + NUMERAL construction may be reanalysed as a single syntactic unit.

2. Numeral expressions in Polish - basic data

Rutkowski (2001) and Rutkowski and Szczegot (2001) divide the semantic class of Polish numerals (i.e. the class of lexemes that refer to specific cardinalities) into three categories. According to this approach, words denoting cardinalities 1-4 are called adjectival numerals (or A-numerals), words meaning 'thousand', 'million', 'milliard' etc. (i.e. referring to very high quantities) belong to

nominal numerals (or N-numerals) and the rest of the class in question is referred to as numerals proper (or Q-numerals) – see also Neidle (1988), Franks (1995), Giusti and Leko (1996), Veselovská (2001), among others, for similar classifications of numerals in other Slavic languages. A-numerals behave like typical adjectives because they agree with the quantified noun with respect to all morphological features (case, gender and number). N-numerals resemble nouns: they always assign genitive to the following noun. The syntax of Q-numerals is more complex. Similarly to A-numerals, they agree with the head noun in inherent-case contexts (genitive, dative, instrumental and locative), whilst they are genitive-assigners in structural (nominative and accusative) contexts – see, e.g., Franks (1995), Veselovská (2001), Rutkowski (2002a) for a detailed discussion.[2] Another very important characteristic of the syntax of Q-numerals (and, to some extent, N-numerals) is that, when they are sentential subjects, they require the verb to be neuter singular. On the other hand, if the subject noun is quantified by an A-numeral, the verb regularly agrees with the noun in terms of number (plural) and gender (virile or non-virile, depending on the noun).[3] The syntactic behaviour of the three types described above is illustrated in examples (1-3), respectively:

(1) a. Trzej lingwiści spali.   (A-numeral – structural context)
   three.NOM linguists.NOM slept.PLUR,VIR[4]
   'Three linguists were sleeping.'

   b. Ona tańczyła z trzema lingwistami.   (A-numeral – inherent context)
   she danced with[5] three.INSTR linguists.INSTR
   'She was dancing with three linguists.'

(2) a. Milion lingwistów spało.   (N-numeral – structural context)
   million.NOM[6] linguists.GEN slept.SING,NEUT
   'One million linguists were sleeping.'

   b. Ona tańczyła z milionem lingwistów.   (N-numeral – inherent context)
   she danced with million.INSTR linguists.GEN
   'She was dancing with one million linguists.'

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[2] We use the terms "inherent" and "structural" in a pre-theoretical way, i.e. it is not our aim to analyse to what extent they should be considered different from terms such as "oblique"/"direct" or "lexical"/"configurational".

[3] Polish nouns inflect for number and case, and they are marked for gender. In the singular, they may be masculine, feminine or neuter, in the plural, however, only two genders can be distinguished: virile and non-virile. Viriles denote human males, but this gender must also be used when referring to mixed-gender groups including at least one human male.

[4] The glosses we give in this paper are not intended to provide exhaustive morphological descriptions of particular words – they are limited to the most relevant information only.

[5] Note that *z* 'with' is an instrumental-assigner.

[6] Subject N-numeral could be treated as accusative (see Rutkowski, 2000). This issue, however, is even more complicated than the problem of case marking on Q-numerals (see footnote 7) because the syntax of N-numerals seems to be undergoing a grammaticalisation process. Since this phenomenon does not influence our analysis in any way, we will consider N-numeral subjects nominative.

(3) a. Pięciu lingwistów spało. (Q-numeral – structural context)

   five.ACC[7] linguists.GEN slept.SING,NEUT

   'Five linguists were sleeping.'

   b. Ona tańczyła z pięcioma lingwistami. (Q-numeral – inherent context)

   she danced with five.INSTR linguists.INSTR

   'She was dancing with five linguists.'

The case-assignment pattern outlined above is summed up in following table (shaded cells correspond to contexts in which numerals assign the genitive case):

(4) Three classes of Polish numerals (Rutkowski and Szczegot, 2001)

Case Context	A-numerals	Q-numerals	N-numerals
Nom	trzy.NOM orangutany.NOM	pięć.ACC orangutanów.GEN	tysiąc.NOM orangutanów.GEN
Gen	trzech.GEN orangutanów.GEN	pięciu.GEN orangutanów.GEN	tysiąca.GEN orangutanów.GEN
Dat	trzem.DAT orangutanom.DAT	pięciu.DAT orangutanom.DAT	tysiącowi.DAT orangutanów.GEN
Acc	trzy.ACC orangutany.ACC	pięć.ACC orangutanów.GEN	tysiąc.ACC orangutanów.GEN
Instr	trzema.INSTR orangutanami.INSTR	pięcioma.INSTR orangutanami.INSTR	tysiącem.INSTR orangutanów.GEN
Loc	trzech.LOC orangutanach.LOC	pięciu.LOC orangutanach.LOC	tysiącu.LOC orangutanów.GEN
Gloss	'three orang-utans'	'five orang-utans'	'a thousand orang-utans'

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[7] There is evidence that Polish subject Q-numerals should be analysed as accusative rather than nominative – this idea was proposed as early as in Krasnowolski (1897) but has also been discussed in many present-day generative accounts of the syntax of Polish nominals (cf., e.g., Franks, 1995, 2002, Przepiórkowski, 1996, 2004, Rutkowski, 2000). From a purely morphological point of view, the form of Q-numeral subjects might be considered ambiguous between nominative, accusative and, as far as the virile forms are concerned, genitive. However, syntactic arguments for the accusative interpretation are very convincing. It can, for instance, be shown that demonstratives preceding Q-numerals are clearly accusative (and not nominative). The fact that verbs exhibit neuter singular agreement with the Q-numeral subject also suggests the Q-numeral is non-nominative (neuter agreement being a default option in structures with non-nominative subjects).

   The accusative hypothesis does not influence the present analysis so, due to space limitations, it will not be discussed here. For a detailed analysis, see especially Franks (2002), who argues that, in West Slavic, accusative Q-numerals are allowed to occur in subject DPs because elements in structural-case contexts are not required to be marked with a specific morphological case (as opposed to inherent contexts). As shown by Franks (2002), the assumption that structural case need not be satisfied offers an interesting explanation of the fact that phrases bearing no case, such as PPs and clauses, are acceptable subjects in Polish.

3. Polish as a DP-type language

It has been argued in the generative literature on nominals (see, e.g., Willim, 2000) that Polish is not a DP-type language (cf. Abney, 1987) because it lacks articles. Moreover, other elements that could be claimed to trigger the referential interpretation of the noun phrase (such as demonstratives or possessives) share many inflectional and syntactic characteristics with adjectives, which has led both generative and non-generative researchers (e.g. Saloni, 1974, Bošković, 2004, among many others) to conclude that they actually are adjectives. The fact that demonstratives and possessives agree with the head noun in case, gender and number suggests that it is plausible to analyse them as specifiers of some kind (adjectival agreement being an instance of spec-head relation). Therefore, they do not seem to be prototypical instantiations of the D° position (although it could be convincingly claimed that referential adjectival elements, e.g. demonstratives, are base-generated in the specifier of DP – see Leko, 1999, among others).

Whether the articleless Slavic languages should be analysed as projecting DPs on top of NPs in spite of the lack of lexical elements that could occupy D° has been subject to much debate among generative linguists. Some of them argue that the DP projection is universal (in line with Longobardi's, 1994, proposal that nominal structures must be DPs if they are to serve as referential expressions, i.e. arguments), others suggest that the presence of DP is subject to cross-linguistic parameterisation (this option seems to be supported by Chierchia's, 1998, assumption that the DP layer is not necessary for argumenthood). The two most influential lines of argumentation in the DP/NP debate concern the phenomenon of left branch extraction (henceforth, LBE – see, e.g., Corver, 1992, Bošković, 2005) on the one hand, and the syntax of personal pronouns (Progovac, 1998) on the other. Following the latter, Rutkowski (2002c) argues that there are good reasons to interpret what appears to be a bare NP in Polish as headed by the D° node. The evidence for the above claim comes mainly from differences in the DP-internal position of nouns and personal pronouns. As noted by Progovac (1998) for Serbo-Croatian, the syntax of adjectives provides an especially salient example of such a word-order asymmetry. Although attributive adjectives generally precede nouns in Polish, they are admitted only to the right of personal pronouns. This is illustrated below (note that, being an adjective, *sam* 'alone/himself' has to agree with the noun it modifies in terms of gender, number and case):

(5)   a.   [Sam prezydent] lubi generatywizm.
                alone.NOM,SING,MASC president.NOM likes generativism
                'The president himself likes generativism.'

b.   [On sam] lubi generatywizm.

he.NOM alone.NOM,SING,MASC likes generativism

'He himself likes generativism.'

We can account for the above asymmetry by assuming a DP-type phrase structure in which personal pronouns occupy the D° node, nouns reside in N° and adjectival modifiers are specifiers above the nominal head. Following Progovac's (1998) model, Rutkowski (2002c) further argues that Polish personal pronouns are actually base generated in N° and subsequently move from their underlying position to D° (see also Veselovská, 2003, and Franks and Pereltsvaig, 2004, for similar accounts of Czech and Russian, respectively):

(6)
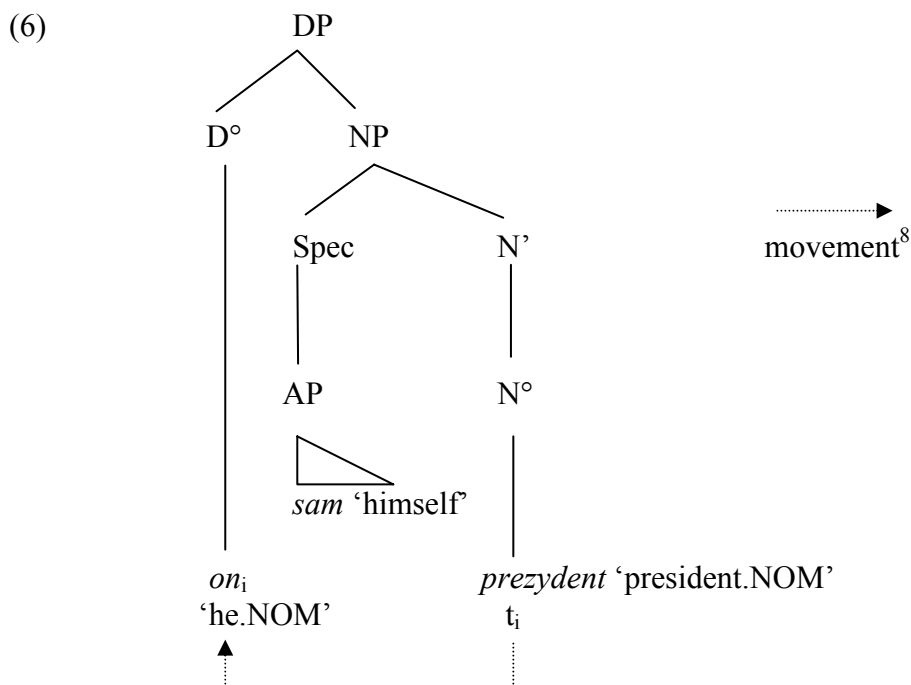
Rutkowski (2002c) extends the above analysis to noun/pronoun asymmetries in structures modified by quantifiers such as *wszyscy* 'all' and cardinal numerals, as well as the structure consisting of the indefinite pronoun *coś* 'something' and an AP.

