

# Chapter 11

## Headedness as an epiphenomenon: Case studies on compounding and blending in German

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This paper demonstrates how statements like “compounds are right-headed in German” can be interpreted in a paradigmatic approach to morphology in terms of word-formation relations between lexical units, without presupposing word structures with “head constituents”. Using the theoretical framework of the Pattern-and-Restriction Theory (Nolda 2012, 2018), it is shown in four case studies that right-headedness applies in German not only to compounds, but in principle also to blends – a domain where “head constituents” are notoriously difficult to ascertain. Headedness properties such as being a word-formation product which is categorially and/or semantically determined by its last basis are identified solely on the basis of word-formation relations and the involved formation patterns. In a paradigmatic approach of this kind, headedness emerges as an epiphenomenon of the word-formation relations between lexical units in a linguistic system.

### 1 Overview

In a paper discussing the question “Do words have heads?”, Becker (1990: 5–8) distinguishes two kinds of morphological description: *syntagmatic morphology* and *paradigmatic morphology*. Syntagmatic morphology in the sense of Becker (1990) describes morphological regularities in terms of relations between constituents in word structures. Paradigmatic morphology, in turn, describes morphological regularities in terms of relations between words (or stems, one might add). Key notions of syntagmatic approaches include “head” and “non-head”,



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whereas descriptions in paradigmatic approaches make explicit or implicit reference to “products”, “bases”, “morphological processes”, “word-formation rules”, and “morphological restrictions” (as pioneered in the work of Aronoff 1976). The contrast between syntagmatic and paradigmatic morphology thus roughly coincides with Hockett’s (1954) distinction between “Item and Arrangement” and “Item and Process”.

According to Becker (1990: 6), paradigmatic approaches can cope for any kind of morphological phenomena, whereas syntagmatic approaches are designed for concatenative morphology:

Clearly for every syntagmatic analysis there is a corresponding paradigmatic analysis, however the reverse is not valid: There are structures that can be analysed paradigmatically but not syntagmatically, since a syntagmatic analysis is only possible for additive rules but not for subtractive or substitutional processes.

Compounds, for example, are readily analysed in both approaches, since they are basically formed by means of concatenation. For blends, however, there is no straightforward syntagmatic analysis, because their formation can involve various kinds of shortening operations.

Although paradigmatic approaches do not encode head relations in word structures, relations such as the “categorical dependency” of a compound on one of its bases can still be accounted for by appropriate formation rules. To put it in the words of Zwicky (1985: 2): “category determination resides not in constituents but in rules performing morphological operations”. A similar point can be made for the “semantic dependency” which is typical for endocentric subordinative compounds. Thus head properties like “categorical dependency” or “semantic dependency” can in principle be determined in a paradigmatic approach without presupposing any structural heads.<sup>1</sup>

In the present paper, it will be demonstrated how a statement of the sort “compounds are right-headed in German” can be interpreted in a paradigmatic approach like the *Pattern-and-Restriction Theory (PR)*. PR is a general theory of word formation which was developed and axiomatically formalised by Nolda (2012, 2018). PR’s major theoretical tools are *formation patterns* and associated

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<sup>1</sup>As an anonymous reviewer points out, a related approach is taken by Construction Morphology which describes the headedness of words in terms of constructional schemas (Booij 2010: Section 1.4 and 3.1, Arcodia 2012, and others). Still, Construction Morphology is, in my view, more akin to syntagmatic approaches to word formation: schemas directly specify properties of products, whereas properties of bases are only indirectly specified via properties of constituents of the product.

formation restrictions, which are used to describe *word-formation relations* between lexical units in a spoken or written linguistic system.<sup>2</sup> Instead of syntagmatically encoding them in word structures, PR states word-formation relations paradigmatically between *lexical units*, the latter being understood in the sense of *Integrational Linguistics (IL)* as pairings of a paradigm and a lexical meaning (Lieb 1983, 1992, 2005).<sup>3</sup>

Using this theoretical framework, it will be shown that right-headedness not only applies to compounding products in German, but also to certain blending products. This claim will be based on case studies on selected compounds and blends in spoken Modern German. Given a word-formation relation between a word-formation product and at least two word-formation bases, the following subkinds of headedness will be distinguished:

- the property of the product of being *categorially determined* by one of the bases and
- the property of the product of being *semantically determined* by one of the bases.

These properties are based on properties of the formation patterns by means of which word-formation products are formed from word-formation bases. “Right-headedness” can then be reconstructed as a descriptive term for the property of being a product that is categorially and/or semantically determined by the last basis. In this paradigmatic approach, thus, headedness emerges as an epiphenomenon of the relations between word-formation products and word-formation bases.

This paper is structured as follows. Section 2 introduces the notions of *lexical word* and *lexical stem* presupposed from IL. Sections 3 and 4 discuss selected formation patterns and their associated formation restrictions in four case studies on compounds and blends in a system of spoken Modern German. On the basis of these case studies, right-headedness will be reconstructed as a purely descriptive term in PR in Section 5. Theoretical notions of PR are introduced in a mostly informal way as we go along.

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<sup>2</sup>There is a sample computer implementation of PR called “PPR” (“System for Processing Formation Patterns and Restrictions”, available at <http://andreas.nolda.org/software.html#ppr>), which can be used for testing the soundness of theoretical and empirical hypotheses in the PR framework. It currently provides a very limited lexicon and selected formation patterns for spoken and written Modern German systems, including some of the patterns discussed in this paper.

<sup>3</sup>For a closely related word-formation theory in the IL framework cf. the *Process Model of Word Formation* by Lieb (2013).

## 2 Lexical units

According to the IL conception, a *lexical word* consists of a word paradigm and a lexical meaning. For lexical words in spoken linguistic systems, the following informal notation will be used in this paper:<sup>4</sup>

$/\text{norD}[\text{ə}]\text{n}/_{\text{north}}^{\text{W}}$ : lexical word consisting of a word paradigm with the citation form  $/\text{norD}[\text{ə}]\text{n}/$  and a lexical meaning paraphrased here as ‘north’.

$/\text{norD}[\text{ə}]\text{n}/_{\text{northern region}}^{\text{W}}$ : lexical word consisting of a word paradigm with the citation form  $/\text{norD}[\text{ə}]\text{n}/$  and a lexical meaning paraphrased here as ‘north region’.

Lexical words are grammatically characterised by means of *lexical categorisations* such as:

- (1) noun in the masculine

Categorisations like (1) are modelled as sets of *word categories*:

- (2) {Noun, Masc-N}

(“Masc-N” stands for ‘nominal word in the masculine’, i.e. masculine noun or pronoun.<sup>5</sup> For a complete list of the symbols cf. the appendix.)

A *word paradigm* is a relation between *word forms* and the *paradigmatic categorisations* they realise. For instance, the word form  $/\text{norD}[\text{ə}]\text{n}/$  in the word paradigm of the lexical words  $/\text{norD}[\text{ə}]\text{n}/_{\text{north}}^{\text{W}}$  and  $/\text{norD}[\text{ə}]\text{n}/_{\text{northern region}}^{\text{W}}$  realises the following paradigmatic categorisations:

- (3) a. nominal word form in the nominative singular

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<sup>4</sup>In the phonological notation used here, the IPA symbol “<sup>W</sup>” represents a *primary lexical accent*, understood as the potential of a syllable for bearing a non-contrastive syntactic accent (Lieb 1999b); *deaccented lexical accents* (“secondary lexical accents”) are represented by the IPA symbol “<sup>ˊ</sup>”. In syllables with primary or deaccented lexical accents, the IPA symbol “<sup>ˊ</sup>” marks vowels which are phonetically realised as long, smoothly cut, tense vowels, while unmarked vowels in such syllables are phonetically realised as short, abruptly cut, lax ones. Contrasts in vowel quality between tense and lax vowels are ignored. “[ə]” represents phonologically unspecified schwa, which may, or may not, be inserted epenthetically in phonetic units; “[ə]r” is the phonological representation for syllabic vocalic [ɻ]. Capital “D” stands for an archiphonemic sound which is unspecified for voice (or tenseness) and is realised as [d] unless it undergoes final devoicing (tensing) (cf. Lieb 1999a: 374–375).

<sup>5</sup>In this paper, a distinction is made between *nouns* and *nominal words*, the latter comprising nouns, adjectives, pronouns, and articles.

