Directionality in affixation: the applicability of Marchand's (1964) semantic criteria

Alba E. Ruz (University of Granada) —
Bożena Cetnarowska (University of Silesia in Katowice)

ABSTRACT
This paper presents a study of directionality in word-class changing affixation. Specifically, it addresses the various semantic criteria proposed in Marchand (1964) for directionality in conversion as applied to a sample of affixation in English. The semantic criteria by Marchand have frequently been pointed out in the literature but have not been studied in detail in either conversion or affixation. The aim is to determine whether these criteria are applicable in overt affixation, where directionality does not seem to pose a problem (because, unless back-formation is attested, the affix signals the directionality of the process), or whether the criteria fail to apply even to these cases.

KEYWORDS
affixation, conversion, directionality, lexical semantics, semantic criteria

DOI
https://doi.org/10.14712/18059635.2023.1.1

1 INTRODUCTION

Directionality remains a difficult issue in many cases of English word formation, e.g., *smile*^{N} / *smile*^{V} (*smile*^{V} > *smile*^{N} or *smile*^{N} > *smile*^{V}), *deboned*^{ADJ} (*de-* + *boned*^{ADJ} or *debone*^{V} + *-ed*), or *reconsideration*^{N} (*re-* + *consideration*^{N} or *reconsider*^{V} + *-ation*) (cf. Plag 2003: 2.4, on multiple affixation). In conversion, this is partly the result of the difficulty inherent in the process, at least under a view that conversion is a word-formation process involving several paronymic lexemes (see e.g., Cruse 1986: 130, 132, for a description of paronymy). In both conversion and affixation, this is also partly due to the criteria used in the identification of directionality, and the level of application of the criteria (lexeme vs. sense) (cf. Plank 2010).

This paper tests Marchand's (1964) directionality criteria in a sample of word-class changing affixation in English, with the following aims:

i. To study whether Marchand's (1964) semantic criteria for directionality prove applicable in a sample of word-class changing affixation in English.
ii. To test how measurable the criteria are when considering senses, e.g., how true it is for a base to show fewer restrictions of usage than its derivatives.

Testing Marchand's criteria in a sample of affixation in English is justified by the fact that conversion has often been described by analogy to other word-formation pro-

cesses, mainly to affixation.[1] However, word formation by affixation may or may not react to directionality tests similarly.

This is also a relevant issue in the description of present-day English, especially because the (non-)applicability of the criteria brings forward various possibilities yet to be studied, each with its consequences for the description of English word formation today and, in particular, for the status of conversion:

i. If the criteria prove applicable in affixation, it may be expected that they be applicable in conversion too, at least under a view that conversion and affixation are parallel processes in that they may have similar functionalities in language and produce semantically equivalent outputs.
ii. If the criteria do not prove applicable in affixation, it may then be expected that these criteria would neither be applicable in conversion.

The paper is structured as follows: Section 2 outlines the theoretical background for the study. Section 3 elaborates on the method employed for the extraction of the derivational paradigms and for the analysis of the criteria for directionality. Section 4 presents the results of the study. Section 5 discusses the results, and Section 6 offers the conclusions of the study.

2 DIRECTIONALITY IN ENGLISH WORD FORMATION

Various criteria have been proposed in the literature for the identification of directionality in word formation in unclear cases. They include diachronic criteria relying on historical evidence and attestation dates to decide which lexeme[2] is basic (as in Biese 1941). They also contain synchronic criteria with an emphasis on the use and semantics of the lexemes involved (as proposed by Marchand 1963, 1964).

