

# Towards a Construction Grammar Account of the Distributive PO in Polish<sup>\*</sup>

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**Abstract.** Polish distributive constructions involving the form *po* are well known for their syntactic and semantic idiosyncrasy. The aim of this paper is to show that, contrary to the received wisdom, two different lexemes PO take part in such constructions: a preposition and an adnumeral operator. This explains some of the idiosyncratic behaviour, namely, the apparent ability of PO to combine with different grammatical cases. A preliminary Construction Grammar analysis is proposed which eschews the potential problem of missed generalisations that such a dual account of PO might engender.

**Keywords.** Distributive PO, adnumeral operator, Sign-Based Construction Grammar, Polish.

## 1 Introduction

The distributive element PO in Polish, which may roughly be translated as ‘each’, is known for its highly idiosyncratic behaviour: it seems to combine with either the locative, as in (1) below, or the accusative, as in (2) (cf., e.g., Łojasiewicz 1979 and Franks 1995, pp.160–161), it apparently exhibits limited external distribution (it most readily occurs in the direct object and the subject position; cf., e.g., Franks 1995, pp. 161–162, and Przepiórkowski 1999, pp. 117–119), and it imposes semantic constraints on the phrase it combines with, possibly expressible in terms of cardinal generalised quantifiers (Przepiórkowski 2008).

- (1) Dałem im            po jabłku.  
gave-I them.DAT PO apple.LOC  
‘I gave them an apple each.’

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- (2) Dałem im po dwa jabłka.  
 gave-I them.DAT PO two.ACC apples.ACC  
 ‘I gave them two apples each.’

In Przepiórkowski 2006 I show that the case of the phrase that combines with PO depends on the grammatical class of that phrase, and not on its grammatical number. That is, *jabłku* in (1) appears in the locative because it is a nominal phrase, not because it is singular, and similarly *dwa jabłka* in (2) appears in the accusative because it is a numeral phrase, not because it is plural.

In that article and in other work I treated PO in line with all previous literature and with Polish dictionaries, i.e., as a single preposition which for some reason takes an argument either in the locative or in the accusative. In the current work I show that in fact there exist two different distributive elements PO: a preposition combining with locative nominal phrases and an adnumeral modifier, whose distribution is by no means constrained to accusative numeral phrases.

This analysis explains away the most controversial assumption about PO, namely, that as a single preposition it takes arguments in two different grammatical cases, depending on the internal nature of these arguments. On the other hand, postulating two different distributional elements PO smacks of a missed generalisation, as both elements have the same semantic impact.

In what follows I outline an analysis couched in Sign-Based Construction Grammar (SBCG; Sag 2007, 2010b,a, and Kay and Sag 2009), a dialect of Construction Grammar (CxG; cf., e.g., Fillmore *et al.* 1988, Goldberg 1995, 2006, Michaelis and Lambrecht 1996, Croft 2001, Goldberg and Jackendoff 2004, Boas and Sag 2010) formalised within the framework of Head-driven Phrase Structure Grammar (HPSG; Pollard and Sag 1987, 1994, see also Przepiórkowski *et al.* 2002). One conspicuous property of CxG is the assumption that grammatical constructions are organised in an inheritance hierarchy, i.e., a given construction may have a number of subconstructions, each inheriting the general properties of the mother construction and possibly adding its own. It is this feature of Construction Grammar that makes it possible to describe the two distributive POs without a loss of generalisation.

The following section, §2, presents the basic empirical facts which lead to the conclusion that there exist two different distributive PO elements in Polish. In the interest of brevity, the examples are either artificially constructed or, if attested, they are often simplified. The

main empirical bulk of the argument, with numerous attested examples from the current demo of the National Corpus of Polish (<http://nkjp.pl/>) and from the Internet at large, may be found in Przepiórkowski 2010.

The proposed analysis is described in §3. No previous knowledge of any of the grammatical frameworks mentioned above should be necessary to understand the main points of the analysis.

Finally, §4 concludes the paper.

## 2 Two Distributive PO Constructions

When the distributive PO occurs with nominal phrases, as in (1), it assigns the locative case. In Polish, the locative is a strictly post-prepositional case, i.e., only arguments of some prepositions occur in the locative and it is never assigned by verbs or lexemes from other grammatical classes. In particular, nothing else than the form *po* in (1) may explain the occurrence of the locative, as the position occupied by the PO-phrase is ordinarily an accusative position:

- (1') Dałem im jabłko.  
gave-I them.DAT apple.ACC  
'I gave them an apple.'

Hence, there is no reason to doubt that the distributive PO in (1) is in fact a locative-assigning preposition.

However, the assumption that all occurrences of the distributive PO are prepositional is problematic for the following examples, from Łojasiewicz 1979, p. 154:

- (3) W pokojach będą po dwa fotele.  
in rooms be.FUT.PL PO two armchair.ACC/NOM.PL  
'There will be two armchairs in each room.'
- (4) Na ławkach leżały po trzy arkusze  
on benches lie.PAST.PL PO three sheet.ACC/NOM.PL  
papieru.  
paper.GEN.SG  
'There lay three sheets of paper on each bench.'

In both cases the PO-phrase occupies the subject position and the verb agrees with the numeral phrase which co-occurs with PO. That is, assuming the prepositional analysis of PO, the verb agrees with an accusative phrase which occurs within a prepositional phrase.