According to Progovac (1998), the N-to-D raising of pronouns shown above is motivated by the Principle of Greed (unlike nouns, pronouns move in order to check their referential features). This movement operation (originally proposed in Cardinaletti, 1994) is subject to some controversy since, as noted by an anonymous reviewer, "pronouns do not have lexical (notional) content, which makes them unsuitable for membership in the N-category". However, Panagiotidis (1998) argues

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[8] We use arrows to mark case requirements and movement in a schematic and theory-independent way (they are not intended as a formal/technical representation of how case is assigned/checked, neither should they be interpreted as showing the precise mechanism of movement/chain-formation – such specific issues are not crucial for the analysis presented in this paper).

that it is actually the lack of descriptive content that makes a noun acquire pronominal interpretation. According to him, "pronominality is an output of syntax, not a primitive". If we accept Chomsky's (1995) assumption that gender is lexically specified on N, we should explain why third-person pronouns are marked for gender although they reside in D°. Panagiotidis (1998) proposes that N-to-D movement could be a plausible explanation in this case. Pronouns that originate in N° (i.e. nominal heads with null denotation) might be compared to other nouns which do not denote anything, such as *one* in English. Moreover, Panagiotidis (1998) argues that even those pronouns that are base-generated in D° (like *het* in Dutch) are interpreted as pronominal elements due to the fact that they are complemented by a phonologically null nominal head with no denotation (i.e. they are never dangling/intransitive).

Note also that, according to Saloni (1974), personal pronouns must be analysed as a sub-class of nouns from a morphological point of view. This approach is motivated by the fact that all Polish nouns (including personal pronouns) decline for number and case. Świdziński (1997) further assumes that, similarly to nouns, all personal pronouns in Polish are specified for gender: even 1st and 2nd-person pronouns trigger gender agreement on the verb (Polish verbs always agree with nominative subjects), which means that, for instance, two separate (although homophonous) lexical entries for 'we' have to be postulated ([+virile] and [-virile]):

(7)   a.   My przyszliśmy.
                we.NOM came.1,PL,VIR
                'We (human males) came.'
        b.   My przyszłyśmy.
                we.NOM came.1,PL,NONVIR
                'We (non-males or non-human males) came.'

It has to be emphasised that the N-to-D movement postulated by Progovac (1998) is not crucial for the analysis of numeral constructions proposed in the present paper. However, we will opt for it because of two facts. Firstly, adjectives in examples such as (5b) agree in number, gender and case with the pronominal head they modify, which suggests a kind of spec-head relation – under this assumption, the agreement could not take place if the pronoun were base-generated in D°. Secondly, and more importantly, as will be shown below (cf. example (17b) and the corresponding structure in (18)), case-marking data seem to support the view that pronouns must originate below the slot occupied by Q-numerals (which, in our opinion, means that they cannot originate in D°). Therefore, we will assume Rutkowski's (2002c) approach to Polish nominals (i.e. adopt Progovac's, 1998, model) in the rest of the present paper.

Space limitations prevent us from discussing the claim that the articleless Slavic languages should not be analysed as projecting DP because they allow LBE out of NPs – in violation of Ross's (1967) Left Branch Condition (cf., e.g., Uriagereka, 1988, Corver, 1992). Bošković (2005) provides an overview of this line of reasoning and concludes that the possibility of LBE is dependent on the presence/absence of DP because the position of adjectives in DP and non-DP languages is different – namely, Abney's (1987) AP-over-NP structure (A° selects an NP complement) is possible in DP languages only. In non-DP languages, on the other hand, NP must be the highest nominal projection (taking AP as its specifier) because AP cannot function as an argument. Being a phrasal movement, LBE is possible only if extracted adjectives are phrases and not heads – hence, it is impossible in DP languages.

Although we find Bošković's (2005) proposal very interesting and insightful, a detailed analysis of its pros and cons is beyond the scope of the present paper and we leave it for future research.[9] We will not attempt to examine here the conditions under which LBE is possible cross-linguistically. However, it has to be emphasized that the extraction-based analysis runs into problems with a number of examples from Polish (see, Rutkowski, in preparation). We will not be able to discuss all such cases in the present paper but let us give at least one example. The analysis of LBE presented by Bošković (2005) is supported by the fact that LBE out of a complement of a

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[9] Linde-Usiekniewicz and Rutkowski (in preparation) notice that the NP-over-AP vs. AP-over-NP distinction proposed by Bošković (2005) might offer a plausible explanation of why Polish adjectives do not modify coordinated NPs. The problem in question is illustrated below:

(i)　　a.　　piękny chłopak i piękna dziewczyna
　　　　　　　beautiful.NOM,SING,MASC boy.NOM and beautiful.NOM,SING,FEM girl.NOM
　　　　　　　'a beautiful boy and a beautiful girl'
　　　　b.　　*piękni chłopak i dziewczyna
　　　　　　　beautiful.NOM,PLUR,VIR boy.NOM and girl.NOM

A nominal complex consisting of two coordinated NPs cannot be modified by a single adjective, although each NP might be modified separately. The above regularity applies both to (pre-nominal) attributive and (post-nominal) classifying adjectives (for more on this distinction, see Progovac and Rutkowski, 2005):

(ii)　　a.　　fonologia generatywna i składnia generatywna
　　　　　　　phonology.NOM generative.NOM,SING,FEM and syntax,NOM generative.NOM,SING,FEM
　　　　　　　'generative phonology and generative syntax'
　　　　b.　　*fonologia i składnia generatywne
　　　　　　　phonology.NOM and syntax,NOM generative.NOM,PLUR,NONVIR

Nevertheless, copular constructions consisting of a coordinated NP subject and a plural adjectival predicate are fully grammatical:

(iii)　　chłopak i dziewczyna są piękni
　　　　　boy.NOM and girl.NOM are beautiful. NOM,PLUR,VIR

 Linde-Usiekniewicz and Rutkowski (in preparation) conclude that, unlike the predicate in (iii), the plural adjective in (i) cannot modify the whole conjunct because the position it occupies is structurally lower than the nominal ConjP (i.e. the adjective must be NP-internal). The prediction then would be that only AP-over-NP languages allow the following structure: AP [ConjP NP & NP] (e.g. *beautiful girl and boy*).

noun ("deep LBE") is unacceptable. However, this issue seems to be more complex since the following example is grammatical in Polish[10]:

(8) Jakich Adam otworzył [NP pudełko [NP t_i czekoladek]]?
     what-kind-of Adam opened box.ACC chocolates.GEN
     'What kind of chocolates did Adam open a box of?'

In a Corver-style approach to extraction the higher N (*pudełko* 'box') should project a minimality barrier (N') for the LBE trace. In Bošković's (2005) terms the same assumption is captured differently: deep LBE must be impossible because the higher NP is a phase (since its head noun takes a non-trace complement). Whichever explanation we choose, structures such as (8) remain problematic.

It should also be noted that Bošković (2005) himself considers Progovac's (1998) analysis of personal pronouns quite convincing and says that it could possibly be incorporated into his extraction-based model if pronouns were assumed to be the only Ds in Slavic. However, if pronouns are taken to occupy D° they should block extraction out of the rest of the nominal structure they head. This is not the case in Polish, as the following data show (note that the syntactic position of the cardinal *pięciu* 'five' is lower than that of the personal pronoun *ich* 'they' – see the tree diagram in (18)):

(9) a. Widziałem ich pięciu pijanych.
         saw.1,SING,MASC they.GEN five.ACC drunk
         'I saw five of them drunk.'
     b. Pięciu widziałem ich pijanych.
         five.ACC saw.1,SING,MASC they.GEN drunk

Thus, the LBE-based analysis seems to contradict the idea that the syntax of personal pronouns follows from their (surface) D° status. Since we view the DP analysis of Polish pronouns as the most convincing way of explaining the noun/pronoun asymmetries described in Progovac (1998) and Rutkowski (2002c), we will not adopt Bošković's (2005) approach to DPs in this paper. Note, however, that we do not argue that all nouns in Polish must project to DP: the fact that DPs are required in some positions does not imply that they must occur in others. Nominal structures which are not referential or function as predicates need not be DPs. Franks (2002) and Franks and Pereltsvaig (2004) propose a convincing model in which functional layers are projected only if they

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[10] Thanks to Jagwiga Linde-Usiekniewcz for pointing this out to us.

are necessary (e.g. DPs occur when they are associated with specificity features). Therefore, although we will include the DP projection in the structures and tree diagrams presented in this paper, we view this phrase as a potential layer – projected only if the nominal complex in question is required to function as an argument/be referential.

4. Q-numerals as functional heads

There has been no general agreement among generative linguists working on numeral expressions about the syntactic status of numerals. There are at least two approaches to this issue: numerals are analysed as either functional or lexical heads. In this section, we will attempt to confront these two points of view and argue that the latter option does not account for the syntactic complexity of Polish numeral constructions (for a detailed discussion of this question, see Rutkowski, 2005b).