Since then, several studies have taken on the issue from various perspectives and in various theoretical frameworks (see e.g., Cetnarowska 1993, Štekauer 1996, Twardzisz 1997, Plag 2003, Balteiro 2007, Bram 2011, Lohmann 2017, on English, Don 2003, based on phonological and morphological properties in Dutch, Plank 2010, on German, but potentially extendable to other languages, or Tribout 2020, on French, among others). However, to the best of our knowledge, no solid method to identify directionality has been found and directionality remains a deadlock in many respects (cf. Bauer and Valera 2005: 11). This is because, interestingly, the criteria tested in the literature do not seem to agree, and have typically been found to contradict one

1 This study makes sense within a framework which considers affixation and conversion as parallel processes in the sense that both are asymmetrical and have similar functionalities. However, in order not to bias the analysis and because the aim of this study is to test the criteria for directionality in affixation, conversion is not included in the derivational paradigms, only word-class changing affixation is represented.

2 The term *lexeme* is used here in the traditional sense to refer to words assigned to one word class only, e.g., *love*^{N} and *love*^{V} being two different lexemes (cf. Lyons 1977: 423–424).

another, indicating opposite directions in many cases (cf. e.g., Bram 2011, for a review of the diachronic and synchronic criteria used in the literature and their degree of agreement in English). This fact supports the idea that directionality is not easily predictable, and that a reliable method to tell directionality is yet to be found.

Thus, considering that no experimental research has confirmed directionality convincingly and that there is little evidence on theoretical or empirical grounds to confidently claim a direction in unclear cases, this paper aims at testing a method of assessing directionality by applying a series of semantic criteria in a sample of affixation in English, for which, initially, directionality does not seem to pose a problem.

Specifically, taking a synchronic approach, it is here believed that a look at the semantic complexity of the lexemes involved may help predict the direction in derivation, as it would be expected, e.g., that the semantically more complex lexeme in a pair be derived from the semantically less complex one. The focus is on Marchand's (1964) semantic (or 'content') criteria for directionality (see Section 3 for a brief description of the criteria used in this study and their application).

Another key aspect of this study is the adoption of Plank's (2010) claim that directionality should be studied at the level of senses rather than at the level of lexemes, because several directions (and, thus, several bases and derivatives) may be found for the various senses which develop between a pair of lexemes. Similarly, Marchand claims that "a word may be a derivative in one sense and not in another" (1964: 12), while Quirk et al. affirm that "conversion shows lexicalization having specific sense orientation, in that only a particular sense of a word may be converted to another word class" (1985: 1529). Although these claims are widely accepted, few studies pay attention to senses when commenting on the issue of directionality (cf. Ševčíková 2021). This study tests the semantic criteria proposed by Marchand (1964) (specifically, semantic dependence, semantic pattern, semantic range, and restrictions of usage, hereafter SD, SP, SR, and RU, respectively) at the level of senses, while corpus data (range of registers in which a lexeme is used and frequency of occurrence, hereafter Reg and Freq) is given for lexemes as a whole.

3 METHOD

This section presents the method for the analysis of Marchand's (1964) criteria in this paper. Specifically, Section 3.1 describes the decisions taken for the data sample selection and extraction, while Section 3.2 describes and exemplifies how the analysis of the criteria for directionality was carried out.

3.1 DATA SAMPLE SELECTION AND EXTRACTION

The data sample in this study includes 30 underived bases: 10 nouns, 10 verbs, and 10 adjectives (see Table 1). These bases are the point of departure for the study because they were classified as simple in 40 European languages by participants in an international research project with a focus on crosslinguistic investigation into derivational networks (*Projekt Monika*, cf. Körtvélyessy et al. 2020, and specifically Popova 2020 on English).

Körtvélyessy et al. (2020) draw a distinction between a derivational network, which is viewed as a system of complex words (arranged into orders of derivation) grouped around a single underived lexeme, and a derivational paradigm, which is defined as a set of first-order derivatives from a given lexeme. Here, in contrast to the position taken by Körtvélyessy et al. (2020), the term *derivational paradigm* is used in a wider sense to refer to a "[...] series of related morphological forms which share a base or base type"[3] (Bauer 1997: 245, cf. also Bauer 1983), or to a group of words sharing a common root (Beecher 2004: 17; Fernandez-Dominguez et al. 2020: 4, among others).