Such an analysis directly clashes with the well-documented and robust generalisation that in Polish, as in other Indo-European languages, the finite verb only agrees with nominative subjects. Whenever the subject occurs in a different case or does not bear case at all, the verb occurs in the default 3rd person singular neuter form (cf., e.g., Jaworska 1986a,b, Dziwirek 1990, Świdziński 1992, Franks 1995, Przepiórkowski 1999, 2004, Miechowicz-Mathiasen and Witkoś 2007).

The problem is mentioned in Franks 1995, p. 162, who notes that the numeral phrases in (3)–(4), accusative on the prepositional PO analysis, are syncretic with the nominative forms, and stipulates that because of this syncretism “the verb is somehow agreeing with the apparent nominative plural subject DP [determiner phrase; AP], ignoring the fact that it is embedded in a PP [prepositional phrase; AP]”.<sup>1</sup>

In Przepiórkowski 2010 I show at length that such paucal numeral phrases co-occurring with PO in the subject position do bear the nominative case. The evidence comes from human masculine (‘virile’)<sup>2</sup> forms, which — unlike the inanimate masculine forms *fotele* and *arkusze* in (3)–(4) — do not exhibit the nominative/accusative syncretism.

Consider the attested (but shortened) example below:

- (5) Do Senatu wybierani są                    po dwaj        senatorzy  
       to senate selected    be.PRES.PL PO two.NOM senators.NOM.PL  
       z        każdego stanu.  
       from each        state

‘Two senators from each state are selected for the Senate.’

The forms *dwaj* and *senatorzy* are in the nominative; the corresponding accusative forms are *dwóch* and *senatorów*, and the corresponding locative — *dwóch* and *senatorach*. Hence, in order to maintain the uniform prepositional analysis of PO, this hypothetical preposition would have to be able to combine not with two, but with at least three different cases: locative, accusative<sup>3</sup> and nominative. Moreover, while the locative/accusative case assignment split assumed so far corresponds to the

<sup>1</sup> I refrain here from a more detailed discussion of Franks’ claims regarding the distributive PO, because of the questionable acceptability judgements of some of the crucial data therein. In particular, contrary to Łojasiewicz 1979, p. 154, Franks 1995, p. 162 assigns ‘?’ to (3) and ‘?\*’ to (4), both perfectly acceptable to my native ears.

<sup>2</sup> I assume here the repertoire of 5 grammatical genders in Polish, as proposed in Mańczak 1956 and now rather widely accepted in Polish linguistics: human masculine, animate masculine, inanimate masculine, feminine and neuter.

<sup>3</sup> In the normally accusative direct object position, PO would co-occur with the accusative *dwóch senatorów*.

grammatical class of the argument, the nominative/accusative case of the numeral phrase within the prepositional phrase would depend on the position of that phrase in the sentence, as if the preposition were in fact transparent to case assignment. Also, the fact that the subject–verb agreement crosses the prepositional phrase boundary would still remain unexplained.

In fact, as shown in Przepiórkowski 2010, the distributive PO may also occur in other case positions, although attested examples are rare and sometimes marginal. The following example, where PO appears in a normally dative position and combines with a dative numeral phrase, illustrates this possibility:

- (6) Broń została przekazana po dwóch osobom z  
 weapon AUX transfered.PASS PO two.DAT person.DAT.PL from  
 każdego ugrupowania.  
 each group  
 ‘The weapon was handed in to two people from each group.’

In view of such evidence, the uniform prepositional analysis of the distributive PO cannot be maintained: it is clear that in (2), (3)–(4), (5) and (6) PO acts as some kind of a modifier of numerals or numeral phrases, possibly an adnumeral operator (Pol. *operator adnumeratywny*) in the sense of Grochowski 1997.

Independent evidence for the adnumeral operator status of PO, when it co-occurs with numeral phrases, is provided by Jadwiga Linde-Usiekniewicz and Paweł Rutkowski (p.c., November 2009). Consider the contrast between (7) and (8).

- (7) a. Posłał go po 2 smaczne jabłka.  
 sent him for 2 tasty apples  
 ‘He sent him to fetch 2 tasty apples.’  
 b. Posłał go po smaczne 2 jabłka.  
 sent him for tasty 2 apples
- (8) a. Dał każdemu po 2 smaczne jabłka.  
 gave each one PO 2 tasty apples  
 ‘He gave each of them 2 tasty apples.’  
 b. \*Dał każdemu po smaczne 2 jabłka.  
 gave each one PO tasty 2 apples

The form *po* occurring in (7) is an unambiguous preposition, homonymous with the distributive PO, but lacking its distributive semantics

and always combining with the accusative. In this example, and in almost all other contexts, the adjective modifying the noun may ‘float’ to the pre-numeral position, without any clear adverse impact on the acceptability of the sentence. This should be contrasted with (8), where the distributive form *po* needs to be adjacent to the numeral.

Moreover, there is a parallelism between (8) and (9), featuring a typical adnumeral operator, *z* ‘about’.