- b. nominal word form in the accusative singular
- c. nominal word form in the dative singular

Categorisations like those in (3) are modelled in IL as sets of *word-form categories*:

- (4)
- a. {Nom-Nf, Sing-Nf}
  - b. {Acc-Nf, Sing-Nf}
  - c. {Dat-Nf, Sing-Nf}

These sets can be thought of as specifications of corresponding “paradigm cells”.<sup>6</sup>

Lexical meanings like ‘north’ or ‘northern region’ are understood in IL as *concepts* of a certain kind (for details cf. Lieb 1985). As a rule, concepts are uniquely determined by their intension. The intension of ‘north’, for example, may be identified with the property of being a direction oriented towards the North Pole.<sup>7</sup> As problems of lexical semantics are beyond the scope of the present paper, I won’t explicitly define lexical meanings here; instead, an intuitive understanding of the paraphrases in single quotation marks will be taken for granted.

In analogy to lexical words, IL conceives *lexical stems* as consisting of a stem paradigm and a lexical meaning, the latter being identical to the lexical meaning of the corresponding lexical word (if any).<sup>8</sup> Lexical stems will be notated as follows in this paper:

$/\text{norD}/_{\text{north}}^{\text{St}}$ : lexical stem consisting of a stem paradigm with the citation form  $/\text{norD}/$  and the lexical meaning ‘north’.

$/\text{norD}/_{\text{northern region}}^{\text{St}}$ : lexical stem consisting of a stem paradigm with the citation form  $/\text{norD}/$  and the lexical meaning ‘northern region’.

These lexical stems can be grammatically characterised by means of the following lexical categorisation:

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<sup>6</sup>A closely related paradigm notion can be found in Stump’s (2001: 43) Paradigm Function Morphology (for discussion cf. Lieb 2005).

<sup>7</sup>From a mathematical point of view, directions may be modelled as families of parallel vectors with arbitrary length.

<sup>8</sup>Lexical stems without corresponding lexical words may be assumed for “combining forms”, insofar as the latter are best analysed not as affixes, but as stems which are “bound”, or “trapped” in the sense of Lieb (2013). Conversely, there may be lexical words without corresponding lexical stems; this arguably is the case for “nominalised adjectives” in Modern German, which are usually seen as being directly formed from adjectival words (not stems) through syntactic conversion (for discussion cf. Nolda 2012: Section 3.2.2).

- (5) noun stem in the masculine

This categorisation is modelled as a set of *stem categories*:

- (6) {NounSt, Masc-NSt}

A *stem paradigm* relates *stem forms* to paradigmatic categorisations consisting of *stem-form categories*. According to the view taken here, the form /'norD/ of /'norD/\_{north}^{St}, realises the following categorisations:

- (7) a. nominal basic stem form  
b. nominal compounding stem form

Or, in set-theoretic terms:

- (8) a. {Basic-NStf}  
b. {Comp-NStf}

/'norD/ is a compounding stem form because it can be used as a first base form in the formation of compounds like /'norD/ /,to:r/\_{north gate}^{St}.<sup>9</sup> It is a basic stem form because from it all stem forms in the stem paradigm can be formed, including the singular stem form /'norD/ /[ə]n/ and the derivation stem form /'nørD/, the latter being used as a base form in the derivation of /'nørD/ /lix/\_{northern}^{St}.<sup>10</sup> In contrast, the stem paradigm of /'norD/\_{northern region}^{St} contains the derivation stem form /'norD/, which is used as a base form in the formation of derivatives like /'norD/ /if/\_{Nordic}^{St}. (For this conception of stem paradigms – with basic stem forms, inflection stem forms, as well as word-formation stem forms – cf. Fuhrhop 1998: Chapter 2.)

As a matter of fact, then, the stem paradigms of the lexical stems /'norD/\_{north}^{St} and /'norD/\_{northern region}^{St} overlap: they share at least some form–categorisation pairs. In addition, their lexical meanings are related through a semantic relation (viz. metonymy). These lexical stems therefore are variants of the same *lexicological stem*, to be called “/'norD/^{LSt}”. Similarly, the lexical words /'norD[ə]n/\_{north}^{W} and /'norD[ə]n/\_{northern region}^{W} are variants of the same *lexicological word*, called “/'norD[ə]n/^{LW}” here. In general, lexicological units are sets of lexical units of the same part of speech with identical or overlapping paradigms and related lexical

<sup>9</sup>There are also compounding stem forms like /'ja:r/ / [ə]s/ with a linking element. (Actually the lexical stem /'ja:r/\_{year}^{St} also has a compounding stem form without linking element; for discussion, cf. Section 3.1.)

<sup>10</sup>“x” denotes the phoneme underlying both [ç] and [χ] in systems of spoken Modern German.

meanings (cf. Nolda 2016, 2018).<sup>11</sup> In informal contexts, I shall denote lexical and lexicological units – be they spoken or written – by their orthographic citation forms in italics.

Conventionalised, “existing” lexical units like *Norden* are part of the *vocabulary* of the linguistic system; the same holds for conventionalised word-formation products like *Nordtor* and *nördlich*. The vocabulary is a subset of the *lexicon* of the linguistic system, which also includes non-conventionalised and “non-existent”, but still “possible” lexical units such as *Nordpfeil*:

- (9) Der Nordpfeil bewegt sich Richtung Norden, wie er soll. (S1)  
 the north.arrow move.3sg itself direction north as he shall.3sg  
 ‘The compass needle turns north as it should.’

(“S1” refers to an entry in the list of sources.)

In the PR view, the investigation of word formation is concerned with the formation of lexical units in the lexicon of a given linguistic system. This heuristic principle is twofold. First, it states that monosemous lexical units, not potentially polysemous lexicological units, are the objects of word-formation description. This assumption is motivated by the observation that some, but not necessarily all, variants of a lexicological unit may count as word-formation products while others may be derived by different processes, such as metonymy or metaphor. Second, word-formation description is not restricted to conventionalised lexical units in the vocabulary subset of the lexicon, because questions of conventionalisation (commonly discussed under the label of “lexicalisation”) are orthogonal to the investigation of word formation.

Word forms and stem forms are conceived as *sequences* of syntactic or morphological *atoms*. The singular stem form /'norD/ / [ə]n/, for instance, is a sequence consisting of two morphological atoms: /'norD/ and / [ə]n/, which are phonological units in a spoken linguistic system.<sup>12</sup> Sequences with *n* members are modelled as total functions from *position indices* {1, ..., *n*} to atoms:

- (10) {{1, /'norD/},  
 {2, / [ə]n/}}

<sup>11</sup>This conception of lexical units and lexicological units roughly corresponds to the distinction made by Cruse (1986: Chapter 3) between “lexical units” and “lexemes”.

<sup>12</sup>As a theory of word formation is, PR is neutral with respect to questions of phonological representation. For the sake of this paper, I make the minimal assumption that the phonological representation of atoms in spoken linguistic systems not only specifies segmental phonological properties but also suprasegmental ones, in particular syllable structures and lexical accents (cf. also Note 4).

An alternative, non-set-theoretic, notation is given in (11):

$$(11) \quad \begin{array}{c} 1 \quad 2 \\ /'norD/ \quad /[\text{ə}]n/ \end{array}$$

The basic stem form  $/'norD/$  and the pseudo-suffix<sup>13</sup>  $/[\text{ə}]n/$ , in contrast, are unit sequences, involving a single member each:

$$(12) \quad \begin{array}{c} 1 \\ /'norD/ \end{array}$$

$$(13) \quad \begin{array}{c} 1 \\ /[\text{ə}]n/ \end{array}$$

The same holds for the word form  $/'norD[\text{ə}]n/$ :

$$(14) \quad \begin{array}{c} 1 \\ /'norD[\text{ə}]n/ \end{array}$$

In the following, I shall stick to notations like “ $/'norD[\text{ə}]n/$ ” and “ $/'norD/ \quad /[\text{ə}]n/$ ” for word and stem forms.

Forms can be combined in two ways. By *concatenation*  $\frown$ , two forms are combined by adapting the position indices in the second form without changing the overall number of atoms. For example, the concatenation of the forms  $/'norD/$  and  $/[\text{ə}]n/$  results in the form  $/'norD/ \quad /[\text{ə}]n/$ :

$$(15) \quad /'norD/ \quad \frown \quad /[\text{ə}]n/ = /'norD/ \quad /[\text{ə}]n/$$

By *fusion*  $\smile$ , the rightmost atom of the first form and the leftmost atom of the second form are merged into one,<sup>14</sup> thereby reducing the number of atoms accordingly:

$$(16) \quad /'norD/ \quad \smile \quad /[\text{ə}]n/ = /'norD[\text{ə}]n/$$

### 3 Compounding

In the Pattern-and-Restriction Theory, word formation is not described syntagmatically in terms of relations between constituents in word structures, such

<sup>13</sup>Pseudo-suffixes of this sort are termed “morphologischer Rest” by Eisenberg (2013: 209), as pointed out by an anonymous reviewer.