For each base, the derivational paradigms by word-class changing affixation were extracted after searches in both the *British National Corpus* (Davies 2004–, hereafter BNC) and the *Oxford English Dictionary* (hereafter OED). In order not to overlook any possible derivative, a list of word-class changing derivational affixes based on Quirk et al. (1985) and Stockwell & Minkova (2001) was used. After extraction of the derivatives, a sample of 317 derived lexemes was obtained. It must be noted that not all the derivatives were found in both the OED and the BNC. Some derivatives appeared only in the OED (around 37%), other derivatives were found only in the BNC (around 4%), and, probably, certain senses or derivatives may not be attested in either source. Withal, a combination of these two sources is believed to build a fairly complete picture of the paradigms for the 30 bases considered. Table 1 shows the total number of derivatives by affixation per base.[4]

Nouns	**nDerivatives**	**Verbs**	**nDerivatives**	**Adjectives**	**nDerivatives**
bone	16	*burn*	8	*bad*	4
day	7	*cut*	10	*black*	11
dog	17	*dig*	8	*long*	12
eye	11	*drink*	16	*narrow*	7
fire	10	*give*	7	*new*	5
louse	9	*hold*	15	*old*	6
name	14	*know*	13	*straight*	9
stone	15	*pull*	5	*thick*	14
tooth	20	*sew*	5	*thin*	7
water	20	*throw*	7	*warm*	9
Sum	139		94		84

TABLE 1. Number of derivatives by affixation per paradigm base

Once the paradigms were extracted, the criteria for directionality were applied, as described and exemplified in Section 3.2.

3 The term *base* is used here in the sense of a word-formation base, i.e., a motivating lexeme. For discussion on the vagueness of the term *paradigm* see Fernández-Alcaina & Čermák (2018: 70, and references therein).

4 The semantics of the lexemes for this study were last checked in the OED in October 2021.

3.2 APPLICATION OF MARCHAND'S CRITERIA FOR DIRECTIONALITY

The criteria used in the study are described and exemplified in this Section. Some criteria, following the idea that word semantics must be studied by considering the role of senses, are based on information from the OED, specifically the criteria of SD (Section 3.2.1), SP (Section 3.2.2), RU (Section 3.2.3), and SR (see Section 3.2.4). Other criteria, specifically the criteria of Reg (3.2.5) and Freq (3.2.6) are studied at the level of lexemes, based on data from the BNC.

3.2.1 SEMANTIC DEPENDENCE (SD)

Semantic dependence (henceforth SD) is one of the criteria described by Marchand (1964: 12), who claimed that "[t]he word that for its analysis is dependent on the content of the other pair member is necessarily the derivative", e.g., *knife*^{N} > *knife*^{V} 'to V with a *knife*'. As exemplified in Table 2 for the paradigm of *bone*^{N},[5] this criterion was measured by counting the senses[6] for each derivative showing SD or not.

BASE	D1	D2	nSenses	+ SD	– SD	?	nSD
bone^{N}			22				
	boned^{ADJ}		3	1, 2, 3			3
	boneless^{ADJ}		3	1, 2		3	2
	boneless^{N}		* (1)				1
		bonelessly^{ADV}	1	1			1
		bonelessness^{N}	1	1			1
	bony^{ADJ}/*boney*^{ADJ}		3	1, 2		3	2
	bony^{N}		1	1			1
	bony^{V}		1	1			1
		bonily^{ADV}	- (1)				1
		boniness^{N}	1	1			1
	boning^{N}		4	1, 2, 3a		3b, 4	2.5
	boner^{N}		4	1, 2a	2b, 3	4	1.5
	boneish^{ADJ}		2	1, 2			2
	debone^{V}		1	1			1
		deboned^{ADJ}	2	1, 2			2
		deboning^{N}	1	1			1
Total			**30**				**24**

TABLE 2. Semantic dependence in the paradigm of *bone*^{N} (OED) (nSenses: number of senses that each lexeme takes in the OED; +SD: senses showing SD; –SD: senses not showing SD; nSD: total number of senses showing SD)

5 An asterisk (*) in this and other tables indicates that no specific senses are provided for a lexeme which appears in the same entry in the OED as the lexeme that precedes it in the table. A hyphen (-) in column *nSenses* means that the lexeme does not appear in the OED (but is attested in the BNC). A general sense is counted in these cases.