- (9) a. Dałem każdemu *z* 5 moich książek.  
       gave each one about 5 my books  
       ‘I gave each of them some 5 books of mine.’  
   b. \*Dałem każdemu *z* moich 5 książek.  
       gave each one about my 5 books

I conclude that there are two distributive PO elements in Polish: a locative-taking preposition, as in (1), and an adnumeral operator, as in all other examples above involving the distributive PO. While the latter is — by the nature of adnumeral operators — constrained to numeral phrases, the distributive preposition seems to idiosyncratically constrain the grammatical class of its argument to nominal phrases, as the following unacceptable example, to be compared with the grammatical (2) above, suggests:<sup>4</sup>

- (2′) \*Dałem im *po* dwóch jabłkach.  
       gave-I them.DAT PO two.LOC apples.LOC

Note that although both distributive PO elements are functional closed-class words, they induce very different grammatical structures: the preposition combines with the complete nominal phrase, forming a prepositional phrase, while the adnumeral operator, as suggested by the behaviour of floating adjectives exemplified above, first combines with the numeral and only subsequently the numeral complex combines with a nominal phrase, creating a numeral phrase. This difference is schematically shown below, for the phrases *po smacznym jabłku* ‘PO tasty apple’ and *po dwa smaczne jabłka* ‘PO two tasty apples’:

- (10) a. [*po* [*smacznym jabłku*]<sub>NP</sub>]<sub>PP</sub>  
       b. [*po dwa*]<sub>Num</sub> [*smaczne jabłka*]<sub>NP</sub>]<sub>NumP</sub>

<sup>4</sup> A more general explanation of the ungrammaticality of (2′) is that the distributive PO does not impose any constraints on the grammatical class of its argument, but the combination of such PO with numeral phrases is blocked by the existence of the more specific adnumeral PO construction, analogously to regular morphological forms being blocked by the existence of irregular forms.

The following section sketches a uniform analysis of the two distributive PO elements in Polish.

### 3 Constructional Account

#### 3.1 Construction Grammar

Construction Grammar (CxG), together with many other linguistic theories, rejects the distinction between core and periphery, pervasive in the dominant grammatical framework, Principle and Parameters (Chomsky 1995). Instead, it is committed to account for all linguistic phenomena, at all levels of granularity and perceived centrality to the grammatical theory.

The main theoretical notion, giving the name to the whole approach, is construction: roughly a pairing of form (including the structure) and meaning. For example, the ditransitive construction, where a verb combines with a direct object NP and an indirect object NP, is argued (Goldberg 2006) to have a general “ditransitive semantics”, shared by and further constrained in different ditransitive phrases (e.g., *to buy somebody a book* vs. *to send somebody a book*). Various CxG dialects take a different stand on whether each construction must have a semantic impact. For example, while the subject-auxiliary inversion, encompassing such examples as *Did she go?*, *Had she gone*, *they would...*, *Boy did she go!*, *So does he.*, etc., is argued by Goldberg 2006, ch. 8 to introduce an abstract meaning, Fillmore 1999 presents a constructional analysis free from such an assumption. In the analysis outlined below, I follow Sag 2007, 2010b,a in the assumption that some constructions only specify form and/or structure, with the exclusion of semantics.

Constructions are organised in a multiple-inheritance hierarchy, i.e., a construction may be a subtype of a number of more general constructions, inheriting all properties from all such superconstructions. To these, the given construction may add its own properties, and it may in turn have a number of subconstructions, which inherit all properties of the construction (including those inherited from its superconstructions). This way grammatical generalisations may be expressed at the appropriate level of granularity.

#### 3.2 Sign-Based Construction Grammar

Sign-Based Construction Grammar (SBCG; Sag 2007, 2010b,a) is a formalisation of a dialect of CxG known as Berkeley Construction Gram-

mar (BKG; cf., e.g., Fillmore *et al.* 1988, Kay and Fillmore 1997, Lambrecht and Michaelis 1998, as well as papers in Boas and Sag 2010), based on the formal mechanisms and grammatical structure of the Head-driven Phrase Structure Grammar (HPSG; Pollard and Sag 1987, 1994; cf. also Sag *et al.* 2003).

In SBCG, as in HPSG, linguistic objects are expressed as feature structures (FSs), where each FS has a type which determines which features may appear in the FS and what types of values they may have. For example, the type *sign*, corresponding to lexemes, words and phrases (including sentences), specifies six features, including the following three:

$$(11) \text{ sign: } \left[ \begin{array}{l} \text{FORM } \textit{morphological-object} \\ \text{SYN } \textit{syntactic-object} \\ \text{SEM } \textit{semantic-object} \end{array} \right]$$

The values of these three features represent information about the morphological form of the sign, its syntactic (and morphosyntactic properties) and its semantic impact. The values of SYN are described in more detail below. In the remainder of this paper the values of FORM will be informally represented by lists of word forms so that, e.g., the value of FORM for the phrase *She sang a song*. will be shown as  $\langle \textit{she}, \textit{sang}, \textit{a}, \textit{song} \rangle$ . Since SBCG seems to be compatible with the whole range of approaches to semantics and there is no semantic representation worked out specifically for SBCG, I will not formally specify values of SEM.