<sup>14</sup>Merging atoms is discussed at length in Lieb (1999a) under the label of “phonological connection” (“phonologische Verbindung”).

as “heads” and “non-heads”; rather, it is described paradigmatically in terms of relations between lexical units functioning as products and bases.<sup>15</sup> The main difference between compounding and blending on the one hand and other word-formation processes like derivation, conversion, or clipping on the other hand is the number of bases involved in the formation of a product: derivation, conversion, and clipping products are formed through *one-place* word-formation processes, involving one basis at a time, whereas compounding and blending products are formed from two or more bases through word-formation processes which are at least *two-place*. The same distinction holds for the formation patterns used in PR to describe those word-formation relations: derivation, conversion and clipping patterns are one-place, while compounding and blending patterns are at least two-place.<sup>16</sup>

The treatment of compounding in PR will be illustrated in Section 3.1 and 3.2 below in two case studies on selected compounds, each involving a productive compounding pattern in some system of spoken Modern German. Typical blending patterns are discussed in Section 4.1 and 4.2 in two case studies on selected blends. Of course, these formation patterns are only a proper subset of the totality of compounding and blending patterns in spoken Modern German; what is more, there will be no substantial reference to compounding or blending in written German (for two recent studies on that subject matter cf. Scherer 2013 and Borgwaldt 2013). These case studies will serve as a basis for the reconstruction of right-headedness as a descriptive term in PR in Section 5.

### 3.1 Case study I: *Nordtor*

In the PR view, the major task of word-formation description is to explain or predict statements of *word-formation relations* between conventionalised or non-conventionalised lexical units in a linguistic system. Consider, for example, the word-formation relation stated in (17a), which is usually symbolised as in (17b) in traditional accounts of word formation like Fleischer & Barz (2012) for Modern German:

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<sup>15</sup>In comparison to Anderson’s (1992) *A-Morphous Morphology*, PR is both less radical and more uniform. It is less radical because it does not away with morphological segmentation of morphological forms into morphological atoms (“morphs”). As a matter of fact, morphological segmentation is used in this paper as a major criterion for distinguishing between compounding and blending (cf. Section 4 below). PR is more uniform because it does not rely on word structures for the description of any kind of word formation, while in *A-Morphous Morphology*, word structures are still assumed for compounding.

<sup>16</sup>The close relationship of compounding and blending is also stated by Donalies (2002: Chapter 4), who classifies blending even as a subtype of compounding.

- (17) a. *Nordtor* is formed from *Norden* and *Tor*.  
 b.  $Nordtor < Norden + Tor$

Using the notation for lexical words introduced in Section 2 and the ambiguous constant “S” for some specific, yet undetermined, system of spoken Modern German, we can reformulate these statements as follows:

- (18) a.  $/norD, to:r/_{north\ gate}^W$  is formed from  $/norD[\partial]n/_{north}^W$  and  $/to:r/_{gate}^W$  in S.  
 b.  $/norD, to:r/_{north\ gate}^W <^S /norD[\partial]n/_{north}^W + /to:r/_{gate}^W$

An analogous word-formation relation holds between the corresponding lexical stems:

- (19) a.  $/norD/ /to:r/_{north\ gate}^{St}$  is formed from  $/norD/_{north}^{St}$  and  $/to:r/_{gate}^{St}$  in S.  
 b.  $/norD/ /to:r/_{north\ gate}^{St} <^S /norD/_{north}^{St} + /to:r/_{gate}^{St}$

Such word-formation relations implicitly involve a *word-formation process* and a certain *formation pattern*, which are made explicit in (20) and (21):

- (20) a.  $/norD, to:r/_{north\ gate}^W$  is formed from  $/norD[\partial]n/_{north}^W$  and  $/to:r/_{gate}^W$  through compounding in S by means of Pattern 1.  
 b.  $/norD, to:r/_{north\ gate}^W <_{comp(Pattern\ 1)}^S /norD[\partial]n/_{north}^W + /to:r/_{gate}^W$
- (21) a.  $/norD/ /to:r/_{north\ gate}^{St}$  is formed from  $/norD/_{north}^{St}$  and  $/to:r/_{gate}^{St}$  through compounding in S by means of Pattern 1.  
 b.  $/norD/ /to:r/_{north\ gate}^{St} <_{comp(Pattern\ 1)}^S /norD/_{north}^{St} + /to:r/_{gate}^{St}$

According to PR, formation patterns combine for *formation means* – a *formal means* (FM), a *paradigmatic means* (PM), a *lexical means* (LM), and a *semantic means* (SM). Pattern 1 consists of the following means:

*Pattern 1*

FM: deaccentuation of the second base form and concatenation

PM: identity with the categorisation of the second base form

LM: identity with the categorisation of the second basis

SM: formation of a concept according to the scheme ‘entity denoted by the second basis in a classificatory relation to an entity denoted by the first basis’

Formation means are modelled as set-theoretic operations: formal means operate on forms, paradigmatic means operate on paradigmatic categorisations, lexical means operate on lexical categorisations, and semantic means operate on concepts. In Pattern 1, the means are all two-place operations, relating two arguments to one value each. Therefore, Pattern 1 can be said to be two-place, too. Generally speaking, an  $n$ -place formation pattern has an  $n$ -place formal means, an  $n$ -place paradigmatic means, an  $n$ -place lexical means, and an  $n$ -place semantic means.

I shall now illustrate the application of the means in Pattern 1. In order to do some, I shall use the following semi-formal notation:

$$(22) \quad M: \quad x_1 + x_2 \mapsto x$$

This is to be interpreted as in (23) for arbitrary two-place operations  $M$  with  $x_1$  and  $x_2$  in the domain of  $M$  and  $x$  in the range of  $M$ :

$$(23) \quad M(x_1, x_2) = x$$

FM in Pattern 1 assigns the form /'norD/ /,to:r/ with initial accent to /'norD/ and /'to:r/:

$$(24) \quad \text{FM:} \quad \begin{array}{l} /'norD/ + /'to:r/ \mapsto \\ /'norD/ \widehat{\phantom{to:r}} /,to:r/ = /'norD/ /,to:r/ \end{array}$$

This can be achieved in the following steps:<sup>17</sup>

1. The second base form /'to:r/ is deaccented to /,to:r/.<sup>18</sup>
2. The results /'norD/ and /,to:r/ are combined by means of the concatenation operation, denoted by " $\widehat{\phantom{to:r}}$ ".

In the same way, the form /'norD/ /,to:r/ /ə/ can be formed with FM in Pattern 1:

$$(25) \quad \text{FM:} \quad \begin{array}{l} /'norD/ + /'to:r/ /ə/ \mapsto \\ /'norD/ \widehat{\phantom{to:r}} /,to:r/ /ə/ = /'norD/ /,to:r/ /ə/ \end{array}$$

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<sup>17</sup>Note that this is one of many equivalent formulations of FM in Pattern 1 which all give rise to the same set-theoretic operation, i.e. the same extensional relation between arguments and values. What matters in PR is which arguments and values are related by the means, not the way this is achieved. Thus, PR clearly is a declarative theory of word formation, and not a derivational or transformational one.

<sup>18</sup>*Deaccentuation* replaces primary lexical accents by deaccented lexical accents ("secondary lexical accents").

A paradigmatic means determines the “paradigm cells” which are occupied by the product forms. PM in Pattern 1 does so by copying the paradigmatic categorisation of the second base form to the product form:

- (26) a. PM: {Comp-NStf} + {Basic-NStf}  $\mapsto$  {Basic-NStf}  
 b. PM: {Comp-NStf} + {Sing-NStf}  $\mapsto$  {Sing-NStf}  
 c. PM: {Comp-NStf} + {Plur-NStf}  $\mapsto$  {Plur-NStf}

Thereby, each product form inherits its paradigmatic categorisation from the second base form; effectively, the former also inherits the inflection class of the latter as far as number marking is concerned.<sup>19</sup> PM in Pattern 1 is an example for a *last-base-inheriting* operation, i.e. an  $n$ -place operation on categorisations (with  $n \geq 2$ ) that copies its  $n$ -th argument to the value. Similarly, a *first-base-inheriting* operation copies its first argument to the value. *First-base-inheriting* operations, *last-base-inheriting* operations, etc. are *base-inheriting*.