Rutkowski (2001, 2002a) describes Polish numeral expressions as (at least) three-layered and assumes a special functional projection in the region between DP and NP. We will follow this approach here and refer to the additional projection as QP (see also Babby, 1988, Shlonsky, 1991, Franks, 1995, Giusti and Leko, 1996, among others).[11] The Q° head is occupied by a Q-numeral, which requires its complement NP to be genitive:

(10)
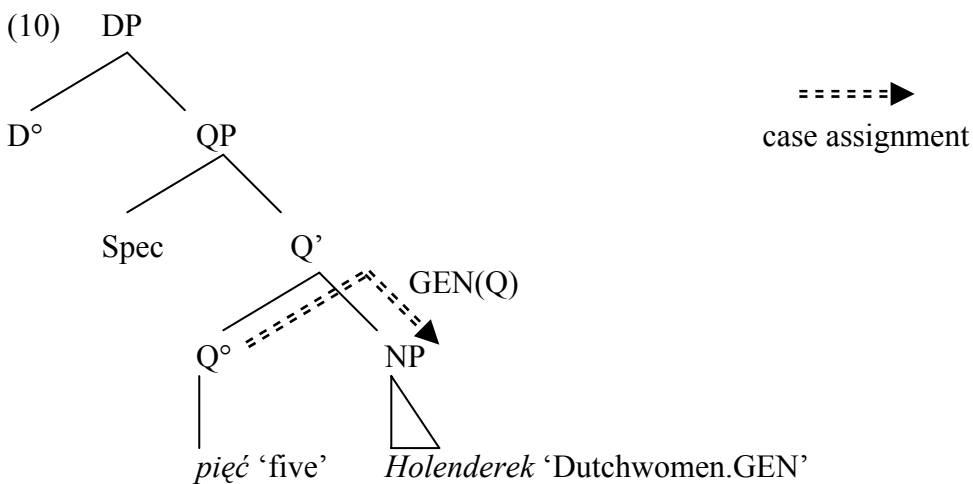
On the other hand, A-numerals never assign case. Therefore, it seems plausible to analyse them as specifier-based modifiers (cf., e.g., Giusti and Leko, 1996, Veselovská, 2001). Since QP is semantically associated with number, we assume that A-numerals are located in Spec,QP (if they are present the Q° head remains empty).

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[11] As with the DP layer, we do not claim that QPs are projected in all nominal contexts. We follow Franks (2002) and Franks and Pereltsvaig (2004) in assuming that functional layers are projected only if required – thus, QPs are linked to quantificational contexts only.

We follow Veselovská (2001) in assuming that GEN(Q) is structural (configurational). She distinguishes the "postnominal genitive" assigned by nouns or quantifiers from the genitive selected by verbs and concludes that only the latter is inherent (lexical). A different account has been proposed by Franks (1995, 2002). He views cases as bundles of features and argues that GEN(Q) in Polish can optionally be [+oblique] or [-oblique]. This claim is meant to account for the fact that modifiers which precede the numeral in Polish (demonstratives, adjectives, quantifiers) are either accusative or genitive. According to Franks (1995, 2002), these elements are base-generated in a lower position and than raised to a position in front of the numeral. If GEN(Q) is [+oblique], it is assigned before the modifier moves – thus, the modifier must be marked as genitive:

(11) a. te_i pięć t_i osób

these.ACC five.ACC people.GEN[-oblique]

'these five people'

b. $tych_i$ pięć t_i osób

these.GEN five.ACC people.GEN[+oblique]

We cannot follow Franks's (1995, 2002) approach to the [oblique] feature because we view the accusative pre-modifier of the Q-numeral as base-generated in its surface position (i.e. preceding the Q° head) – thus, it can never be assigned GEN(Q) (cf. Babby, 1988). As argued in Rutkowski (2000), there are two slots where elements such as demonstratives or adjectives can be placed: either before Q°, or after it. The placement of such modifiers influences their interpretation. In (12a) and (13a), it is the whole set that is being described by the demonstrative *te* 'these' or the adjective *pełne* 'full', whereas in (12b) and (13b) the modifiers refer to each quantified item separately.

(12) a. te pięć osób

these.ACC five.ACC people.GEN

'these five people'

b. pięć tych osób

five.ACC these.GEN people.GEN

'five of these people'

(13) a. pełne osiemset szklanek

full.ACC eight-hundred.ACC glasses.GEN

'not less than eight hundred glasses'

b. osiemset pełnych szklanek

eight-hundred.ACC full.GEN glasses.GEN

'eight hundred full glasses'

Note that this difference does not depend on the word order – even if the genitival NP-internal adjective/demonstrative is extracted out of its phrase and placed in a pre-numeral position, its "scope" does not change (cf. Rutkowski, 2000, see also Derwojedowa and Linde-Usiekniewicz, 2003, for an analysis of the thematic-rhematic structure of such sentences, which could be viewed as a possible motivation for the extraction of the determiner):

(14)   tych pięć t$_i$ osób
        these.GEN five.ACC people.GEN
        'five of these people'

The claim that items which are base-generated as pre-modifiers of Q° can only be accusative is supported by the syntax of the word *wszyscy* 'all'. This general quantifier agrees with the following head in case, gender and number, which suggests a spec-head relation. However, as noted by Rutkowski (in preparation), the general quantifier, unlike demonstratives or adjectives (cf. examples (12-13)), never follows Q-numerals:

(15)   a.   wszystkich ośmiuset lingwistów
                all.ACC,VIR eight-hundred.ACC,VIR linguists.GEN
                'all the eight hundred linguists'
        b.   *ośmiuset wszystkich lingwistów
                eight-hundred.ACC,VIR all.GEN,VIR linguists.GEN

Taking the above into account, Rutkowski (in preparation) argues that the general quantifier must be base-generated in a specifier position above Q°. We adopt this view here and consider the word *wszystkich* in (15a) accusative. However, from the morphological point of view, the virile form is ambiguous between accusative and genitive. Thus, Franks (1995, 2002) claims that both these case options are possible in examples such as (15a). This does not seem to be a correct analysis, as shown by the ungrammaticality of the genitive marking on the general quantifier in non-virile structures (cf. Bogusławski, 1973):

(16)   a.   wszystkie osiemset kobiet
                all.ACC,NONVIR eight-hundred.ACC,NONVIR women.GEN
                'all the eight hundred women'

b.   *wszystkich osiemset kobiet

all.GEN,NONVIR eight-hundred.ACC,NONVIR women.GEN

We take the above examples to indicate that both *wszystkich* in (15a) and *wszystkie* in (16a) are accusative. The general quantifier cannot originate below Q° because it does not modify each quantified item separately (cf. Bogusławski, 1973). Note that phrases such as 'eight hundred full glasses' could be rephrased as 'one full glass multiplied by eight hundred', whereas the phrase 'all the eight hundred women' could never be interpreted as '*one all woman multiplied by eight hundred'. To conclude, we think there are good reasons to treat all the accusative pre-modifiers of Q° mentioned above (adjectives, demonstratives, quantifiers) as base-generated in their surface position. Therefore, Franks's (1995, 2002) analysis of the status of GEN(Q) does not seem to be applicable in our model.

It is worth noticing that the above discussion is consistent with our analysis of Q-numerals as Q° heads. The fact that Q-numerals can be modified independently from the main noun shows that they could not be treated as belonging to the complex of adjectival modifiers of the N° head – their status must be different from regular pre-nominal adjectives (which could not be modified by other adjectives). In this respect, Q-numerals seem similar to other modifiable pre-nominal elements which must be analysed as heads (e.g. measure or quantity nouns, argued by Rutkowski, 2005a, to occupy M°).

Q-numerals are good candidates for a functional category because they form a closed class and the nature of their semantic content is not strictly linguistic but rather arithmetic (their interpretation depends on an independent extra-linguistic system of counting and, thus, differs from the denotative content of nouns). Nelson and Toivonen (2000) point out that even at the one-word stage of language acquisition, children seem to show certain awareness of the syntactic context of quantification: they are able to distinguish numerals from other words. Therefore, Rutkowski (2003) assumes that the function of the QP projection is to signal the quantificational character of the nominal structure in which it occurs. The elements which occupy Q° might be viewed as mere indices referring to arithmetic competence (unavailable to people who cannot count, e.g. children). Thus, it seems plausible that it is actually the quantificational configuration of QP (and not the lexical entries corresponding to particular cardinalities) that assigns GEN(Q) and selects the NP complement. It could be said that quantificational information is provided by the QP layer in the same way as referential information is provided by the DP layer. Only those nominal expressions which are specified in terms of reference, number and other functional features may be used as complete syntactic objects.

The assumption that the four lowest numerals have a non-functional status is obviously

controversial: there is no simple explanation of why they are categorially different from Q-numerals (although it has to be noted that, as shown by Hurford, 2001, among others, the distinction between the lowest numerals, on the one hand, and the rest of the numeral set, on the other, is attested in many unrelated languages). Both A- and Q-numerals are quantity-denoting elements so it could be assumed that all items belonging to these classes should have the same function with respect to the denotation of the quantified noun. It is, of course, possible that the A/Q distinction is marked in the lexicon – thus, it must be unpredictable which cardinals are functional or lexical in a particular language and why it happens. However, following Nelson and Toivonen (2000), Rutkowski (2003) points out that it does not seem coincidental that A-numerals form an ordered sequence, instead of being randomly scattered in the lexicon. In order to explain the origin of the A/Q distinction within the set of numerals, Rutkowski (2003) suggests a possible connection between the phenomenon in question and the limitations of human perception and attention. This analysis is based on extra-linguistic data, namely, it refers to the neuropsychological "magical number four" argued for by Cowan (2001). A detailed discussion of this analysis would be beyond the scope of the present paper. Let us note, however, that, thanks to referring to a universal mental mechanism, Rutkowski (2003) formulates a hypothesis that, from a historical point of view, the exceptional status of the lowest cardinals need not be totally arbitrary.

The proposal that Q-numerals are functional rather than lexical elements might be argued to explain the mixed pattern of case assignment presented in Section 2 of the present paper (cf. Veselovská, 2001, Rutkowski, 2001, 2002a). Such an analysis requires the following assumptions (see Emonds, 2000):

- lexical elements are inserted into the syntactic derivation at a relatively early stage ("D-structure" in terms of the Government-Binding approach to syntax)

- functional elements are inserted into the syntactic derivation later, prior to Spell-out (at "S-structure")

- inherent case assignment takes place at "D-structure", whereas structural case assignment is driven by the "S-structure" configurations (cf. Chomsky, 1986).

The above statements lead to a conclusion that Q-numerals cannot assign genitive in the context of inherent cases (such as dative, instrumental or locative) because, being functional elements, they enter the syntactic derivation after the noun has been assigned an inherent case value. Therefore, numerals can act as case assigners only in structural contexts (nominative and accusative – see a detailed discussion in Veselovská, 2001, Rutkowski and Szczegot, 2001, Rutkowski, 2002a).