Types are organised in a multiple inheritance hierarchy. For example, one of the subtypes of *sign* is *expression*, whose two maximal subtypes<sup>5</sup> are *word* and *phrase*, where the type *word* adds one more feature, expressing the argument structure (list of its arguments, sub-categorisation frame) of a given word:

$$(12) \text{ word: } [\text{ARG-ST } \textit{list}(\textit{expression})]$$

Since FSs of type *word* inherit properties from all supertypes of *word*, each such FS will be specified for all the following features (and some more, not mentioned in this paper): FORM, SYN, SEM, ARG-ST.

Constructions are not represented as FSs of type *sign*, but rather as FSs of type *construct*, where each construct encodes a local tree: the mother and a list of daughters:

$$(13) \text{ construct: } \left[ \begin{array}{l} \text{MTR } \textit{sign} \\ \text{DTRS } \textit{list}(\textit{expression}) \end{array} \right]$$

<sup>5</sup> Maximal subtypes are types which do not have any subtypes, i.e., they are the leaves in the type hierarchy.



Typical phrases are headed constructs, i.e., one of the daughters is distinguished as the head daughter, which determines the morphosyntactic properties of the phrase. A subtype of *construct* used for modelling such constructions introduces the additional head daughter feature:

$$(14) \textit{headed-ctx}: [\text{HD-DTR } \textit{sign}]$$

All constructs considered below will be headed, i.e., their FSs will carry three features: MTR, DTRS and HD-DTR.

The fact that the mother of a headed construct shares its morphosyntactic properties with the head daughter is formalised as the following constraint, also given in an abbreviated form:

$$(15) \textit{headed-ctx} \Rightarrow \left[ \begin{array}{l} \text{MTR} \left[ \text{SYN} \left[ \text{CAT} \boxed{\square} \right] \right] \\ \text{HD-DTR} \left[ \text{SYN} \left[ \text{CAT} \boxed{\square} \right] \right] \end{array} \right]$$

$$(15') \textit{headed-ctx} \Rightarrow \left[ \begin{array}{l} \text{MTR|SYN|CAT} \boxed{\square} \\ \text{HD-DTR|SYN|CAT} \boxed{\square} \end{array} \right]$$

This constraint assumes that one of the features of *syntactic-object* (i.e., of FSs which are values of the SYN feature) is CAT. Some other features of *syntactic-object* relevant in this paper are given below:

$$(16) \textit{syntactic-object}: \left[ \begin{array}{l} \text{CAT } \textit{category} \\ \text{VAL } \textit{list(expression)} \\ \text{GAP } \textit{list(expression)} \end{array} \right]$$

Within each *syntactic-object*, values of CAT represent morphosyntactic properties of that object, values of VAL(ence) — the arguments which still need to be overtly realised to form a complete phrase (or sentence), and GAP is a technical feature used in the analysis of unbounded dependencies (cf., esp., Sag 2010a).

In summary, (15) is saying that whatever the value of HD-DTR|SYN|CAT (represented here by the variable  $\boxed{\square}$ ), MTR|SYN|CAT must have the same value (the values of both features are structure-shared). Given that, e.g., case information is contained in a noun's CAT value, (15) makes sure that the whole NP will bear the same case as its nominal head daughter.

I assume that one of the subtypes of *headed-ctx* is *head-rightval-ctx*, responsible for the tree-configurational realisation of one of the VAL elements to the right of the head.<sup>6</sup>

<sup>6</sup> This construct roughly corresponds to *head-comp-ctx* and *subj-head-ctx* in Sag 2010a. For reasons of exposition I assume that only one argument is realised at a time, resulting in binary branching trees, and make other simplifying assumptions regarding word order.

$$(17) \textit{ head-rightval-cxt} \Rightarrow \left[ \begin{array}{l} \text{MTR|SYN|VAL } \langle \emptyset \rangle \\ \text{DTRS } \langle \langle \emptyset, \langle \emptyset \rangle \rangle \\ \text{HD-DTR } \langle \emptyset \rangle [\text{SYN|VAL } \langle \emptyset \rangle \circ \langle \langle \emptyset \rangle \rangle] \end{array} \right]$$

In such constructs one of the elements of the VAL list ( $\langle \emptyset \rangle$  above) of the head daughter ( $\langle \emptyset, \langle \emptyset \rangle \rangle$  above) is realised as the right daughter in the local tree. Moreover, the VAL feature of the mother is the list containing all the other elements of the head daughter's VAL, with the effect analogous to the cancellation of arguments in categorial grammars.<sup>7</sup> In case the value of the head daughter's VAL is a one-element list (i.e.,  $\langle \emptyset \rangle$  is the empty list), (17) reduces to the following constraint:

$$(17') \textit{ head-rightval-cxt} \Rightarrow \left[ \begin{array}{l} \text{MTR|SYN|VAL } \langle \rangle \\ \text{DTRS } \langle \langle \emptyset, \langle \emptyset \rangle \rangle \\ \text{HD-DTR } \langle \emptyset \rangle [\text{SYN|VAL } \langle \langle \emptyset \rangle \rangle] \end{array} \right]$$

### 3.3 Towards an Account

The basic idea is simple. Among Polish constructs there is a distributive construct, which relates its semantics to the form *po*. This construct has exactly two subconstructs, prepositional and adnumeral. Since according to HPSG (and SBCG) architecture any linguistic object must be of a maximally specific type (cf. fn. 5), any particular use of the distributive construction must be either prepositional or numeral.