LM in Pattern 1 is a *last-base-inheriting* operation, too, which copies the lexical categorisation of the second basis to the product:

- (27) LM: {NounSt, Masc-NSt} + {NounSt, Neut-NSt}  $\mapsto$  {NounSt, Neut-NSt}

This accounts, in particular, for the fact that the lexical gender of nominal compounds formed by means of this and other compounding patterns in systems of Modern German is identical to the lexical gender of the second basis. In addition, it ensures that the part of speech of compounds is identical to that of their second basis (which is trivially the case in noun–noun compounds).<sup>20</sup>

Finally, SM in Pattern 1 takes care of the *word-formation meaning*, i.e. of those aspects of the lexical meaning of the product that are word-formation-related. One word-formation-related aspect of the meaning of /'norD/ /,to:r/<sup>St</sup><sub>north gate</sub>' is the fact that any entity denoted by it is also denoted by the second basis /to:r/<sup>St</sup><sub>gate</sub>'; put differently, the second base meaning is implied by the product meaning. SM in Pattern 1 therefore has to be a *last-base-implying* operation, i.e. an  $n$ -place operation on concepts (with  $n \geq 2$ ) such that each of its value implies the  $n$ -th argument. In the case of a *first-base-implying* operation, each value implies the first argument. *First-base-implying* operations, *last-base-implying* operations, etc. are *base-implying*. Word-formation products formed by means of a

<sup>19</sup>As a matter of fact, inheritance of paradigmatic categorisations can also occur in derivation, as argued for in Nolda (2019: 367–368) with reference to the formation of prefix verbs in Modern German.

<sup>20</sup>No attempt is made here to further classify base-inheritance along the lines of Scalise & Fábregas (2010) who distinguish between “categorial heads” (determining the part-of-speech category) and “morphological heads” (determining other categories such as lexical gender or inflection class).

formation pattern with a base-implying semantic means are traditionally called “endocentric”; those formed by means of a pattern with a semantic means that is not base-implying are called “exocentric”.

A further word-formation-related aspect of the product meaning concerns the relation between the base meanings in compounds like  $\langle /norD/ /,to:r/_{north\ gate}^{St}$ . This is a debated matter in the literature (a recent overview can be found in Olsen 2012). Following Dowty (1979: 316–319), I assume that  $\langle /norD/ /,to:r/_{north\ gate}^{St}$  and other compounds formed by this pattern have a word-formation meaning which involves an “(appropriately) classificatory relation” between the denotata of the bases (for discussion cf. Downing 1977):

(28) SM: ‘north’ + ‘gate’  $\mapsto$  ‘gate in a classificatory relation to the north’

Note that the word-formation meaning ‘gate in a classificatory relation to the north’ is underspecified with respect to the lexical meaning of the product, which actually denotes gates on the north side of some building. In general, PR does not require that the word-formation meaning be identical to the lexical meaning of the product as long as the former is implied by the latter (cf. Nolda 2018).

Taken together, the formal, paradigmatic, lexical, and semantic means in Pattern 1 specify a two-place *formation operation* on *formation instances*. Formation instances are quadruples like those in (29), (30), and (31) combining arguments or values of the means in Pattern 1:

- (29)  $\langle /norD/,$   
       {Comp-NStf},  
       {NounSt, Masc-NSt},  
       ‘north’ $\rangle$
- (30) a.  $\langle /to:r/,$   
       {Basic-NStf},  
       {NounSt, Neut-NSt},  
       ‘gate’ $\rangle$
- b.  $\langle /to:r/,$   
       {Sing-NStf},  
       {NounSt, Neut-NSt},  
       ‘gate’ $\rangle$
- c.  $\langle /to:r/ /ə/,$   
       {Plur-NStf},  
       {NounSt, Neut-NSt},  
       ‘gate’ $\rangle$

- (31) a.  $\langle /'norD/ /,to:r/,$   
           {Basic-NStf},  
           {NounSt, Neut-NSt},  
           ‘gate in a classificatory relation to the north’)
- b.  $\langle /'norD/ /,to:r/,$   
           {Sing-NStf},  
           {NounSt, Neut-NSt},  
           ‘gate in a classificatory relation to the north’)
- c.  $\langle /'norD/ /,to:r/ /ə/,$   
           {Plur-NStf},  
           {NounSt, Neut-NSt},  
           ‘gate in a classificatory relation to the north’)

The formation instances in (29), (30), and (31) *instantiate* the bases and products involved in the word-formation relation (21): the *base instance* (29) instantiates the first basis  $/'norD/_{north}^{St}$ , the *base instances* (30a), (30b), and (30c) each instantiate the second basis  $/'to:r/_{gate}^{St}$ , and the *product instances* (31a), (31b), and (31c) instantiate the product  $/'norD/ /,to:r/_{north\ gate}^{St}$ . The first and second components of those formation instances represent formal and categorial properties of one of their forms, while the third and fourth components represent categorial and semantic properties of the lexical unit itself.

The formation operation specified by Pattern 1 takes base-instance pairs like  $\langle(29), (30a)\rangle$ ,  $\langle(29), (30b)\rangle$ , and  $\langle(29), (30c)\rangle$  as arguments and assigns to them the product instances (31a), (31b), and (31c), respectively. From a logical point of view, there is nothing that would exclude base-instance pairs in the domain of this formation operation where the first base instance is, say, a singular stem form like  $/'norD/ /[\acute{e}]n/$ ; this, however, is excluded on empirical grounds. In addition, it must be taken care of co-occurrence restrictions on base instances. For example, the compounding stem form  $/'ja:r/$ , occurring in just a few conventionalised compounds like  $/'ja:r/ /,bu:x/_{yearbook}^{St}$ , is compatible only with a handful of stem forms, whereas compounding with the compounding stem form  $/'ja:r/ /[\acute{e}]s/$  (already mentioned cf. Note 9 in Section 2) is fully productive. Last, but not least, the base instances in the domain of our formation operation have to be restricted to instances of noun stems.

Thus, only a proper subset of the domain of the formation operation specified by Pattern 1 is actually used for word formation in S. This subset is the *formation restriction* which is associated with Pattern 1 in S. It restricts what bases are available for word formation in S by means of Pattern 1; indirectly, it also

restricts what products which can be formed in S from those bases by means of the pattern.

The formation restriction associated with Pattern 1 in S can partially or totally be identified in a word-formation grammar of S in terms of declarative constraints like those in Restriction 1, which consists of a *formal constraint* (FC), a *paradigmatic constraint* (PC),<sup>21</sup> and a *lexical constraint* (LC):

*Restriction 1*

FC: The base forms are compatible.

PC: The paradigmatic categorisation of the first base form contains Comp-NStf.  
The paradigmatic categorisation of the second base form contains Basic-NStf, Sing-NStf, or Plur-NStf.

LC: The lexical categorisations of the bases contain NounSt.

In other cases, there may be reason to include a *semantic constraint* (SC) or a *general constraint* (GC).<sup>22</sup> As a matter of fact, all of the above constraints are input-related, applying to components of base instances. In other cases there may also be output-related constraints on the product instances which the formation operation specified by Pattern 1 assigns to the base instances (cf. Section 4.)

Word-formation processes are conceived in PR as one-place functions from *n*-place formation patterns to the *n*-place formation operations specified by the patterns; the word-formation processes are said to be *n*-place themselves. The word-formation process of two-place compounding (comp<sup>2</sup>), for example, is a

<sup>21</sup>The paradigmatic constraint in Restriction 1 effectively excludes Comp-NStf and Der-NStf from the paradigmatic categorisation of the second base form because, at least in Modern German systems, word-formation stem forms are not necessarily inherited by the product. For instance, the only compounding stem form in the paradigm of /'be:r/<sup>St</sup>'berry' is /'be:r/ / [ə]n/; in the paradigm of the compound /'erD/ / 'be:r/<sup>St</sup>'strawberry', however, the compounding stem form is /'erD/ / 'be:r/, not /'erD/ / 'be:r/ / [ə]n/. A similar point can be made for /'frau/<sup>St</sup>'woman' and /'juŋ/ / 'frau/<sup>St</sup>'virgin': the former has both a derivation stem form with umlaut (as in /'froi/ / 'lain/) and a derivation stem form without umlaut (as in /'frau/ / 'lix/), whereas the latter only has a derivation stem form with umlaut (/ 'juŋ/ / 'froi/ / 'lix/).