An alternative analysis of the syntactic status of numerals has recently been advocated by Corver and Zwarts (2004) and Ionin and Matushansky (2005), who argue that numerals are nominal rather than functional heads (this idea dates back to Jackendoff, 1977). Because of space

limitations, we cannot discuss this line of reasoning in detail. However, we will try to show that it seems inapplicable to Polish.

Corver and Zwarts (2004) point out that Dutch numerals can complement personal pronouns, which, according to them, indicates that cardinals appear in a position typically occupied by a noun (after a determiner). The PRONOUN + NUMERAL construction is grammatical in Polish too, but its syntactic properties could actually be claimed to support (or at least not to rule out) the functional interpretation of Q-numerals. It is crucial to note that Polish cardinal numerals normally precede nouns but follow pronouns (cf. Rutkowski, 2002c):

(17)   a.   [Siedmiu lingwistów] tańczyło tango.

               seven.ACC linguists.GEN danced.SING,NEUT tango

               'Seven linguists were dancing tango.'

       b.   [Nas siedmiu] tańczyło tango.

               we.GEN seven.ACC danced.SING,NEUT tango

               'Seven of us were dancing tango.'

The analysis of this word order asymmetry seems straightforward (see Section 3 of this paper): pronouns reside in D°, nouns reside in N° and numerals reside in Q°. Note that the personal pronoun in the above examples appears in the genitive form. This case marking can be explained if we assume that the pronoun is base generated inside NP (and raised to D° after the genitive of quantification assignment):

(18)
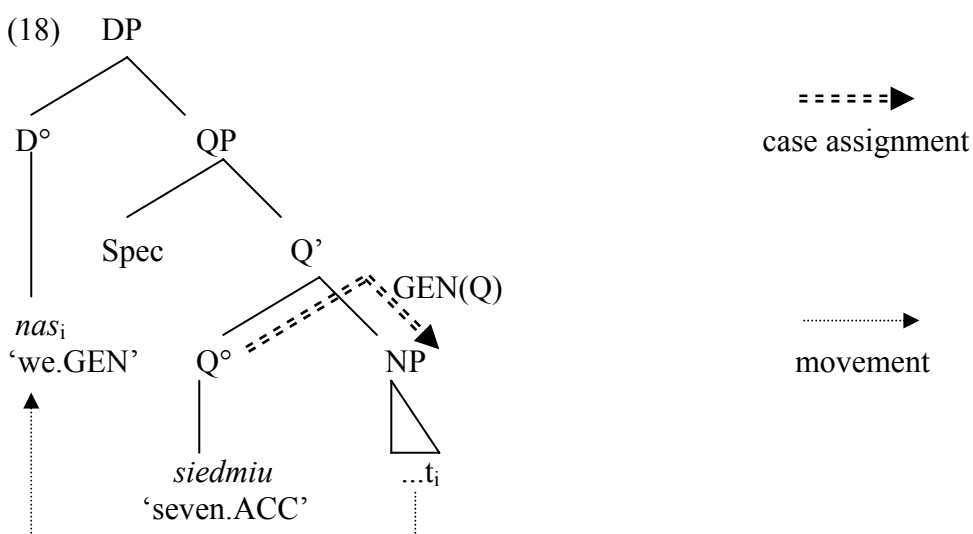
If the pronoun is quantified by an A-numeral, it is not assigned genitive but we can still observe the word-order asymmetry discussed above (the personal pronoun precedes the numeral because the latter occupies a fixed position):

(19)

```
           DP
          /  \
        D°    QP
        |    /  \
       my_i Spec  Q'
    'we.NOM'  |   /  \
       ▲      |  Q°    NP
       |      |  |     /|
       |      | cztery ...t_i
       |_____|'four.NOM'___|
```

                              ....▶
                              movement
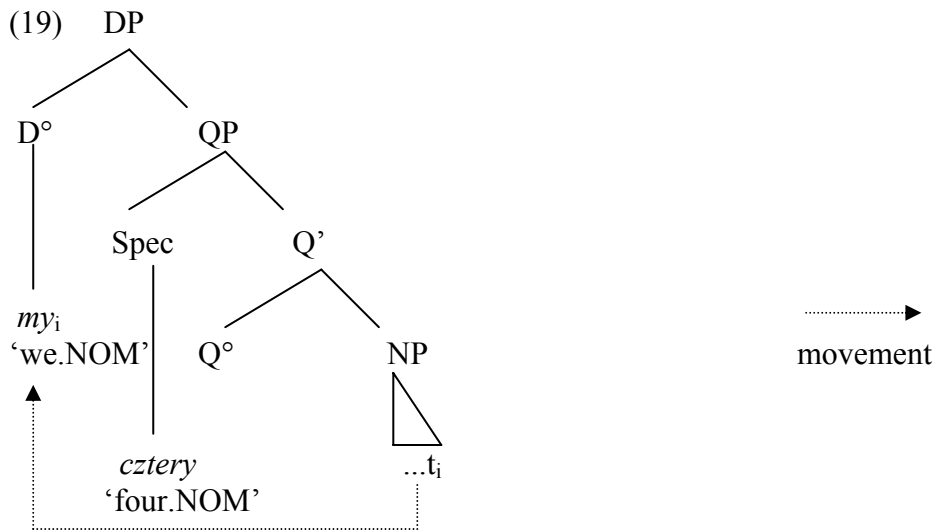
Thus, examples such as (17b) do not seem to contradict the functional status of Q-numerals.

According to Ionin and Matushansky (2005), in structures like (20) both cardinals are nominal heads which take the rest of the NP as their complement.

(20)   szesnaście tysięcy Holenderek
         sixteen.NOM thousands.GEN Dutchwomen.GEN
         'sixteen thousand Dutchwomen'

This is a plausible structural analysis, however, in our opinion, it does not imply that both cardinals have to be nominal. We argue that in Polish only N-numerals are noun-like heads:

(21)   DP

```
        DP
       /  \
     D°    QP
          /  \ - - - -> GEN(Q)
        Q°    NP
             /  \ - - -> 
           N°    NP - - -> GEN(N)
                 |
                 N°
```

D°

QP

Q°   NP

N°   NP

N°

GEN(Q)

GEN(N)

= = = = =▶

case assignment

szesnaście
'sixteen.ACC'

tysięcy
'thousands.GEN'

Holenderek
'Dutchmomen.GEN'
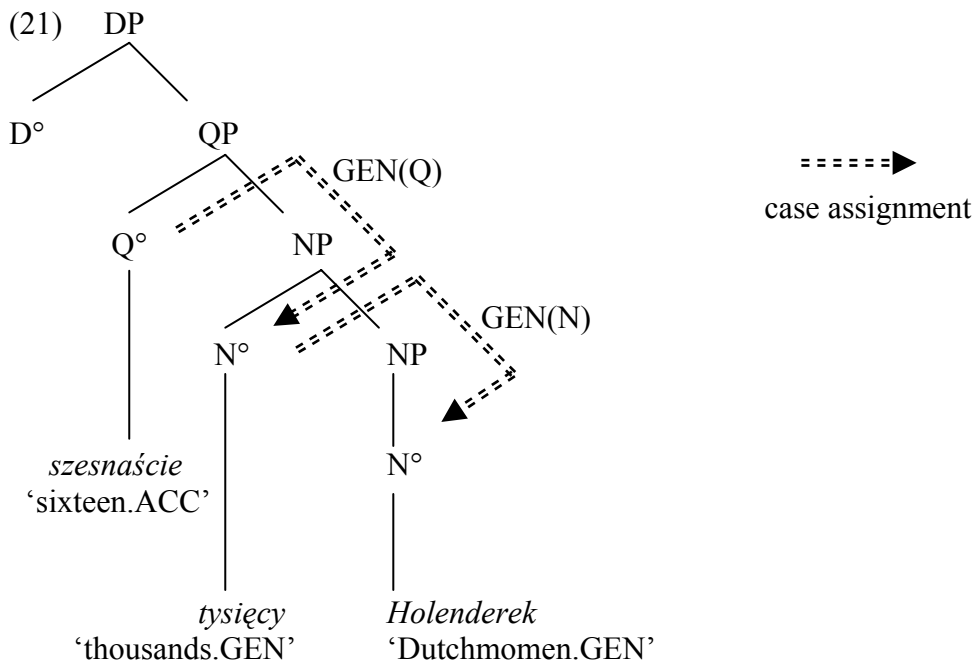
It is worth noting that N-numerals could be compared to, e.g., container or measure nouns such as *butelka* 'bottle' (in *butelka mleka* 'a bottle of milk') or *litr* 'litre' (in *litr mleka* 'a litre of milk'). Structures of this kind are often referred to as "pseudo-partitives" (cf. Selkirk, 1977, Koptjevskaja-Tamm, 2001). Similarly to N-numerals, pseudo-partitive nouns refer to broadly understood quantity, assign genitive to the following nominal head, and have certain characteristics that distinguish them from regular nouns (e.g. they usually take complements and are seldom modified by attributive adjectives). It could even be claimed that pseudo-partitive nouns and N-numerals are semi-functional elements (subject to an on-going process of grammaticalisation) – possibly heading a special functional phrase above the noun (Measure Phrase, MP – cf. Rutkowski, 2005a), but preserving much more nominal features than Q-numerals. We leave the possibility of analysing N-numerals as occupying the head of MP (similarly to pseudo-partitive nouns) for future research.