The general distributive construct, *distr-cxt*, is a (perhaps indirect) subtype of the *head-rightval-cxt* and it is constrained in the following way:

$$(18) \textit{ distr-cxt} \Rightarrow \left[ \text{MTR} \left[ \begin{array}{l} \text{FORM } \langle \textit{po}, \dots \rangle \\ \text{SEM } (\textit{distributional semantics}) \end{array} \right] \right]$$

Hence, this is a typical construction, relating form (the first word of the construction must be *po*) and meaning (the distributional semantics is contained in the value of SEM) within the mother of the local tree. Since *distr-cxt* is a headed construct, any FS of this type will also contain features DTRS and HD-DTR, and independent principles (not shown here) will ensure that the value of HD-DTR is one of the elements of DTRS. However, these principles do not force the first word to be the head; as we will see below, *po* will be analysed as the head of the prepositional distributive construction, but not the head of the adnumeral distributive construction.

<sup>7</sup>  $\circ$  is the so-called shuffle operator, combining the two lists in a way that preserves the order of each of them, e.g., possible values of  $\langle a, b \rangle \circ \langle c, d \rangle$  are  $\langle a, b, c, d \rangle$ ,  $\langle a, c, b, d \rangle$ ,  $\langle a, c, d, b \rangle$ ,  $\langle c, a, d, b \rangle$ , etc., but not, e.g.,  $\langle b, a, c, d \rangle$ .

**Distributive Prepositional Construct** The two subtypes of *dist-ctx* are *dist-prep-ctx* and *dist-adnum-ctx*. The distributive prepositional construct requires that the head daughter in the local tree is a preposition combining with a locative nominal phrase:

$$(19) \text{ dist-prep-ctx} \Rightarrow \left[ \text{HD-DTR} \left[ \begin{array}{c} \textit{word} \\ \text{SYN} \left[ \begin{array}{c} \text{CAT } \textit{prep} \\ \text{VAL} \langle \left[ \text{SYN|CAT} \left[ \begin{array}{c} \textit{noun} \\ \text{CASE } \textit{loc} \end{array} \right] \rangle \end{array} \right] \end{array} \right] \right] \right]$$

The above constraint, in combination with the constraints on the supertypes of *dist-prep-ctx* given above, ensures that any FS of this type will satisfy the following description:

$$(20) \left[ \begin{array}{c} \textit{dist-prep-ctx} \\ \text{MTR} \left[ \begin{array}{c} \text{FORM } \langle \textit{po}, \dots \rangle \\ \text{SYN|VAL } \langle \rangle \\ \text{SEM } (\textit{distributional semantics}) \end{array} \right] \\ \text{DTRS } \langle \underline{1}, \underline{2} \rangle \left[ \begin{array}{c} \text{SYN|CAT} \left[ \begin{array}{c} \textit{noun} \\ \text{CASE } \textit{loc} \end{array} \right] \end{array} \right] \rangle \\ \text{HD-DTR } \underline{1} \left[ \begin{array}{c} \textit{word} \\ \text{SYN} \left[ \begin{array}{c} \text{CAT } \textit{prep} \\ \text{VAL } \langle \underline{2} \rangle \end{array} \right] \end{array} \right] \end{array} \right]$$

Moreover, an independent general principle relating the FORM value of the mother to the FORM values of the daughters will make sure that the head preposition is in fact PO, as in the following construct corresponding to *po smacznym jabłku* ‘PO tasty apple’:<sup>8</sup>

$$(20') \left[ \begin{array}{c} \textit{dist-prep-ctx} \\ \text{MTR} \left[ \begin{array}{c} \text{FORM } \underline{3} \oplus \underline{4} \\ \text{SYN|VAL } \langle \rangle \\ \text{SEM } (\textit{distributional semantics}) \end{array} \right] \\ \text{DTRS } \langle \underline{1}, \underline{2} \rangle \left[ \begin{array}{c} \text{FORM } \underline{4} \langle \textit{smacznym}, \textit{jabłku} \rangle \\ \text{SYN} \left[ \begin{array}{c} \text{CAT} \left[ \begin{array}{c} \textit{noun} \\ \text{CASE } \textit{loc} \end{array} \right] \\ \text{VAL } \langle \rangle \end{array} \right] \end{array} \right] \rangle \\ \text{HD-DTR } \underline{1} \left[ \begin{array}{c} \textit{word} \\ \text{FORM } \underline{3} \langle \textit{po} \rangle \\ \text{SYN} \left[ \begin{array}{c} \text{CAT } \textit{prep} \\ \text{VAL } \langle \underline{2} \rangle \end{array} \right] \end{array} \right] \end{array} \right]$$

For this analysis to work, the following lexical entry must be present in the lexicon of Polish:

$$(21) \left[ \begin{array}{c} \textit{word} \\ \text{FORM } \langle \textit{po} \rangle \\ \text{SYN} \left[ \begin{array}{c} \text{CAT } \textit{prep} \\ \text{VAL} \langle \left[ \text{SYN} \left[ \begin{array}{c} \text{CAT|CASE } \textit{loc} \\ \text{VAL } \langle \rangle \end{array} \right] \rangle \end{array} \right] \end{array} \right] \end{array} \right]$$

In fact, this is one of the two prepositions PO, the other one taking an accusative argument, and both having multiple functions in Polish.