<sup>22</sup>An example for a general constraint would be the requirement that the second basis of a compound must be a compound itself. Such a constraint is needed for the formation restriction associated with the compounding pattern by means of which a product like /,lanD/ / [ə]s/ / 'fu:l/ / ,amt/<sup>St</sup>'federal education authority' with non-initial accent is formed from the noun stem /'lanD/<sup>St</sup>'federal state' and the compound /'fu:l/ / ,amt/<sup>St</sup>'education authority'. Of course, apart from this general constraint, there are further, in particular semantic, constraints (cf. the study of Benware 1987).

function from two-place formation patterns like Pattern 1 to the two-place formation operations specified by them. As a rule, two-place compounding is involved in word-formation relations like (20) and (21) between two bases and one product. When the arity is clear from the context, I shall continue to speak of “compounding” (“comp”) *tout court*.

Given this conception, the word-formation relation stated in (21) can be logically derived in PR from the word-formation theory and a word-formation grammar of S. This derivation requires, in particular, that the following conditions hold:

1. There is a base-instance pair instantiating  $/\text{norD}/_{\text{north}}^{\text{St}}$  and  $/\text{to:r}/_{\text{gate}}^{\text{St}}$  in the formation restriction associated with Pattern 1 in S.
2. The formation process specified by Pattern 1 assigns to those base instances a product instance instantiating  $/\text{norD}/ / \text{to:r}/_{\text{north gate}}^{\text{St}}$ .
3. The word-formation process comp in S assigns this formation process to Pattern 1.

In the case at hand, there are three base-instance pairs which fulfil these conditions together with one product instance each:

- the base-instance pair  $\langle (29), (30a) \rangle$  with the product instance (31a);
- the base-instance pair  $\langle (29), (30b) \rangle$  with the product instance (31b);
- the base-instance pair  $\langle (29), (30c) \rangle$  with the product instance (31c).

Each of them can be used for explaining or predicting the word-formation relation (21) in PR (for the logic of explanation and prediction in PR cf. Nolda 2018).<sup>23</sup>

Word-formation relations obtained in this way are *direct* word-formation relations. Such word-formation relations can be explicitly stated in PR as follows:

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<sup>23</sup>Since PR does not presuppose any word structures which represent the formation history, forms like  $/\text{norD}/ / \text{to:r}/ / \text{ə}/$  and their categorisation as plural stem form can be motivated by word-formation as well as by inflection. In the former case, exemplified above, the stem form  $/\text{norD}/ / \text{to:r}/ / \text{ə}/$  is formed from the stem forms  $/\text{norD}/$  and  $/\text{to:r}/ / \text{ə}/$  by means of FM in Pattern 1, and its paradigmatic categorisation {Plur-NStf} is copied by PM in Pattern 1 from the paradigmatic categorisation of  $/\text{to:r}/ / \text{ə}/$ . In the latter case,  $/\text{norD}/ / \text{to:r}/ / \text{ə}/$  is formed from the stem form  $/\text{norD}/ / \text{to:r}/$  by the formal means in a certain inflectional formation pattern (“plural formation by means of suffixation with /ə/”), and the paradigmatic means in that pattern determines its categorisation as plural stem form. (A similar point is made in Nolda (2019: 369) for the formation of past-tense stem forms of prefix verbs in Modern German.)

- (32) a. /'norD/ /,to:r/'<sub>north gate</sub><sup>St</sup> is directly formed from /'norD/'<sub>north</sub><sup>St</sup> and /'to:r/'<sub>gate</sub><sup>St</sup> through compounding in S by means of Pattern 1.  
 b. /'norD/ /,to:r/'<sub>north gate</sub><sup>St</sup>  $\llcorner_{\text{comp}(\text{Pattern } 1)}^{\text{S}}$  /'norD/'<sub>north</sub><sup>St</sup> + /'to:r/'<sub>gate</sub><sup>St</sup>

From this direct word-formation relation between the lexical stems /'norD/'<sub>north</sub><sup>St</sup>, /'to:r/'<sub>gate</sub><sup>St</sup>, and /'norD/ /,to:r/'<sub>north gate</sub><sup>St</sup> the *indirect* word-formation relation (33) between the corresponding lexical words can likewise be logically derived in PR (for details cf. again Nolda 2018):

- (33) a. /'norD, to:r/'<sub>north gate</sub><sup>W</sup> is indirectly formed from /'norD[ə]n/'<sub>north</sub><sup>W</sup> and /'to:r/'<sub>gate</sub><sup>W</sup> through compounding in S by means of Pattern 1.  
 b. /'norD, to:r/'<sub>north gate</sub><sup>W</sup>  $\llcorner_{\text{comp}(\text{Pattern } 1)}^{\text{S}}$  /'norD[ə]n/'<sub>north</sub><sup>W</sup> + /'to:r/'<sub>gate</sub><sup>W</sup>

### 3.2 Case study II: *Nordosten*

The object of the next case study is the compound *Nordosten*. The lexical word /,norD'ost[ə]n/'<sub>north-east</sub><sup>W</sup> and its stem /,norD/ /'ost/'<sub>north-east</sub><sup>St</sup> are formed as follows in the linguistic system S under discussion:

- (34) /,norD'ost[ə]n/'<sub>north-east</sub><sup>W</sup>  $\llcorner_{\text{comp}(\text{Pattern } 2)}^{\text{S}}$  /'norD[ə]n/'<sub>north</sub><sup>W</sup> + /'ost[ə]n/'<sub>east</sub><sup>W</sup>  
 (35) /,norD/ /'ost/'<sub>north-east</sub><sup>St</sup>  $\llcorner_{\text{comp}(\text{Pattern } 2)}^{\text{S}}$  /'norD/'<sub>north</sub><sup>St</sup> + /'ost/'<sub>east</sub><sup>St</sup>

Pattern 2 consists of the following means:

#### *Pattern 2*

- FM: deaccentuation of the first base form and concatenation
- PM: identity with the categorisation of the second base form
- LM: identity with the categorisation of the second basis
- SM: formation of a concept according to the scheme 'sum of the entities denoted by the bases'

The formation restriction associated with Pattern 2 in S satisfies the constraints in Restriction 2:

*Restriction 2*

- FC: The base forms are compatible.  
 PC: The paradigmatic categorisation of the first base form contains Basic-NStf.  
 The paradigmatic categorisation of the second base form contains Basic-NStf, Sing-NStf, or Plur-NStf.  
 LC: The lexical categorisations of the bases contain NounSt.  
 SC: The bases denote entities of the same sort for which a sum operation is defined.

Note that PC in Restriction 2 requires that the first base form is categorised as a basic stem form. By this requirement it is predicted that there are no specific compounding stem forms – and thus no linking elements – occurring in compounds of this type.<sup>24</sup> SC ensures that the semantic types of the base concepts are appropriate for SM in Pattern 2.

FM in Pattern 2 differs from the formal means in Pattern 1 only with respect to accentuation. In the present example, the product forms /,norD/ /'ost/ and /,norD/ /'ost/ /[ə]n/ have final accent:

- (36) a. FM: /,norD/ + /'ost/  $\mapsto$   
           /,norD/  $\widehat{\phantom{/}}$  /'ost/ = /,norD/ /'ost/  
 b. FM: /,norD/ + /'ost/ / [ə]n/  $\mapsto$   
           /,norD/  $\widehat{\phantom{/}}$  /'ost/ / [ə]n/ = /,norD/ /'ost/ / [ə]n/

PM and LM in Pattern 2 are identical to the paradigmatic and lexical means in Pattern 1. These last-base-inheriting operations copy their second argument to the value:

- (37) a. PM: {Basic-NStf} + {Basic-NStf}  $\mapsto$  {Basic-NStf}  
       b. PM: {Basic-NStf} + {Sing-NStf}  $\mapsto$  {Sing-NStf}
- (38) LM: {NounSt, Masc-NSt} + {NounSt, Masc-NSt}  $\mapsto$  {NounSt, Masc-NSt}

In the example at hand, LM in Pattern 2 happens to apply trivially since both bases have the same lexical gender.

The main difference between Pattern 1 and 2 arguably is the semantic means. SM in Pattern 2 constructs concepts expressing the sum of the entities denoted by the bases:

<sup>24</sup>A similar point is made by Becker (1992: 29) with respect to copulative compounds like *Fürst-bischof*, which have no linking elements either.