6 Arabic-numbered senses were noted down for the analysis of the semantic criteria relying on the OED, and subsenses were considered too when relevant, as shown, e.g., in

Table 2 exemplifies the analysis of SD for the paradigm of *bone*[N]. The numbers in columns *+SD, –SD*, and *?* correspond to the specific Arabic numbers of the senses for the lexemes, as they appear in the OED. For the paradigm in Table 2, it can be seen that out of the total number of senses found for all the derivatives by affixation from *bone*[N] (n = 30), 24 senses seem to show SD (e.g., *boneless*[ADJ], sense 1 'Having no bones; lacking bones', or *boned*[ADJ], [7] sense 2 'Provided with bone or bones'). When synonyms were used for the description of the lexemes, the entries for the synonyms were checked and if they referred to the original bases, the derivatives were analyzed as showing SD towards the base too.

While most senses seem to satisfy the criterion in this paradigm, senses 2b and 3 for the derivative *boner*[N] are marked as not showing SD:

(1) 2b. A cow of moderate to poor quality or condition whose meat is typically used for low-grade beef products. Frequently *attributive.*
(2) 3. *slang* (chiefly *North American*). A mistake, a blunder; frequently (and in earliest use) *Sport* (originally and chiefly *Baseball*) a poor decision or tactical error, *esp.* one that causes one's team to lose a game. Frequently in ***to pull a boner***: to make a mistake. Cf. bonehead n. 1b.

In the case of sense 2b (1) even if a relation may be perceived by speakers, the base is not mentioned in the definition in the dictionary and, thus, a SD relation cannot be confidently claimed. Sense 3 (2), on the other hand, seems to have emerged specifically for the derivative, as no related sense is found in the base.

Also, senses classified as unclear regarding whether they show SD to the base or not are listed under column "?". For example, sense 3 below for *boneless*[ADJ] (3) or sense 4 for *boner*[N] (4) because no clear reference to *bone*[N] is made.

(3) *boneless*[ADJ] 3. *figurative*. Lacking substance, solidity, or strength; (of a person) having little strength of character or willpower; lacking 'backbone'.
(4) *boner*[N] 4. *slang* (originally *U.S.*). An erection of the penis. Hence *figurative*: a strong attraction to or state of excitement about something specified.

Another case classified as unclear is sense 3 for *bony*[ADJ] (5), because even if it makes reference to sense 12 in *bone*[N] (6), the latter (i.e., sense 12) also makes reference to the former (i.e., sense 3) of the adjective:

Tables 2–4. For instance, for *boner*[N] in Table 2, nSD (the sum of the number of senses showing dependence to the base *bone*[N]) is 1.5 because subsenses were counted as 0.5, and under our analysis, just sense 1 and subsense 2a show SD.

7 This formation can be viewed as a deverbal adjective, ultimately referred to a base noun and resulting from a two-step derivation (i.e., N > V > ADJ), or, as noted by an anonymous reviewer, as a denominal adjective (N > ADJ, similarly to the adjectives *haired* and *talented*).

(5) *bony*ADJ 3. *U.S. Mining*. Of coal: containing a considerable amount of slate or shale. Cf. bone *n.*[1] 12.

(6) *bone*N1 12. *Mining*. Slaty or shaly material embedded in coal seams; coal containing such material. Cf. bony *adj.* 3.