<sup>8</sup>  $\oplus$  is the list concatenation function, i.e.,  $\langle \textit{po} \rangle \oplus \langle \textit{smacznym}, \textit{jabłku} \rangle = \langle \textit{po}, \textit{smacznym}, \textit{jabłku} \rangle$ .

**Distributive Adnumeral Construct** For the second distributive construction, with the adnumeral operator PO, I assume that adnumeral operators are constrained in the following way (where *adnum-word* is a subtype of *word*):

$$(22) \text{ adnum-word} \Rightarrow \left[ \begin{array}{l} \text{SYN|CAT} \\ \text{ARG-ST } \langle \rangle \end{array} \left[ \begin{array}{l} \text{adv} \\ \text{SELECT} \left[ \begin{array}{l} \text{word} \\ \text{SYN} \left[ \begin{array}{l} \text{CAT } \textit{num} \\ \text{GAP } \langle \rangle \end{array} \right] \end{array} \right] \end{array} \right] \right]$$

That is, adnumeral operators do not take any arguments, but as modifiers they combine (via the SELECT value) with a numeral word. Moreover, that numeral word must be specified as [GAP  $\langle \rangle$ ], in effect prohibiting any extraction from the numeral phrase, in accordance with the observations above concerning floating adjectives (cf. (8)–(9)).

Given this constraint, the lexical entry for the adnumeral PO is as simple as:

$$(23) \left[ \begin{array}{l} \textit{adnum-word} \\ \text{FORM } \langle \textit{po} \rangle \end{array} \right]$$

Now we are ready to introduce the second subtype of *distr-cxt*, *dist-adnum-cxt*, constrained in the following way:

$$(24) \text{ dist-adnum-cxt} \Rightarrow [\text{HD-DTR } [\text{SYN|CAT } \textit{num}]]$$

Perhaps surprisingly, the only information specific to the distributive adnumeral construct is that the head daughter is numeral. Since this is a subtype of *head-rightval-cxt*, the FORM of the numeral must occur at the beginning of the FORM of mother, i.e., since this is a subtype of *dist-prep-cxt*, it must start with *po*. But there is no numeral in Polish of this form. The only way to resolve this set of constraints is for the numeral to be first pre-modified by the adnumeral operator PO, in accordance with the *head-leftfunc-cxt* (left functor) construct:

$$(25) \text{ head-leftfunc-cxt} \Rightarrow \left[ \begin{array}{l} \text{MTR|SYN|VAL } \boxed{0} \\ \text{DTRS } \langle \boxed{1} [\text{SYN|CAT|SELECT } \boxed{2}], \boxed{2} \rangle \\ \text{HD-DTR } \boxed{2} [\text{SYN|VAL } \boxed{0}] \end{array} \right]$$

Substituting the adnumeral operator (23) (together with the constraint in (22)) for the non-head daughter  $\boxed{1}$  in (25), and the nominative numeral *dwa* expecting a nominative NP for the head daughter  $\boxed{2}$ , as in *po dwa smaczne jabłka* ‘PO two tasty apples’, we get the following local tree for *po dwa*:<sup>9</sup>

<sup>9</sup> NP[*nom*] abbreviates  $\left[ \begin{array}{l} \text{SYN} \\ \text{CAT} \left[ \begin{array}{l} \textit{noun} \\ \text{CASE } \textit{nom} \end{array} \right] \\ \text{VAL } \langle \rangle \end{array} \right]$ .

$$(26) \left[ \begin{array}{l} \textit{head-leftfunc-cxt} \\ \text{MTR} \left[ \begin{array}{l} \text{FORM} \langle po, dwa \rangle \\ \text{SYN} \left[ \begin{array}{l} \text{CAT} \boxed{3} \\ \text{VAL} \boxed{0} \end{array} \right] \end{array} \right] \\ \text{DTRS} \langle \boxed{1}, \boxed{2} \rangle \left[ \begin{array}{l} \text{FORM} \langle po \rangle \\ \text{SYN|CAT|SELECT} \langle \boxed{2} \rangle, \langle \boxed{2} \rangle \end{array} \right] \\ \text{HD-DTR} \langle \boxed{2} \rangle \left[ \begin{array}{l} \text{FORM} \langle dwa \rangle \\ \text{SYN} \left[ \begin{array}{l} \text{CAT} \boxed{3} \left[ \begin{array}{l} num \\ CASE nom \end{array} \right] \\ \text{VAL} \boxed{0} \langle \text{NP} \{ nom \} \rangle \end{array} \right] \end{array} \right] \end{array} \right]$$

Note the effect of the constraint (15) on *headed-cxt*, of which *head-leftfunc-cxt* is an indirect subtype, and which makes the mother morphosyntactically numeral (and nominative; cf. the variable  $\boxed{3}$ ).