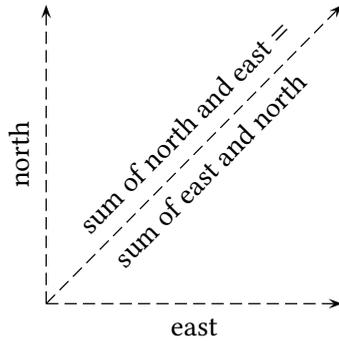


Figure 1: Sum of directions

(39) SM: ‘north’ + ‘east’  $\mapsto$  ‘sum of north and east’

Here, “sum” is understood in a broad sense covering arithmetic sum as in the formation of the “complex numeral” *hunderteins*, mereological sum as in the formation of the “fusional compound” *Mecklenburg-Vorpommern*, sum of directions as in the formation of the “intermediate-denoting compound” *Nordosten*, etc.<sup>25</sup> As illustrated in Figure 1, the sum operation on directions works in an analogous way to the sum operation on vectors, the only difference being that vectors have a length and an orientation, whereas directions have an orientation only (cf. Note 7 in Section 2 above). Obviously, SM in Pattern 2 is not a base-implying operation: the direction denoted by the product is denoted neither by the first basis nor by the second basis. This semantic means has another characteristic property instead – it is a *commutative* operation, i.e. an  $n$ -place operation (with  $n \geq 2$ ) whose values are independent of the order of its arguments:

(40) SM: ‘east’ + ‘north’  $\mapsto$  ‘sum of east and north’ = ‘sum of north and east’

Commutativity of semantic means can be used to distinguish in arbitrary linguistic systems  $S$  between coordinative word formation (like the formation of  $/,norD/ /'ost/_{north-east}^{St}$  through compounding in  $S$  by means of Pattern 2) and subordinative word formation (like the formation of  $/,norD/ /,to:r/_{north\ gate}^{St}$  through compounding in  $S$  by means of Pattern 1):

*Definition 1*

Let  $n \geq 2$ .

$n$ -place *coordinative word-formation* in  $S$  is that  $n$ -place word-formation

<sup>25</sup>“Complex numeral”, “fusional compound”, and “intermediate-denoting compound” are Wälchli’s (2005) descriptive terms. In general, such compounds are exocentric, while “appositional compounds” like English *singer-bassist* are endocentric (for discussion, cf. Olsen 2014).

process in  $S$  whose arguments are all  $n$ -place formation patterns in  $S$  with a semantic means that is commutative.

*Definition 2*

Let  $n \geq 2$ .

$n$ -place *subordinative word-formation* in  $S$  is that  $n$ -place word-formation process in  $S$  whose arguments are all  $n$ -place formation patterns in  $S$  with a semantic means that is not commutative.

By applying this terminology to the products themselves, we can distinguish between coordinative (or “copulative”) products and subordinative (or “determinative”) products in  $S$  being formed through of coordinative or subordinative word formation in  $S$ , respectively. The compound  $/,norD/ /'ost/_{north-east}^{St}$ , then, is a coordinative compound in  $S$  because it is formed through coordinative compounding in  $S$ , while  $/'norD/ /,to:r/_{north gate}^{St}$  is a subordinative compound in  $S$  formed through subordinative compounding in  $S$ . Note that for  $/,norD/ /'ost/_{north-east}^{St}$  being a coordinative compound in  $S$ , it is both necessary and sufficient to be formed through coordinative compounding in  $S$  – i.e. through compounding by means of a formation pattern with a commutative semantic means; it is irrelevant, however, whether or not there is in  $S$  a conventionalised synonymous lexical unit  $/,ost/ /'norD/_{east-north}^{St}$  = ‘north-east’ with “reversed bases”.

## 4 Blending

It is a debated matter in the literature whether blends result from word formation or word creation. Proponents of the latter position cite as arguments: deliberate formation, deviant patterns, unpredictable forms, and more or less intransparent meanings (cf. in particular, Ronneberger-Sibold 2006, 2015). Others argue that blending is a word-formation process *sui generis* with specific, but systematic, formation patterns (an opinion hold, *inter alia*, by Müller & Friedrich 2011). In the view taken here, there exists a subset of blends in Modern German systems that, although deliberately created, are formed through a word-formation process by means of formation patterns which are very similar to the compounding patterns discussed in Section 3 above. With appropriate restrictions, these patterns can be used to form conventionalised as well as non-conventionalised blends (a point also made by Schulz 2004). Among these patterns, I shall discuss two by means of which blends like *Naturlaub* or *Kurlaub* can be formed from bases with an overlapping part.

#### 4.1 Case study III: *Naturlaub*

The first blend to be discussed is *Naturlaub*. It appears to be more or less conventionalised in certain varieties of Modern German and occurs in two major graphematic forms:<sup>26</sup>

(41) *Naturlaub* im Norden (S4)  
 nature.vacation in.the north  
 ‘nature vacation in the north’

(42) *Grüße* aus dem *NatUrlaub* (S3)  
 greeting.PL out.of the nature.vacation  
 ‘greetings from nature vacation’

In the linguistic system S under discussion (some specific system of spoken Modern German), the corresponding lexical word /na'tu:rlauB/<sub>nature vacation</sub><sup>W</sup> and its homophonous stem /na'tu:r/rlauB/<sub>nature vacation</sub><sup>St</sup> are formed as follows:<sup>27</sup>

(43) /na'tu:rlauB/<sub>nature vacation</sub><sup>W</sup> <<sub>S</sub>blend(Pattern 3)  
 /na'tu:r/<sub>nature</sub><sup>W</sup> + /u:rlauB/<sub>vacation</sub><sup>W</sup>

(44) /na'tu:rlauB/<sub>nature vacation</sub><sup>St</sup> <<sub>S</sub>blend(Pattern 3)  
 /na'tu:r/<sub>nature</sub><sup>St</sup> + /u:rlauB/<sub>vacation</sub><sup>St</sup>

As to Pattern 3, I propose to assume the following means for it:

##### *Pattern 3*

FM: deaccentuation of the first base form and fusion before the overlapping part<sup>28</sup>

<sup>26</sup>In the German Reference Corpus (DeReKo-2018-I), *Naturlaub* and *NatUrlaub* are the only graphematic forms with more than one token (141 tokens and 102 tokens, respectively). The relatively high number of *NatUrlaub* tokens may be due to the fact that this form is also a brand name (cf. Friedrich 2008: 413).

<sup>27</sup>According to the analysis proposed here, the blend /na'tu:rlauB/<sub>nature vacation</sub><sup>St</sup> has the base stem form /na'tu:rlauB/ with a single morphological atom. The homonymous compound /na'tu:r/ /lauB/<sub>nature foliage</sub><sup>St</sup>, however, has a bipartite base stem form /na'tu:r/ /lauB/ with two morphological atoms and an additional, deaccented, lexical accent on the second atom.

<sup>28</sup>The *overlapping part* of two forms  $f_1$  and  $f_2$  is the largest common part of the last non-affix atom in  $f_1$  and the first non-affix atom in  $f_2$  that contains a syllabic full vowel and spans up to a syllable boundary. Different lexical accents are ignored.

- PM: identity with the categorisation of the second base form
- LM: identity with the categorisation of the second basis
- SM: formation of a concept according to the scheme ‘entity denoted by the second basis in a classificatory relation to an entity denoted by the first basis’

The formation restriction associated with Pattern 3 in S should satisfy the following constraints:

*Restriction 3*

- FC: There is exactly one non-affix atom in the first base form.  
There is an overlapping part of the base forms.  
The second base form has a primary lexical accent on or after the overlapping part.  
The base forms are segmentally distinct from the product form.
- PC: The paradigmatic categorisation of the first base form contains Basic-NStf.  
The paradigmatic categorisation of the second base form contains Basic-NStf, Sing-NStf, or Plur-NStf.
- LC: The lexical categorisations of the bases contain NounSt.

As in Restriction 2, PC in Restriction 3 requires that the first base form is categorised as a basic stem form. There are no empirical reasons to assume specific compounding or blending stem forms here; in particular, there are no linking elements occurring in Modern German blends (Müller & Friedrich 2011: 78).