3.2.2 SEMANTIC PATTERN (SP)

For the criterion of SP, Marchand (1964: 15) stated that "[c]ertain words have characteristic meanings which mark them as derivatives", e.g., *father*V 'to act as a father'. This criterion was measured here by calculating the number of senses for each lexeme showing a SP typical of a derivative (i.e., nSP), as in Table 3 for the paradigm of *bone*N.[8]

BASE	D1	D2	nSenses	–SP/?	nSP
*bone*N			22		
	*boned*ADJ		3		3
	*boneless*ADJ		3		3
	*boneless*N		* (1)		1
		*bonelessly*ADV	1		1
		*bonelessness*N	1		1
	*bony**ADJ		3		3
	*bony*N		1	1	0
	*bony*V		1		1
		*bonily*ADV	- (1)		1
		*boniness*N	1		1
	*boning*N		4	3b	3.5
	*boner*N		4	†1, 2b, 3, 4	0.5
	*boneish*ADJ		2		2
	*debone*V		1		1
		*deboned*ADJ	2		2
		*deboning*N	1		1
Total			**30**		**25**

TABLE 3. Semantic pattern in the paradigm of *bone*N (OED)

Table 3 exemplifies the analysis of the criterion of SP for the paradigm of *bone*N, for which the number of senses for each lexeme showing a SP typical of a derivative was noted down. Specifically for the paradigm of *bone*N, a large number of senses (n = 25) were found to take a SP typical of a derivative from the nominal base or the related base in D1. In some cases, no SP signaling the assumed derivative character of the senses is used, as in *bony*N (see example (5)). The related sense, *bone*N (sense 12 in example (6)), is defined using the same wording as the definition for *bony*N, thus,

8 Marchand (1969) lists a series of paraphrases for each affix which were particularly useful in the analysis of this criterion.

no SP typical of a derivative is found, but the two lexemes can be used to refer to the material.

3.2.3 RESTRICTION OF USAGE (RU)

Following Marchand, this study expects derivatives to show more RU than their bases. Marchand (1964: 13) claimed that "[i]f one word has a smaller range of usage than its pair member, it must be considered the derivative", listing various possibilities for RU (1969: 13–14). More specifically: i) for one of the words not to be generally accepted while the other is commonly used; ii) for a word to be restricted to certain forms as one of the word classes while it is not restricted as the other; iii) for a word to be used as half serious or semifacetious; or iv) to take a literary or poetic use. Marchand (1964) also mentions frequency in relation to RU, in the sense that if a word is less commonly used than the other in a pair, then, this may be expressed in terms of frequency, being the less commonly used lexeme less frequently used too. In this study, however, Freq is analyzed, not as part of RU, but as a separate, though clearly not unrelated, criterion.

In this study, the criterion of RU was measured by counting the total number of senses showing any restrictions in the OED. This criterion is divided into several types, as shown in Table 4 for the paradigm of *bone*^{N}:

i. RU1: not commonly accepted senses because, e.g., the sense is marked as rare, archaic or obsolete in the OED; it is restricted to a specific group of speakers or a language variety (e.g., Australian, Scottish, American English, etc.); it is specific of a register (e.g., slang and dialectal senses), or used in a specific discipline (e.g., Mining, Astrology, etc.).
ii. RU2: senses the use of which is restricted to a specific form as one word class, not taking all of the inflected or grammatical forms typical of its category, while the use of the other pair member seems to be unrestricted, e.g., verbs that may be used only in one of their forms such as the participle *-ing* form, nouns appearing only in plural form, etc.
iii. RU3: half serious, semi-facetious senses, and those described as humorous senses in the OED.
iv. RU4: not colloquial, i.e., hyperbolic, literary or poetic senses in the OED. Figurative and extended senses were initially listed down within this category too (in gray font in column *RU4*, Table 4), but these were later quantified as restrictions in our analysis only in some cases, while in others they were rather considered as special uses for the lexemes, typically widening the SR or scope of the derivatives. In other words, if a sense of a derivative contrasts with the base-related sense in that it can only be used figuratively, then it would be analyzed as restricted, but if the derivative sense covers the use of the base sense and additionally it can take a figurative interpretation, then this cannot count as restricted because it would rather widen the possibility of use of the derivative sense.