By distinguishing Q-numerals from N-numerals, we provide an explanation of the fact that their syntactic behaviour differs considerably. Note that in inherent-case contexts (such as the instrumental assigned by the preposition *z* 'with' in the following example), it is only the N-numeral that can function as a genitive-assigner:

(22)   a.   z szesnastoma tysiącami Holenderek
           with sixteen.INSTR thousands.INSTR Dutchwomen.GEN
           'with sixteen thousand Dutchwomen'
       b.   *z szesnastoma tysięcy Holenderek
           with sixteen.INSTR thousands.GEN Dutchwomen.GEN

Ionin and Matushansky (2005) rightly argue that complex numerals should be analysed as composed entirely in the syntax and interpreted by the regular rules of semantic composition. We agree with this statement, nevertheless, in our opinion, it does not mean that numerical complexes cannot consist of both lexical noun-like elements (N-numerals) and functional elements (Q-numerals). Ionin and Matushansky (2005) point out that complex numeral constructions such as (23a-b) could be treated as coordinated structures.
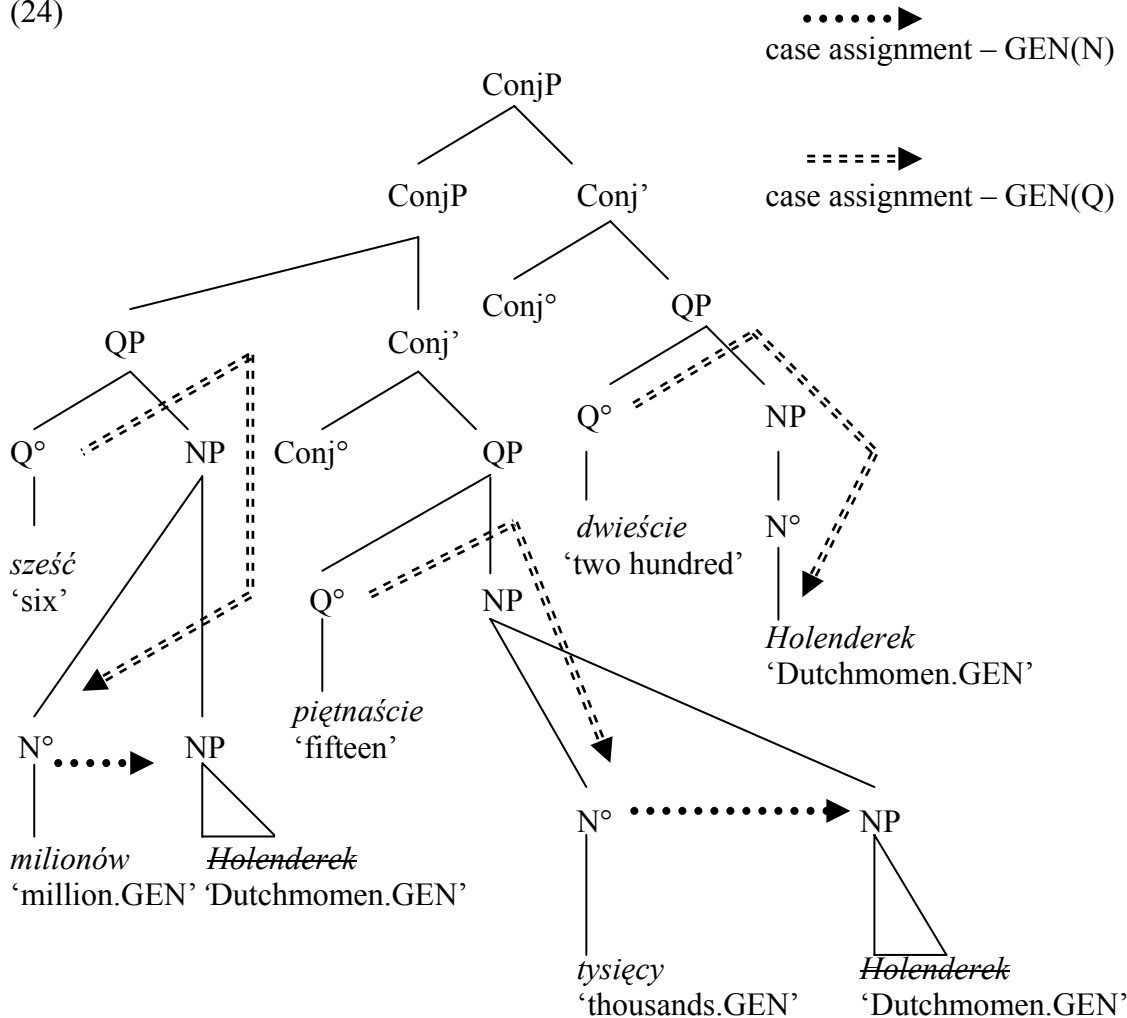
(23)   a.   Sześć milionów piętnaście tysięcy dwieście Holenderek lubiło jazz.

        six.ACC   millions.GEN   fifteen.ACC   thousands.GEN   two-hundred.ACC[12]
        Dutchwomen.GEN liked.SING,NEUT jazz

        'Six million fifteen thousand two hundred Dutchwomen liked jazz.'

        b.   Sześć milionów piętnaście tysięcy dwie Holenderki lubiły jazz.

        six.ACC millions.GEN fifteen.ACC thousands.GEN two.NOM Dutchwomen.NOM
        liked.PL,NONVIR jazz

        'Six million fifteen thousand and two Dutchwomen liked jazz.'

This analysis seems to be readily applicable to Polish. However, the structure we propose in (24) below have to reflect the fact that it is only the very last numeral of the whole complex that controls the quantified noun and the verb: if the final element is a Q-numeral the noun has to be genitive and the verb has to be neuter singular (see 23a), and if the final element belongs to A-numerals the quantified noun receives case from outside the numerical expression and the verb agrees with the noun (see 23b). Ionin and Matushansky (2005) argue that, in complex numeral structures involving coordination, each coordinated N-numeral (such as *thousand* or *million*) must take the quantified NP as its complement. The NP is then subject to right-node raising. We find the basic assumption of this analysis plausible, however, in our opinion, the fact that the quantified NP appears only once in the whole complex structure results from a PF-deletion process (which is independently required in our analysis – see Section 5 of the present paper), and not from right-node raising. This is illustrated below – the deleted copies are crossed out:

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[12] Note that *dwieście* 'two hundred', *trzysta* 'three hundred', *czterysta* 'four hundred' etc. are simplex numerals in Polish (although their equivalents in other Slavic languages, as well as in Old Slavic, are complex).

(24)

```
                                                        •••••►
                                                        case assignment – GEN(N)


                              ConjP
                             /    \
                           /        \
                      ConjP          Conj'                =====►
                     /    \         /    \                case assignment – GEN(Q)
                   /        \     /        \
                 QP          Conj°          QP
                /  \        /    \         /  \
              /      \    /        \     /      \
            Q°       NP  Conj'      Q°        NP
            |       /|   /   \      |          |
          sześć    / |  Q°    QP   dwieście    N°
          'six'   /  |  |    /  \  'two hundred'
                 /   |  piętnaście  NP         Holenderek
                /    |  'fifteen'  / \         'Dutchmomen.GEN'
              N°    NP           Q°   NP
              |     /\           |    
           milionów  \         N°••••••••••►NP
          'million.GEN' Holenderek |          /\
                       'Dutchmomen.GEN'      /  \
                                    tysięcy   Holenderek
                                  'thousands.GEN' 'Dutchmomen.GEN'
```

To sum up, we do not see good reasons to treat Q-numerals as nouns. Furthermore, as shown in Rutkowski (2002b), Polish Q-numerals have actually *developed* from nouns in a diachronic sense. In 16th-century Polish, today's Q-numerals behaved like regular nouns: they assigned genitive to the nouns they quantified in all case contexts. They also regularly agreed with their modifiers and the verb: numerals such as *pięć* 'five' were feminine singular nouns so they made the verb assume the feminine singular form and were modified by feminine singular demonstratives (cf. Klemensiewicz, Lehr-Spławiński and Urbańczyk, 1964:401):

(25) a.   Ona pięć panien szła.   (Old Polish)
            that.NOM,FEM five.NOM maidens.GEN walked.SING,FEM
            'Those five maidens walked.' (literally 'That five of maidens walked.')

      b.   Tamte pięć panien szło.   (Modern Polish)
            those.ACC,FEM five.ACC maidens.GEN walked.SING,NEUT
            'Those five maidens walked.'

This means that the Old Polish Q-numeral *pięć* 'five' behaved like present-day feminine group nouns such as *grupa* 'group':

(26)   Tamta grupa panien szła.   (Modern Polish)

       that.FEM group.NOM maidens.GEN walked.SING,FEM

       'That group of maidens walked.'

Rutkowski (2002b) accounts for the diachronic change between 16th-century and Modern Polish by employing the generative model of grammaticalisation proposed by Roberts and Roussou (1999). According to that model, grammaticalisation involves reanalysis of lexical material as functional material, leading to structural simplification. In 16th-century Polish, numeral expressions were bi-phrasal: they contained two DPs. Most numeral expressions in Modern Polish are mono-phrasal (in the sense that they form only one DP), and, therefore, simpler in terms of structure (two separate extended projections have been replaced with only one). However, this simplification has resulted in the new pattern of case assignment and verbal agreement discussed in Section 2 of the present paper.

Whatever our analysis of the diachronic change in Polish numeral syntax is, it is clear that, as a result of that process, Q-numerals have become far less noun-like than they used to be in Old Polish. Moreover, the syntactic noun-to-numeral (or lexical-to-functional) shift seems to be an on-going process. Even the syntax of N-numerals (which still possess many nominal characteristics) shows a clear tendency to change to the Q-numeral pattern with respect to verbal agreement: in constructions with masculine N-numerals such as *tysiąc* 'a thousand', the verb either agrees regularly or takes the singular neuter form (characteristic of Q-numeral structures; see Veselovská 2001 for an account of a similar phenomenon in Czech).[13]

It could be said that the grammaticalisation process which seems to deprive numerals of their nominal properties results in a kind of continuum: there are quantity-referring elements which are purely nominal, other quantifiers are very different from nouns, and, finally, there are lexical units that seem to be halfway between nouns and non-nominal modifiers. This observation is in line with Jackendoff's (1977) division of English quantity-referring expressions into three classes: group nouns (*a bunch of bananas*), semi-numerals (*a hundred bananas*), and cardinals (*five bananas*), which differ with respect to the use of articles and the preposition *of*.

It should also be stressed that there is a separate class of regularly derived feminine denumeral nouns in Polish: *piątka* 'a five', *szóstka* 'a six', *siódemka* 'a seven' etc. They may refer

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[13] Veselovská (2001) refers to N-numerals as semi-numerals and assumes that they have "dual lexical specification" – i.e. they may resemble either lexical nouns or functional quantifiers.

to objects (e.g. coins, banknotes, buses of a given route or grades at school) but also to groups of individuals:

(27)   Tamta piątka panien szła.

       that.FEM five.NOM maidens.GEN walked.SING,FEM

       'That five of maidens walked.'