As such, it may act as the head in the *dist-adnum-cxt* construct (cf. (24)), and it satisfies the constraint (18) on *distr-cxt* that the whole construction starts with *po*. The main properties of the feature structure of type *dist-adnum-cxt*, corresponding to the whole phrase *po dwa smaczne jabłka* ‘PO two tasty apples’, are given below:

$$(27) \left[ \begin{array}{l} \textit{dist-adnum-cxt} \\ \text{MTR} \left[ \begin{array}{l} \text{FORM} \boxed{4} \oplus \boxed{5} \\ \text{SYN} \left[ \begin{array}{l} \text{CAT} \boxed{3} \\ \text{VAL} \langle \rangle \end{array} \right] \\ \text{SEM} \langle \textit{distributional semantics} \rangle \end{array} \right] \\ \text{DTRS} \langle \boxed{1}, \boxed{2} \rangle \left[ \begin{array}{l} \text{FORM} \boxed{5} \langle \textit{smaczne, jabłka} \rangle \\ \text{SYN} \left[ \begin{array}{l} \text{CAT} \left[ \begin{array}{l} noun \\ CASE nom \end{array} \right] \\ \text{VAL} \langle \rangle \end{array} \right] \end{array} \right] \\ \text{HD-DTR} \langle \boxed{1} \rangle \left[ \begin{array}{l} \text{FORM} \boxed{4} \langle po, dwa \rangle \\ \text{SYN} \left[ \begin{array}{l} \text{CAT} \boxed{3} \left[ \begin{array}{l} num \\ CASE nom \end{array} \right] \\ \text{VAL} \langle \boxed{2} \rangle \end{array} \right] \end{array} \right] \end{array} \right]$$

## 4 Summary and Shortcomings

The whole analysis of the distributive PO sketched above consists of:

- the postulation of type *distr-cxt* (a subtype of *head-rightval-cxt*), with two immediate subtypes: *dist-prep-cxt* and *dist-adnum-cxt*,
- simple constraints on these three constructs: (18), (19) and (24),
- the trivial lexical entry (23) for the adnumeral PO.

All other types, constraints, and even the lexical entry for the prepositional PO (21) are needed independently in the grammar of Polish.

Nevertheless, this proposal is just an outline of an analysis, the first exercise in formulating an account in terms of the Sign-Based Construction Grammar. The most obvious shortcoming is the lack of any semantic account of distributive constructions in Polish; instead,

I concentrated on giving a minimal account of the two distributive PO elements which would avoid the problem of a missed generalisation. I assume that the specification of the value of SEM is largely orthogonal to the syntactic analysis of the two POs.

Also, the analysis does not have anything to say about the external distribution of distributive constructions. As mentioned in the introduction, the received wisdom is that such constructions are limited to the direct object and subject positions, but examples such as (6) refute this generalisation. It seems that the adnumeral distributive constructions are in principle — but subject to semantic constraints — allowed in any context that licences numeral phrases, even if they are often marked in oblique cases. The matter is more complex in case of prepositional distributive constructions, with the locative NP, which do seem to be allowed only in (roughly) direct object and subject positions. For example, (6'), parallel to the acceptable (6), seems to be completely out.

- (6') \*Broń została przekazana po jednym ochroniarzu  
 weapon AUX transfered.PASS PO one.LOC.SG guard.LOC.SG  
 z każdego banku.  
 from each bank  
 'The weapon was handed in to one guard from each bank.'  
 (intended)

In fact, what is surprising is not that such distributive prepositional phrases are not allowed in some positions, but that they may occur in otherwise nominal positions, as in (1). Again, I assume that any account of the distribution of such phrases is orthogonal to the analysis sketched above.

The proposed account is also too restrictive in at least two ways. First, the constraint (22) on adnumeral operators is too strong, as it requires that the adnumeral operator combines directly with the numeral, contrary to facts such the following, where additional adnumeral modifiers may intervene between PO and the numeral:

- (28) Dałem im po ponad / prawie / całe  
 give.1.SG.MASC.PAST they.DAT PO over almost whole  
 sto jabłek.  
 hundred.ACC apples  
 'I gave each of them over / almost / as many as 100 apples.'

Second, current account also says nothing about the possibility of the ellipsis of the NP within the numeral phrase, as in:

- (29) Dałem                                    im                    po sto.  
       give.1.SG.MASC.PAST they.DAT PO hundred  
       ‘I gave 100 to each of them.’

Since *dist-adnum-cxt* is an indirect subtype of *head-rightval-cxt*, the argument must be overtly realised.

Finally, the account is simplified in various ways for expository reasons. For example, a realistic grammar would not constrain the relative order of immediate constituents via constructs such as *head-rightval-cxt* or *head-leftfunc-cxt*, but would contain an independent linearisation component (cf., e.g., Kathol 2000).

Undoubtedly, an exhaustive account of Polish distributive constructions requires a book-length treatment.