FM in Pattern 3 assigns the product form /na'tu:rlauB/ (a unit sequence) to the base forms /na'tu:r/ and /'u:rlauB/.<sup>29</sup>

- (45) FM: /na'tu:r/ + /'u:rlauB/ ↦  
/nat /  $\bigcirc$  /'u:rlauB/ = /na'tu:rlauB/

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<sup>29</sup>For the sake of the argument, I assume that in the linguistic system S under discussion (some specific system of spoken Modern German), the vowel in the first syllable in /'u:rlauB/ is typically realised as a long, smoothly cut, tense vowel – as in the phonetic transcription of *Urlaub* by the Dudenredaktion (2015: 872).

This is achieved in the following general way:<sup>30</sup>

1. The first base form /na'tu:r/ is deaccented to /nạtu:r/.
2. The overlapping part /u:r/ and any part after it are deleted in /nạtu:r/.
3. Any part of /'u:rlauB/ before the overlapping part /u:r/ is deleted.
4. The results /nat/ and /'u:rlauB/ are combined by means of the fusion operation, denoted by “ $\overset{\frown}{\cup}$ ”.

In (45), the deaccented lexical accent introduced in step 1 is removed with the overlapping part /u:r/ in step 2. This is not the case in the formation of blends like *Triolade* (cf. Friedrich 2008: 479):

$$(46) \quad /,tri: o'la:də/_{\text{bar with three types of chocolate}}^{\text{St}} \leftarrow_{\text{blend(Pattern 3)}}^{\text{S}} /,tri: o'_{\text{trio}}^{\text{St}} + /ʃoko'la:də/_{\text{chocolate}}^{\text{St}}$$

Here, the accented syllable in the first base form /'tri: o/ is before the overlapping part /o/. The lexical accent is thus not removed in step 2:

$$(47) \quad \text{FM: } /'tri: o/ + /ʃoko'la:də/ \mapsto /,tri: / \overset{\frown}{\cup} / o'la:də/ = /,tri: o'la:də/$$

As to step 3, it does not delete anything in (45) since the overlapping part /u:r/ is at the very beginning of the second base form.<sup>31</sup> For a non-trivial example consider the blend *Mordsee* (cf. Friedrich 2008: 408):

<sup>30</sup>Of course, this is just one of many equivalent formulations of FM in Pattern 3 (cf. Note 17 in Section 3.1).

There is another blending pattern in systems of spoken Modern German for blends where the first base form contains more than one non-affix atom. As far as I can see, this pattern differs from Pattern 3 only with respect to the formal means which works in the following way:

1. The second base form is deaccented.
2. The overlapping part and any part before it are deleted in the second base form.
3. Any part of the first base form after the overlapping part is deleted.
4. The results are combined by means of the fusion operation.

Put in a nutshell, this formal means is “deaccentuation of the second base form and fusion after the overlapping part”. This pattern can be used not only to form (non-conventionalised) blends like /'zelB/ /st/ /,morD/ /,ze:/'<sub>suicidal North Sea</sub>^{\text{St}} where the overlapping part is a proper part of an atom, but also in borderline cases like /'ʃraiB/ /,tif/ /,tenis/'<sub>desktop-ping-pong</sub>^{\text{St}} (Schulz 2004: 300) where the overlapping part spans a full atom.

<sup>31</sup>This is the case because in the view taken here, there is no underlying initial glottal stop in the base form /'u:rlauB/. If one would assume a base form with such a consonant, then the latter would be deleted in step 3 anyway.

$$(48) \quad /'morD/ /,ze:/'_{murderous\ North\ Sea} \ll^S /'morD/'_{murder} + /'norD/ /,ze:/'_{North\ Sea}$$

In this case, step 3 deletes a non-empty part of the second base form /'norD/ /,ze:/ before the overlapping part /orD/:

$$(49) \quad \text{FM: } /'morD/ + /'norD/ /,ze:/ \mapsto \\ /m \quad / \text{ } \textcircled{\cap} \quad /' \quad orD/ /,ze:/ = /'morD/ /,ze:/$$

The output-related constraint in Restriction 3 according to which the base forms are segmentally distinct from the product form is a necessary condition for the recoverability of the bases.

As can be seen from (45), FM in Pattern 3 reduces the number of atoms: the number of atoms in the product form is lower than the total number of atoms in the base forms.<sup>32</sup> Such *fusioning* formal means can be used to define “blending” and “compounding” for arbitrary linguistic systems  $S$ .<sup>33</sup>

*Definition 3*

Let  $n \geq 2$ .

$n$ -place *blending* ( $\text{blend}^n$ ) in  $S$  is that  $n$ -place word-formation process in  $S$  whose arguments are all  $n$ -place formation patterns in  $S$  with a formal means that is fusioning.

*Definition 4*

Let  $n \geq 2$ .

$n$ -place *compounding* ( $\text{comp}^n$ ) in  $S$  is that  $n$ -place word-formation process in  $S$  whose arguments are all  $n$ -place formation patterns in  $S$  with a formal means that is not fusioning.

<sup>32</sup>A similar point is made by Plank (1981: 198), who states: “das Resultat einer Kontamination soll den Eindruck einer einfachen morphologischen Einheit ohne interne Konstruktionsfuge erwecken [the result of blending shall give the impression of a simple morphological unit without an internal construction boundary]”. As a consequence, the first base form can, in principle, be recovered not only by reference to the phonological material up to the overlapping part (if any) but also by reference to material after it. As pointed out by Schulz (2004: 296), in *Tragikomik*, which is formed by means of another blending pattern from the bases *Tragik* and *Komik*, the final *ik* helps to recover the first base form. Similarly, there may be blends where the second base form can be recovered by reference to material before the overlapping part. Such effects are excluded in compounds because of the internal morphological boundary.

<sup>33</sup>By Definitions 3 and 4, two-place word-formation processes are effectively partitioned into two-place compounding and two-place blending. A further candidate for a two-place word-formation process is reduplication which, however, is assumed here to be a one-place process, producing a total or partial copy from a single basis.

(By convention, the arity specification “2” in “blend<sup>2</sup>” and “comp<sup>2</sup>” is dropped if  $n = 2$ .)<sup>34</sup> Those definitions can be supplemented in word-formation theory by an empirical hypothesis stating that the formal means in any blending pattern are not only fusing but also shortening.<sup>35</sup>

PM in Pattern 3 is identical to the paradigmatic means in Pattern 1 and 2. Again, this last-base-inheriting operation copies the paradigmatic categorisation of the second base form to the product form:

- (50) a. PM: {Basic-NStf} + {Basic-NStf}  $\mapsto$  {Basic-NStf}  
 b. PM: {Basic-NStf} + {Sing-NStf}  $\mapsto$  {Sing-NStf}

LM in Pattern 3 – likewise identical to the last-base-inheriting lexical means in Pattern 1 and 2 – copies the lexical categorisation of the second base to the product:

- (51) LM: {NounSt, Fem-NSt} + {NounSt, Masc-NSt}  $\mapsto$  {NounSt, Masc-NSt}

As a consequence, the product has the same lexical gender as the second basis.

SM in Pattern 3 is the same as the last-base-implicating semantic means in Pattern 1. Applied to the base meanings in (44), it determines the following under-specified word-formation meaning:

- (52) SM: ‘nature’ + ‘vacation’  $\mapsto$  ‘vacation in a classificatory relation to nature’

Since this semantic means is not commutative, /naːtu:rlauB/<sup>St</sup><sub>nature vacation</sub> is a subordinative blend (cf. Friedrich 2008: 413, who classifies this blend as determinative and endocentric). Thus, as argued independently by Müller & Friedrich (2011: Section 5) and others, the dichotomy between subordinative and coordinative products, introduced above for compounds, carries over to blends.

<sup>34</sup>Compounding processes with an arity greater than 2 might be assumed in Modern German for tripartite coordinative compounds like *rot-grün-blau*, arguably denoting the mereological sum of red, green, and blue parts. For potential tripartite blends in Modern German cf. Friedrich (2008: Section 4.6).

<sup>35</sup>In contrast to axioms, theorems, hypotheses, etc., definitions are non-empirical since they can be neither true nor false. This distinction between non-empirical definitions and empirical sentences is blurred in much of the linguistic literature (for discussion cf. Budde 2012: Section 2.2). For instance, shortening is used by Müller & Friedrich (2011: 78) and others as a *defining* criterion for blending, by means of which blending is distinguished from compounding. In my view, this is problematic because the notion of compounding should not exclude by definition the existence of compounding patterns with formal means that involve shortening operations such as apocope.