Corver and Zwarts (2004) rightly point out that the fact that Dutch numerals may take diminutive inflection suggests that they could be analysed as nouns. Interestingly, in Polish only the denumeral nouns mentioned above (*piątka* 'a five' etc.) and N-numerals may be used in the diminutive form:

(28)   Tamta piąteczka panien szła.

       that.FEM five.DIM,NOM maidens.GEN walked.SING,FEM

       'That (nice, cute etc.) five of maidens walked.'

(29)   On chce tylko tysiączek dolarów.

       he wants only thousand.DIM,ACC dollars.GEN

       'He wants just a (little) thousand dollars.'

Regular numerals do not take diminutive inflection, neither can they be pluralized (as opposed to N-numerals and denumeral nouns):

(30)   Trzy piątki panien szły.   (denumeral noun)

       three.NOM fives.NOM maidens.GEN walked.PLUR,NONVIR

       'Three fives of maidens walked.'

(31)   Trzy miliony panien szły/szło.   (N-numeral)

       three.NOM millions.NOM maidens.GEN walked.PLUR,NONVIR/SING,NEUT

       'Three millions maidens walked.'

(32)   *Trzy pięć panien szło.   (Q-numeral)

       three.NOM five.NOM maidens.GEN walked.SING,NEUT

Example (32) shows that, in Modern Polish, Q-numerals are not declinable in terms of number. On the other hand, in Old Polish numerals such as *pięć* 'five' declined like regular feminine nouns such as *pięść* 'fist', they even took the same nominal case and number endings. In Modern Polish the number of different case endings in the numeral declension has been reduced to the (almost)

invariant non-nominative ending -*u* (see Rutkowski, 2002b).[14] Gradual simplification of paradigms and, ultimately, paradigmatisation (i.e. invariantness of a given form) are often assumed to characterise the process of grammaticalisation (cf. Croft, 2000:162-163, and a discussion of the relevant Polish data in Rutkowski, 2002b). Therefore, the ungrammatical example (32) seems to confirm the hypothesis that, form a diachronic perspective, today's Q-numerals are *grammaticalised* (i.e. non-lexical) nouns. If we followed the argumentation presented by Ionin and Matushansky (2005) and assumed that numerals are lexical rather than functional heads cross-linguistically, we would need an alternative means of distinguishing Polish Q-numerals from regular nouns (as shown above, the two classes are clearly distinct). This issue has also been noted by Corver and Zwarts (2004), who analyse Dutch numerals as syntactic nouns but admit that this approach does not offer an answer to the question why numerals such as *tien* 'ten' should be different syntactically from nouns like *tiental* 'ten-count'. Notwithstanding this problem, many of the arguments for the nominal status of Dutch numerals presented by Corver and Zwarts (2004) seem convincing. Note however, that we do not argue that numerals have to be functional heads cross-linguistically. It may well be the case that in some languages they are nouns or adjectives. As pointed out to us by Romuald Huszcza, numerals in some East Asian languages are best analysed as adverbs. Furthermore, in Seri, cardinalities seem to be expressed by means of verbal constructions (thanks to Ora Matushansky for drawing our attention to this fact; see a detailed discussion in Moser and Marlett, 1994). Therefore, we agree with Ionin and Matushansky (2005) that numerals do not form a universal syntactic category. The label NUMERAL should be understood as referring to a semantic class whose elements may belong to different (lexical and functional) categories. However, contrary to Ionin and Matushansky (2005), we argue that Q-numerals in Polish (and other Slavic languages) are best analysed as functional heads (see also Rutkowski, 2005b).

5. The construction NUMERAL + *na* 'out of' + NUMERAL

Polish numeral expressions have attracted considerable attention from generative linguists (see, e.g., Franks, 1995, Przepiórkowski, 1996, Rutkowski, 2001, 2002a, Rutkowski and Szczegot, 2001, and the references cited therein). However, as Corver and Zwarts (2004) rightly point out, "when we think of numerals, the construction that usually comes to mind first is that of a *bare numeral* modifying a noun [...]. Theories about the syntax and semantics of numerals are usually based on this simple and common construction." In what follows, we will try to employ the syntactic model discussed in the first part of this paper to account for the syntactic peculiarities of a more complex

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[14] There are two variants of the instrumental form: either *pięciu* or *pięcioma* (other case forms end in -*u*).

numeral structure, namely the construction of the following form:

(33)   NUMERAL + *na* 'out of' (literally 'on') + NUMERAL

Examples of this structure are rather rare in Polish, which means that their grammaticality status may sometimes seem unclear. Having this in mind, we have carried out a questionnaire investigation aimed at testing the acceptance of these examples by native speakers of Polish. We gave a grammaticality judgement task to thirty-four adult informants (mostly undergraduate students). They were asked to assess the grammaticality of twenty-four test sentences (containing a number of variants of the Num + *na* 'out of' + Num construction) on a 4-point scale: "+" (grammatical), "?+" (rather grammatical), "?-" (rather ungrammatical), "-" (ungrammatical). All of the informants filled out the same questionnaire. We then graded the questionnaire judgements on a scale ranging from 0 to -3 (0 for "+", -1 for "?+", -2 for "?-" and -3 for "-"). Therefore, the mean score for a sentence judged perfectly grammatical by all our informants was 0.000, whereas the mean score for a totally ungrammatical example was -3.000. In the present paper, we tentatively assume that examples which received the mean score lower than -1.500 can be safely considered ungrammatical. It has to be stressed that, although we do not claim that such results can be interpreted as conclusive evidence, they show very clear tendencies (although in some cases they differ considerably from what is said in prescriptive grammars).

The word *na* in (33) is a preposition and it assigns accusative to the following element. To the best of our knowledge, phrases such as *dwie na pięć* 'two out of five' or *trzydzieści na sto* 'thirty out of one hundred' have not been discussed in the framework of generative grammar. They have two variants in Polish, differing in terms of word order (i.e. the position of the quantified noun). They are illustrated below:

(34)   Trzy na sto Holenderek lubiły jazz.
        three.NOM on hundred.ACC Dutchwomen.GEN liked.PL,NONVIR jazz
        'Three out of a hundred Dutchwomen liked jazz.'
(35)   Trzy Holenderki na sto lubiły jazz.
        three.NOM Dutchwomen.NOM on hundred.ACC liked.PL,NONVIR jazz
        'Three Dutchwomen out of a hundred liked jazz.'

Additionally, both of these structures may be subject to a topicalising movement operation, as a result of which the PP beginning with the preposition *na* 'out of' is raised to a position in front of the rest of the phrase (in speech, the topicalised PP is followed by a pause)[15]:

(36) Na sto Holenderek trzy lubiły jazz.

  on hundred.ACC Dutchwomen.GEN three.NOM liked.PL,NONVIR jazz

  'Out of a hundred Dutchwomen, three liked jazz.'

(37) Na sto – trzy Holenderki lubiły jazz.

  on hundred.ACC three.NOM Dutchwomen.NOM liked.PL,NONVIR jazz

  'Out of a hundred, three Dutchwomen liked jazz.'

A non-generative description of such structures has recently been proposed by Derwojedowa (2004) (see also Kopcińska, 1997:45-52). She presents an overview of many relevant examples from Polish and notes that *na* is not the only preposition that appears in such phrases: *z* 'from', *spośród* 'from among' and *wśród* 'among' are also possible. They differ from the accusative-assigner *na* (literally 'on') in that they require the following numeral to take the genitive form. Moreover, it seems that the prepositional constructions can be divided into two sub-types: proportional and episodic ones. We follow Ionin, Matushansky and Ruys (2005) (see also the references cited therein) in assuming that the distinction in question manifests itself when universal/generic quantification is involved: in episodic PPs this kind of quantification is disallowed, whereas in proportional structures it is usually the only option available. In Polish, the episodic reading seems to require the use of the ablative prepositions *z* 'from' and *spośród* 'from among', whereas the prepositions *na* 'in' and *wśród* 'among' occur in proportional structures:

(38) a. Dziewięciu na każdych stu Polaków lubi jazz.   (proportional)

      nine.ACC on every.ACC hundred.ACC Poles.GEN like.SING,NEUT jazz

      'Nine in every one hundred Poles like jazz.'

  b. ?*Dziewięciu z każdych stu Polaków lubi jazz.   (episodic)

      nine.ACC from every.GEN hundred.GEN Poles.GEN like.SING,NEUT jazz

(39) a. ?*Dziewięciu na tych stu Polaków lubi jazz.   (proportional)

      nine.ACC on these.ACC hundred.ACC Poles.GEN like.SING,NEUT jazz

  b. Dziewięciu z tych stu Polaków lubi jazz.   (episodic)

      nine.ACC from these.GEN hundred.GEN Poles.GEN like.SING,NEUT jazz

      'Nine of these one hundred Poles like jazz.'

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[15] The pattern of intonation is the same in English sentences such as *Out of a hundred* [PAUSE] *three Dutchwomen liked jazz* (thanks to Steven Franks for pointing this out to us).

Although our grammaticality judgements are tentative[16], it seems that, similarly to their English counterparts (cf. Ionin, Matushansky and Ruys, 2005, among others), the two variants of Polish prepositional structures are in complementary distribution with respect to universal/generic quantification. The syntax of personal pronouns provides an especially salient example in support of the propositional/episodic distinction. Personal pronouns cannot appear in proportional structures – they are restricted to episodic contexts, in which the PP-internal nominal denotes an entity, i.e. it must be definite or specific/referential (for a detailed discussion of this issue, see Ionin, Matushansky and Ruys, 2005):

(40) a. Dziewięciu z nas szesnastu lubi jazz. (episodic)
nine.ACC from us.GEN sixteen.GEN like.SING,NEUT jazz
'Nine of the sixteen of us like jazz.'
b. *Dziewięciu na nas szesnastu lubi jazz. (proportional)
nine.ACC on us.GEN sixteen.ACC like.SING,NEUT jazz

Note, however, that although the two types of PP constructions mentioned above are distinguishable in terms of semantics, they seem to be identical with respect to the syntactic phenomena we discuss in the present paper. Therefore, unlike Ionin, Matushansky and Ruys (2005), we do not find it necessary to assume that their structures are different. In what follows, we will mostly present examples with the proportional preposition *na* 'on', but our findings hold for phrases headed by the other prepositions as well.