## References

- Boas, H. and Sag, I. A., editors (2010). *Sign-Based Construction Grammar*. CSLI Publications, Stanford, CA. Forthcoming.
- Chomsky, N. (1995). *The Minimalist Program*, volume 28 of *Current Studies in Linguistics*. The MIT Press, Cambridge, MA.
- Croft, W. (2001). *Radical Construction Grammar: Syntactic Theory in Typological Perspective*. Oxford University Press, Oxford.
- Dziwirek, K. (1990). Default agreement in Polish. In K. Dziwirek, P. Farrell, and E. Mejías-Bikandi, editors, *Grammatical Relations: A Cross-Theoretical Perspective*. CSLI Publications, Stanford, CA.
- Fillmore, C. J. (1999). Inversion and constructional inheritance. In G. Webelhuth, J.-P. Koenig, and A. Kathol, editors, *Lexical and Constructional Aspects of Linguistic Explanation*, pages 113–128. CSLI Publications, Stanford, CA.
- Fillmore, C. J., Kay, P., and O'Connor, M. C. (1988). Regularity and idiomacity in grammatical constructions: The case of *let alone*. *Language*, **64**, 501–538.
- Franks, S. (1995). *Parameters of Slavic Morphosyntax*. Oxford University Press, New York.
- Goldberg, A. E. (1995). *Constructions: A Construction Grammar Approach to Argument Structure*. Chicago University Press, Chicago, IL.
- Goldberg, A. E. (2006). *Constructions at Work: The Nature of Generalization in Language*. Oxford University Press, Oxford.
- Goldberg, A. E. and Jackendoff, R. (2004). The English resultative as a family of constructions. *Language*, **80**, 532–565.
- Grochowski, M. (1997). *Wyrażenia funkcyjne. Studium leksyko-graficzne*, volume 104 of *Prace Instytutu Języka Polskiego*. Wydawnictwo Instytutu Języka Polskiego PAN, Cracow.
- Jaworska, E. (1986a). *Aspects of the Syntax of Prepositions and Prepositional Phrases in English and Polish*. Ph. D. dissertation, University of Oxford.
- Jaworska, E. (1986b). Prepositional phrases as subjects and objects. *Journal of Linguistics*, **22**, 355–374.
- Kathol, A. (2000). *Linear Syntax*. Oxford University Press, Oxford.
- Kay, P. and Fillmore, C. J. (1997). Grammatical constructions and linguistic generalizations: the *What's X Doing Y?* construction. *Language*, **75**, 1–33.



- Kay, P. and Sag, I. A. (2009). How hard a problem would this be to solve? In S. Müller, editor, *Proceedings of the HPSG 2009 Conference*, pages 171–191, Stanford, CA. CSLI Publications.
- Lambrecht, K. and Michaelis, L. A. (1998). Sentence accent in information questions: Default and projection. *Linguistics and Philosophy*, **21**, 477–544.
- Łojasiewicz, A. (1979). O budowie wyrażeń z przyimkiem *po* dystrybutywnym. *Polonica*, **V**, 153–160.
- Mańczak, W. (1956). Ile jest rodzajów w polskim? *Język Polski*, **XXXVI**(2), 116–121.
- Michaelis, L. A. and Lambrecht, K. (1996). Toward a construction-based model of language function: The case of nominal extraposition. *Language*, **72**, 215–247.
- Miechowicz-Mathiasen, K. and Witkoś, J. (2007). O podmiotach i ich przypadkach (w nawiązaniu do artykułów Zygmunta Saloniego i Adama Przepiórkowskiego). *Biuletyn Polskiego Towarzystwa Językoznawczego*, **LXIII**, 101–114.
- Pollard, C. and Sag, I. A. (1987). *Information-Based Syntax and Semantics, Volume 1: Fundamentals*. Number 13 in CSLI Lecture Notes. CSLI Publications, Stanford, CA.
- Pollard, C. and Sag, I. A. (1994). *Head-driven Phrase Structure Grammar*. Chicago University Press / CSLI Publications, Chicago, IL.
- Przepiórkowski, A. (1999). *Case Assignment and the Complement-Adjunct Dichotomy: A Non-Configurational Constraint-Based Approach*. Ph. D. dissertation, Universität Tübingen.
- Przepiórkowski, A. (2004). O wartości przypadku podmiotów liczebnikowych. *Biuletyn Polskiego Towarzystwa Językoznawczego*, **LX**, 133–143.
- Przepiórkowski, A. (2006). O dystrybutywnym PO i liczebnikach jedynkowych. *Polonica*, **XXVI–XXVII**, 171–178.
- Przepiórkowski, A. (2008). Generalised quantifier restrictions on the arguments of the Polish distributive preposition PO. *Études Cognitives*, **8**, 159–177.
- Przepiórkowski, A. (2010). O dwóch PO dystrybutywnych. In progress.
- Przepiórkowski, A., Kupść, A., Marciniak, M., and Mykowiecka, A. (2002). *Formalny opis języka polskiego: Teoria i implementacja*. Akademicka Oficyna Wydawnicza EXIT, Warsaw.
- Sag, I. A. (2007). Remarks on locality. In S. Müller, editor, *Proceedings of the HPSG 2007 Conference*, pages 394–414, Stanford, CA. CSLI Publications.

- Sag, I. A. (2010a). English filler gap constructions. *Language*. Forthcoming.
- Sag, I. A. (2010b). Sign-based construction grammar: An informal synopsis. In Boas and Sag (2010). Forthcoming.
- Sag, I. A., Wasow, T., and Bender, E. M. (2003). *Syntactic Theory: A Formal Introduction*. CSLI Publications, Stanford, CA, 2nd edition.
- Świdziński, M. (1992). Realizacje zdaniowe podmiotu-mianownika, czyli o strukturalnych ograniczeniach selekcyjnych. In A. Markowski, editor, *Opisać słowa*, pages 188–201. Dom Wydawniczy Elipsa.