## 4.2 Case study IV: *Kurlaub*

The object of the last case study is the conventionalised blend *Kurlaub*:

- (53) Der Kurlaub werde eingeschränkt, nur für „notwendige Kuren“ sollten Rentenversicherer und Krankenkassen noch zahlen. (S 2)
- the health.cure.vacation restricted.3SG.PASS.SBJV only for necessary cure.PL shall.3PL.SBJV pension.insurance.PL and health.insurance.PL still pay
- ‘Combinations of health cure and vacation will be restricted, pension insurances and health insurances shall only continue to pay for “necessary cures”.’

In the linguistic system S, the lexical word /'ku:rlauB/<sup>W</sup><sub>'health cure plus vacation'</sub> and its stem /'ku:rlauB/<sup>St</sup><sub>'health cure plus vacation'</sub> are formed as follows:

- (54) /'ku:rlauB/<sup>W</sup><sub>'health cure plus vacation'</sub> <<sup>S</sup>blend(Pattern 4)  
/'ku:r/<sup>W</sup><sub>'health cure'</sub> + /'u:rlauB/<sup>W</sup><sub>'vacation'</sub>
- (55) /'ku:rlauB/<sup>St</sup><sub>'health cure plus vacation'</sub> <<sup>S</sup>blend(Pattern 4)  
/'ku:r/<sup>St</sup><sub>'health cure'</sub> + /'u:rlauB/<sup>St</sup><sub>'vacation'</sub>

Pattern 4 combines means from Pattern 2 and 3:

### *Pattern 4*

- FM: deaccentuation of the first base form and fusion before the overlapping part
- PM: identity with the categorisation of the second base form
- LM: identity with the categorisation of the second basis
- SM: formation of a concept according to the scheme ‘sum of the entities denoted by the bases’

Restriction 4 contains the corresponding constraints from Restriction 2 and 3:

### *Restriction 4*

- FC: There is exactly one non-affix atom in the first base form.  
There is an overlapping part of the base forms.  
The second base form has a primary lexical accent on or after the overlapping part.  
The base forms are segmentally distinct from the product form.

- PC: The paradigmatic categorisation of the first base form contains Basic-NStf.  
 The paradigmatic categorisation of the second base form contains Basic-NStf, Sing-NStf, or Plur-NStf.
- LC: The lexical categorisations of the bases contain NounSt.
- SC: The bases denote entities of the same sort for which a sum operation is defined.

FM in Pattern 4 is identical to the formal means in Pattern 3 and assigns the fused product form /'ku:rlauB/ to the base forms /'ku:r/ and /'u:rlauB/:

$$(56) \text{ FM: } /'ku:r/ + /'u:rlauB/ \mapsto /k \ / \bigcirc /'u:rlauB/ = /'ku:rlauB/$$

PM and LM in Pattern 4 are the same as the last-base-inheriting paradigmatic and lexical means in the patterns discussed so far:

$$(57) \text{ PM: } \{\text{Basic-NStf}\} + \{\text{Basic-NStf}\} \mapsto \{\text{Basic-NStf}\}$$

$$(58) \text{ LM: } \{\text{NounSt, Fem-NSt}\} + \{\text{NounSt, Masc-NSt}\} \mapsto \{\text{NounSt, Masc-NSt}\}$$

In particular, the lexical means ensures that the product inherits its lexical gender from the second basis.

SM in Pattern 4 is identical to the semantic means in Pattern 2:

$$(59) \text{ SM: } \text{'health cure'} + \text{'vacation'} \mapsto \text{'sum of health cure and vacation'}$$

The sum operation involved in this example combines events, e.g. health-cure treatments in the morning and vacation activities during the rest of the day. These combined events denoted by the product are denoted neither by the first basis nor by the second basis (at least not as a whole); this is what is to be expected from a semantic means that is not base-implying.<sup>36</sup> Since the semantic means is commutative, /'ku:rlauB/<sup>St</sup><sub>'health cure plus vacation'</sub> is a coordinative blend (also classified as coordinative and exocentric by Friedrich 2008: 387).

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<sup>36</sup>SM in Pattern 4 may involve sum operations of quite different sorts. In the case of the blend /demokra'tu:r/<sup>St</sup><sub>'democracy plus dictatorship'</sub>, for example, SM assigns to the base concepts 'democracy' and 'dictatorship' a concept that denotes the combination of two political systems which neither is a proper democracy nor a full-fledged dictatorship.

## 5 Conclusion

In the case studies in Sections 3.1, 3.2, 4.1, and 4.2, I discussed the word-formation relations (32), (35), (44), and (55), repeated here for convenience:

$$(60) \quad /'norD/ / ,to:r/_{north\ gate}^{St} \ll_{comp(Pattern\ 1)}^S /'norD/_{north}^{St} + /'to:r/_{gate}^{St}$$

$$(61) \quad / ,norD/ / 'ost/_{north-east}^{St} \ll_{comp(Pattern\ 2)}^S /'norD/_{north}^{St} + /'ost/_{east}^{St}$$

$$(62) \quad /na'tu:rlauB/_{nature\ vacation}^{St} \ll_{blend(Pattern\ 3)}^S \\ /na'tu:r/_{nature}^{St} + /u:rlauB/_{vacation}^{St}$$

$$(63) \quad /'ku:rlauB/_{health\ cure\ plus\ vacation}^{St} \ll_{blend(Pattern\ 4)}^S \\ /'ku:r/_{health\ cure}^{St} + /u:rlauB/_{vacation}^{St}$$

“S” stood for some specific, yet undetermined, system of spoken Modern German. The products in those word-formation relations – the subordinative compound  $/'norD/ / ,to:r/_{north\ gate}^{St}$ , the coordinative compound  $/ ,norD/ / 'ost/_{north-east}^{St}$ , the subordinative blend  $/na'tu:rlauB/_{nature\ vacation}^{St}$ , as well as the coordinative blend  $/'ku:rlauB/_{health\ cure\ plus\ vacation}^{St}$  – are *right-headed* in the following sense. All of them are *categorially determined* by the last basis, i.e. they are formed by means of a formation pattern with last-base-inheriting paradigmatic and lexical means. Some of them – viz.  $/'norD/ / ,to:r/_{north\ gate}^{St}$  and  $/na'tu:rlauB/_{nature\ vacation}^{St}$  – are also *semantically determined* by the last basis, because they are formed by means of a formation pattern with a last-base-implying semantic means.

Presupposing the Pattern-and-Restriction Theory, these headedness properties could be established independently of any word structures; in particular, no reference was made to “heads” or “non-heads”. Rather, it was demonstrated that those properties are based on properties of the formation patterns by means of which products are formed from bases through certain word-formation processes. These processes are not restricted to compounding, but apply in principle also to blending. Put differently, headedness properties of compounds and blends can be identified in the Pattern-and-Restriction Theory solely on the basis of word-formation relations and the involved formation patterns – without the assumption of “head constituents”, which are notoriously difficult to ascertain for blends. In the paradigmatic approach followed in this paper, headedness thus

emerges as an epiphenomenon of the word-formation relations between lexical units in a linguistic system. This notion is readily reconstructed as a descriptive term, but has no theoretical significance in such an approach to word formation.

## **Appendix**

### **List of symbols**

Notational conventions:

“St”: lexical stem.

“W”: lexical word.

Symbols for categories:

“Acc-Nf”: nominal word form in the accusative.

“Basic-NStf”: nominal basic stem form.

“Comp-NStf”: nominal compounding stem form.

“Dat-Nf”: nominal word form in the dative.

“Der-NStf”: nominal derivation stem form.

“Fem-NSt”: nominal stem in the feminine.

“Masc-N”: nominal word in the masculine.

“Masc-NSt”: nominal stem in the masculine.

“Neut-NSt”: nominal stem in the neuter.

“Nom-Nf”: nominal word form in the nominative.

“Noun”: noun.

“NounSt”: noun stem.

“Plur-NStf”: nominal stem form in the plural.

“Sing-Nf”: nominal word form in the singular.

“Sing-NStf”: nominal stem form in the singular.

Symbols for word-formation relations:

“<”: word-formation relation.

“<”: direct word-formation relation.

“<”: indirect word-formation relation.

Symbols for word-formation processes:

“blend”: (two-place) blending.

“comp”: (two-place) compounding.

Variables:

“*f*”: sequences of morphological or syntactic atoms.

“*M*”: two-place operations.

“*n*”: natural numbers  $\geq 1$ .

“*S*”: linguistic systems.

“*x*”: arguments or values of two-place operations.

Ambiguous constant:

“*S*”: some specific system of spoken Modern German.

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