It might not seem obvious why expressions such as *two out of ten* in English should not be analysed as complex numerals (occupying one slot in the syntactic structure).[17] However, thanks to its rich morphology, Polish provides clear evidence that the construction NUMERAL + *na* 'out of' + NUMERAL has to be analysed as consisting of two syntactic units: the main numeral phrase and a Prepositional Phrase (beginning with *na* 'out of') adjoined to it. Therefore, examples such as (34-37) must have the following (surface) structures, respectively:

(41) NUM [PP *na* NUM NP]

(42) NUM NP [PP *na* NUM]

(43) [PP *na* NUM NP] NUM

(44) [PP *na* NUM] NUM NP

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[16] Examples (38-39) were not included in our questionnaire.
[17] As pointed out to us by Ora Matushansky, Keenan (1996) treats structures such as *two out of ten* as unanalysable wholes (proportional determiners).

In all the four variants listed above, the whole expression is headed by the numeral which is *not* part of the adjunct PP. This becomes clear when we have a look at the morphological form of the main verb in examples such as (34-37). It is the PP-external numeral *trzy* 'three', and not the PP-internal numeral *sto* 'a hundred' that makes the verb assume the plural/agreeing form (note that *trzy* 'three' is an A-numeral and *sto* 'hundred' is a Q-numeral – see Section 2 of the present paper). This means that even if the main noun (the semantic nucleus of the phrase) is PP-internal (like in examples (34) and (36)), the *head* numeral has to be located outside the PP. Note that in sentences (34) and (36) the noun *Holenderek* 'Dutchwomen' gets its genitival form from the PP-internal numeral *sto* 'a hundred' but the main verb remains uninfluenced by this Q-numeral.

What follows from the above discussion is that, if the main (i.e. PP-external) numeral were a Q-numeral, the verb should take the neuter singular/non-agreeing form. This prediction is confirmed by sentences (45-48), corresponding to examples (34-37) (note that *pięć* 'five' is a Q-numeral and *dwadzieścia dwie* 'twenty-two' is a complex structure headed by the final A-numeral):

(45)   Pięć [PP na dwadzieścia dwie Holenderki] lubiło jazz.
        five.ACC on twenty-two.ACC Dutchwomen.ACC liked.SING,NEUT jazz
        'Five out of twenty-two Dutchwomen liked jazz.'

(46)   Pięć Holenderek [PP na dwadzieścia dwie] lubiło jazz.
        five.ACC Dutchwomen.GEN on twenty-two.ACC liked.SING,NEUT jazz
        'Five Dutchwomen out of twenty-two liked jazz.'

(47)   [PP Na dwadzieścia dwie Holenderki] pięć lubiło jazz.
        on twenty-two.ACC Dutchwomen.ACC five.ACC liked.SING,NEUT jazz
        'Out of twenty-two Dutchwomen, five liked jazz.'

(48)   [PP Na dwadzieścia dwie] pięć Holenderek lubiło jazz.
        on twenty-two.ACC five.ACC Dutchwomen.GEN liked.SING,NEUT jazz
        'Out of twenty-two, five Dutchwomen liked jazz.'

The numeral which is not part of the PP headed by the preposition *na* 'out of' is always the syntactic subject of the whole sentence. This does not depend on whether or not the numeral is followed by the quantified noun. An important question to be asked now is how the presence or absence of the quantified noun should be explained. We propose that examples such as (34) and (45), on the one hand, and (35) and (46), on the other, are both base generated with the following structure (lexicalised in 50):

(49)   [DP [QP NUMERAL [NP NOUN [PP *na* [DP [QP NUMERAL [NP NOUN]]]]]]]

(50)   [DP [QP pięć [NP Holenderek [PP na [DP [QP sto [NP Holenderek]]]]]]]

We further propose that one of the instances of NP gets elided at PF, under identity. The choice of one of the deletion options is subject to topic-focus (thematic-rhematic) configurations (cf. Derwojedowa, 2004). The PP-external deletion is represented in (51) and (53), whilst the PP-internal deletion is represented in (52) and (54) (the elided material is crossed out):

(51)   NUM ~~NP~~ [PP *na* NUM NP]   (corresponding to sentences (34) and (45))

(52)   NUM NP [PP *na* NUM ~~NP~~]   (corresponding to sentences (35) and (46))

(53)   [PP *na* NUM NP] NUM ~~NP~~   (corresponding to sentences (36) and (47))

(54)   [PP *na* NUM ~~NP~~] NUM NP   (corresponding to sentences (37) and (48))

We postulate the following structure for examples such as (45):

(55)

Obviously, the only difference between (45) and (46) is that it is the lower occurrence of the noun that gets deleted.

If the PP-adjunction analysis of sentences such as (34) or (45) is correct, we should not expect adjunct PPs to separate the head Q° from its complement NP because phrases are not usually adjoined in between a head and its complement. This prediction finds confirmation in the following example:

(56)   *Pięć [PP na dwadzieścia dwie] Holenderek lubiło jazz.
         five.NOM on twenty-two.ACC Dutchwomen.GEN liked.SING,NEUT jazz

The genitive case marking on the noun *Holenderek* 'Dutchwomen' means that it would have to be the complement of the Q-numeral *pięć* 'five' and not the A-numeral *dwie* 'two' but this is impossible due to the presence of the PP adjunct in between them.

Supposing the NUMERAL + *na* 'out of' + NUMERAL construction consists of two syntactic units: the main DP and a PP adjoined to it, we can draw a parallel between this structure and expressions containing non-numeral adjunct PPs such as *na całą masę aktorek* 'out of a whole mass of actresses' in (57) or *z tego batalionu* 'from this battalion' in (58)[18]:

(57)   Tylko dwie [PP na całą masę aktorek] umiały pływać.
         only two.NOM on whole.ACC mass.ACC actresses.GEN could.PL,NONVIR swim
         'Only two out of a whole mass of actresses could swim.'
(58)   Pięciu żołnierzy [PP z tego batalionu] umiało czytać.
         five.ACC soldiers.GEN from this.GEN battalion.GEN could.SING,NEUT read
         'Five soldiers from this battalion could read.'

This analysis is also supported by the following data from Derwojedowa (2004)[19]:

(59)   a.   O dwóch na trzydzieścioro siedmioro dzieci nic nie wiadomo.
                about two.LOC on thirty-COLL,ACC[20] seven-COLL,ACC children-GEN nothing
                not is-known

---

[18] Note that *z* 'from' is a genitive-assigner.

[19] As noted by an anonymous reviewer, these examples would be more natural if the preposition *na* 'on' were replaced with the ablative preposition *z* 'from'. This is probably because such sentences can hardly be interpreted as proportional.

[20] Forms such as *trzydzieścioro* or *siedmioro* are called "collective". They are used, amongst other contexts, with nouns denoting young individuals (for instance, children, young animals etc.). This issue does not influence the analysis outlined in the present paper.

              'Nothing is known about two out of thirty-seven children.'

     b.   O dwóch dziewczynkach na trzydzieścioro siedmioro dzieci nic nie wiadomo.

              about two.LOC girls.LOC on thirty-COLL,ACC seven-COLL,ACC children-GEN

              nothing not is-known

              'Nothing is known about two girls out of thirty-seven children.'

Example (59b) shows that the nouns in the upper and lower DPs do not have to be the same. If they are not, the PF-ellipsis is impossible (identity is, obviously, a necessary condition in this case). Nevertheless, examples such as (59a) and (59b) clearly share the same underlying structure.
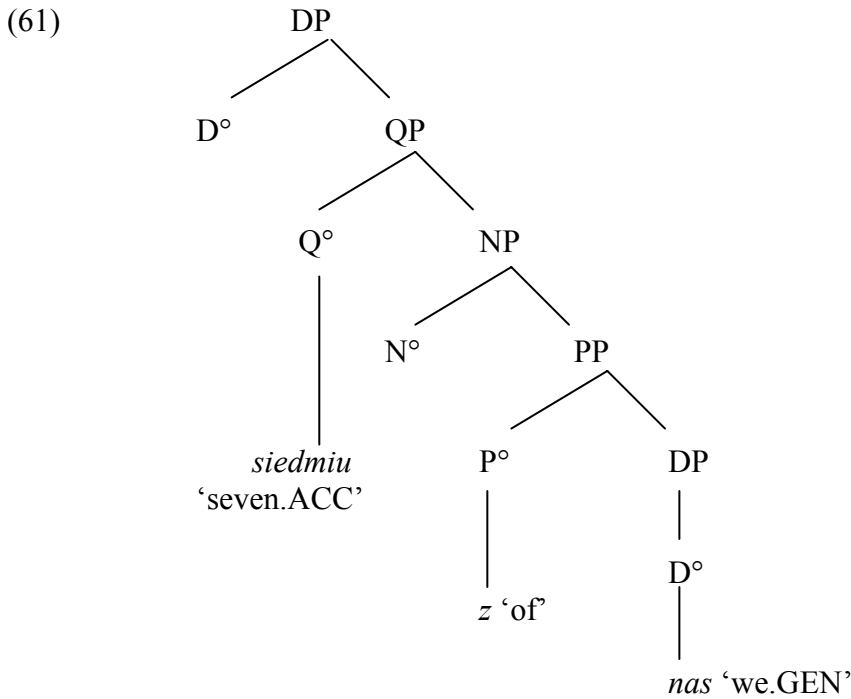
     We should note a similarity between the structure represented in (49) and the following pronominal construction:

(60)   Siedmiu z nas tańczyło tango.   (nas 'we' ≠ siedmiu 'seven')

        seven.ACC,VIR from we.GEN danced.SING,NEUT tango

        'Seven of us were dancing tango.'

The difference between examples (60) and (17b, repeated here as 60') is that the latter refers to a group of people that consists of exactly seven people, whilst (60) means that there are more than seven people in the group to which the first-person plural pronoun refers.

(60')   Nas siedmiu tańczyło tango.   (nas 'we' = siedmiu 'seven')

        we.GEN seven.ACC,VIR danced.SING,NEUT tango

        'Seven of us were dancing tango.'

This semantic distinction can be captured by postulating that the personal pronoun and the numeral in (60) are located in two separate DPs:

(61)

```
                        DP
                      /    \
                    D°      QP
                          /    \
                        Q°      NP
                              /    \
                            N°      PP
                                  /    \
                                P°      DP
                     siedmiu     |       |
                   'seven.ACC'   |       D°
                                 |       |
                               z 'of'    |
                                       nas 'we.GEN'
```

In such a bi-phrasal structure, the indefinite reading would thus be derived from the absence of a personal pronoun in the upper D° node. Since the upper DP lacks a pronominal head, the N° position seems redundant in this case. However, it might as well be argued that N° is occupied by an empty (pro)noun which is marked for gender. Otherwise, there would be no element that the cardinal could agree with (the numeral might be either virile or non-virile – depending on the gender of the quantified head). The cardinal is unlikely to agree with the lower D° – note that the following example is ambiguous:

(62)   Siedem z nas tańczyło tango.
        seven.ACC,NONVIR from we.GEN danced.SING,NEUT tango
        'Seven of us were dancing tango.'

The cardinal is non-virile – this means that the upper DP refers to a group in which there are no entities marked as [+masc, +human]. The lower DP, on the other hand, might refer either to a non-virile or to a mixed group (the personal pronoun is not overtly marked for case – see examples (7a-b)).

6. Reanalysis in structures with PP-internal Q-type heads

If the analysis presented in the previous section is correct, examples such as (63) and (64) are expected to be ungrammatical (cf. examples (45) and (34), which illustrate the standard agreement pattern in this case). Surprisingly, for many speakers of Polish, example (64) is acceptable:

(63)   *Pięć na dwadzieścia dwie Holenderki lubiły jazz.[21]

        five.NOM on twenty-two.ACC Dutchwomen.ACC liked.PL,NONVIR jazz

(64)   Dwie na pięć Holenderek lubiło jazz.

        two.NOM on five.ACC Dutchwomen.GEN liked.SING,NEUT jazz

        'Two out of five Dutchwomen liked jazz.'

In (63), the PP *na dwadzieścia dwie Holenderki* 'out of twenty-two Dutchwomen' can only be interpreted as an adjunct. Therefore, the head Q-numeral *pięć* 'five' should make the verb take the neuter singular inflection. Since the verb is plural, the example cannot be grammatical. However, the structure of example (64) is exactly the same: in this case, it is the Q-numeral *pięć* 'five' that is PP-internal so it should not be able to influence the verb form. Nonetheless, the verb appears in the neuter singular form, characteristic of Q-type structures.

We propose that examples such as (64) should be interpreted as resulting from syntactic reanalysis: the whole structure *dwie na pięć* 'two on five' becomes one numerical expression, headed by the last element (similarly to complex numerals – see Section 4). The input and output of this reanalysis process could be schematised as follows:

(65)   A-NUM [*na* Q-NUM NP] VP.PL,NONVIR   (input – corresponding to (34))

(66)   [A-NUM *na* Q-NUM] NP VP.SING,NEUT   (output – corresponding to (64))

The last element of the reanalysed structure in (66) is a Q-numeral, so the entire complex selects a genitive complement and requires the singular neuter verb form. This grammatical innovation means that the original head A-numeral *dwie* 'two' and the elements *na pięć* 'on five' have merged to form just one Q-type structure. Note that this kind of reanalysis is impossible in (63):

(67)   Q-NUM [*na* A-NUM NP] VP.SING,NEUT   (input – corresponding to (45))

---

[21] This sentence is grammatical according to Derwojedowa (2004) and an anonymous reviewer of the present paper but their judgment has not been confirmed in the questionnaire test we carried out (see above). Responses from the native speakers we consulted resulted in the mean score -1.971, which is far below the level of acceptability that we assume. However, since there are at least some speakers who seem to accept the sentence in question we have decided to mark it as "?*".

(68)   *[Q-NUM *na* A-NUM] NP VP.PL,NONVIR (ungrammatical output – corresponding to (63))

If example (63) were grammatical, the A-numeral would have to be analysed as the head of the whole construction, which would, in turn, mean that the reanalysis could result in creating an A-type complex. Unlike the Q-type structure in (66), the A-type structure would occupy the specifier of QP, since this is where regular A-numerals are placed (see Section 4 of the present paper). However, being derived from a syntactic expression, the A-type complex cannot decline as one syntactic unit (the preposition *na* 'on' assigns accusative to the following A-numeral). Therefore, it is disallowed in Spec,QP (A-numerals must agree in case with the quantified noun).

Note that the indeclinable status of complexes resulting from the syntactic reanalysis of PP-type numeric expressions does not make the structure postulated in (66) ungrammatical because, in this case, the Q° head does not have to agree in case with the quantified noun. However, this is true for structural (i.e. nominative and accusative) contexts only. As shown in Section 2 of the present paper, Q-numerals do not function as case-assigners in inherent-case contexts. Instead, they agree with the quantified noun. Our prediction then must be that the reanalysis shown in (66) is impossible in inherent-case contexts. This is exactly what the data in (69) show:

(69)   a.   Adam tańczył z dwiema na pięć Holenderek.
             Adam danced with two.INSTR on five.ACC Dutchwomen.GEN
             'Adam danced with two out of five Dutchwomen.'
        b.   *Adam tańczył z dwiema na pięć Holenderkami.
   Adam danced with two.INSTR on five.ACC Dutchwomen.INSTR

The relevant fragments of the above examples have the following structures:

(70) P_{Instr} A-NUM [*na* Q-NUM NP.GEN]   (corresponding to (69a))
(71)   *P_{Instr} [A-NUM *na* Q-NUM] NP.INSTR   (corresponding to (69b))

The complex Q-type structure in (71) is disallowed because it cannot be marked as instrumental.

It is crucial to note that we use the term 'reanalysis' to refer to a syntactic innovation in terms of acquisition (i.e. introduction of a new complex Q-type structure to the syntax of Polish numerals), and not as a sentence-formation process. Therefore, the structures in (65) and (66) are not related derivationally in a synchronic sense. Sentences such as (64) must be base generated as (66) – with only one NP and no PF-deletion. The syntactic structure of the reanalysed example (64) could be represented in the following way:

(72)
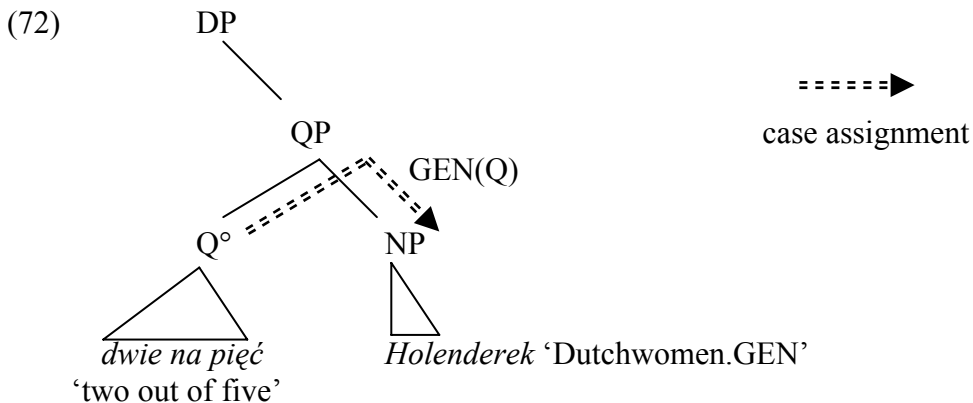
The assumption that the reanalysed numerical phrase functions as a single Q-numeral resembles Corver and Zwart's (2004) analysis of what they call prepositional numerals such as *between thirty and fourty*.

The diachronic development of Polish numerals provides a similar case of structural reanalysis, namely the development of cardinals such as *jedenaście* 'eleven' or *dwanaście* 'twelve' (cf. Rutkowski, 2002b). They derive from syntactically analysable expressions consisting of two numerals linked by the preposition *na* 'on':

(73) a. jedenaście 'eleven' (Modern Polish) < jedinъ na desęte 'one on ten' (Old Slavic)

b. trzynaście 'thirteen' (Modern Polish) < tri na desęte 'three on ten' (Old Slavic)

c. czternaście 'fourteen' (Modern Polish) < četyri na desęte 'four on ten' (Old Slavic)

d. piętnaście 'fifteen' (Modern Polish) < pętь na desęte 'five on ten' (Old Slavic)

In Old Slavic, these structures were headed by the first numeral. However, the word *desęte* 'ten' has now been phonologically eroded (*desęte > dźeśęće > dźeśće > dźće > ście* – see, e.g., Długosz-Kurczabowa and Dubisz, 1998) and fused with the preceding elements. The meaning of the whole construction has changed from compositional to unanalysable. In Modern Polish, the numerals in question are perceived as simplex Q-numerals (even if they derive from expressions headed by A-numerals).

Steven Franks (p.c.) points out that the reanalysis process presented schematically in (65) and (66) resembles the behaviour of the English phrases *kind of/kinda* and *sort of/sorta* in expressions such as *these kind of girls*, *those sort of cars*. In these structures, the original head element *kind*/*sort* becomes a kind of modifier of the main noun. Steven Franks also notes that English numeral constructions of the type NUM *out of* NUM seem to be subject to a restructuring process very similar to the one we have observed in Polish. The following sentences are parallel to the Polish examples in (34-37) and (45-48):

(74)   Only one [PP out of five actresses] is swimming.

(75)   Only one actress [PP out of five] is swimming.

(76)   [PP Out of five actresses], only one is swimming.

(77)   [PP Out of five], only one actress is swimming.

It is always the PP-external numeral that determines the form of the verb: the numeral *one* requires the verb form to be third-person singular. Therefore, the following examples have to be ungrammatical:

(78)   *Only one actress [PP out of five] are swimming.

(79)   *[PP Out of five actresses], only one are swimming.

Nevertheless, Steven Franks points out that, for some speakers of English, sentences such as (80) seem to be acceptable:

(80)   Only one out of five actresses are swimming.

The plural verb form can be explained only if we interpret the above example as parallel to (64), and, therefore, structured in line with the reanalysed pattern shown in (66).

7. Conclusion

In the present paper, we have presented an overview of the syntax of Polish numerical expressions and argued for a model in which Q-numerals have the status of functional heads (based on various synchronic and diachronic data). We have employed this model to analyse the syntax of the structure NUM + *na* + NUM and shown that this construction does not occupy the syntactic slot which is otherwise occupied by a single numeral. Instead, it has to be base generated as two separate DPs – one of them heads the whole numerical expression, whilst the other one is part of an adjunct PP (beginning with the preposition *na* 'out of'). The quantified noun is present in both of these phrases but one of its occurrences is subject to PF-ellipsis. If the PP-internal numeral is a Q-type numeral adjacent to the quantified noun, the construction may be reanalysed as 'mono-phrasal' – with the lower Q-numeral as the head of a single numerical expression.

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