BASE	D1	D2	nS	RU1	RU2	RU3	RU4	nRU
bone^{N}			22	Hist./obs./rare: 3, 10, 18, 19b, 20, 21 Specific: 5, 8b, 12 Slang: > 11, 14	Pl.: 5a, 7, 9, 16 (+coll.), 17 Mass n.: 8a		Figurative: 1c, 4b, 6, 9	15
	boned^{ADJ}		3	Specific: 2			1 (also fig.)	1
	boneless^{ADJ}		3				Figurative: 3	1
	boneless^{N}		* (1)					1
		bonelessly^{ADV}	1				Figurative: 1	1
		bonelessness^{N}	1					0
	*bony**^{ADJ}		3	Specific: 3 (U.S. Mining.)				1
	bony^{N}		1	Specific: 1 (U.S. Mining.)				1
	bony^{V}		1	Obsolete (+ nonce-word): 1				1
		bonily^{ADV}	- (1)					0
		boniness^{N}	1					0
	boning^{N}		4	Specific: 1, 2, 3 Slang: 4	– Pl.			4
	boner^{N}		4	Slang: 1, 3, 4				3
	boneish^{ADJ}		2	Obsolete: 1				1
	debone^{V}		1					0
		deboned^{ADJ}	2	Specific, rare: 1				1
		deboning^{N}	1	Specific: 1				1
Total			**30**			**Total nRU (Der)**		**17**

TABLE 4. Restrictions of usage in the paradigm of *bone*^{N} (OED)

Table 4 exemplifies the analysis of RU for the paradigm of *bone*^{N}. As can be seen, this criterion is divided into various types (columns *RU1–RU4*), but these are later quantified as a whole for each lexeme (column *nRU*), which allows for a base-derivative comparison of RU. The numbers in columns *RU1–RU4* are the specific Arabic numbers that the senses presenting the restrictions specified in each column take in the OED. Specifically for the paradigm from *bone*^{N}, it can be seen that many senses for the derivatives show restrictions of various types (n=17), however, it is to be noted that the base itself has a large number of senses which do show restrictions in use too (n=15).

3.2.4 SEMANTIC RANGE (SR)

Regarding the criterion of SR, Marchand (1964: 14) claimed that "[o]f two homophonous words exhibiting similar sets of semantic features the one with the smaller field of reference is the derivative", e.g., *convert*^{V} > *convert*^{N} 'one who has been converted to a religion/belief'. This criterion is measured qualitatively in this study for the lex-

emes (Section 3.2.4.1), and additionally, a comparison of the number of senses of each lexeme is also carried out (Section 3.2.4.2).

3.2.4.1 QUALITATIVE ANALYSIS OF SR

The qualitative analysis of the criterion of SR is exemplified in Table 5 below for the paradigm of *bone*[N]. In our study, the overall SR for each lexeme was indicated and new or not clearly related senses (those that did not appear specified in the OED for the bases) were listed too. Although a sense analysis is carried out here, qualitative results are given for the lexemes. Thus, even if some lexemes may present new senses they may still be analyzed as taking a narrower SR than the base, because, e.g., various senses of the base are not reflected in the derivative. This is the case of *boner* [N], represented in Table 5 below, which presents new senses (2b and 3) but still its overall SR seems to be considerably narrower than that of the base. In fact, the new senses in the derivative seem to be more specific or restricted. SR for each lexeme was marked as follows:

i. A question mark (?) indicates that the base-derivative SR comparison is unclear either because a derivative does not appear in the OED (e.g., *bonily*[ADV]) or because no sense description is provided, and thus no SR comparison can be made. It is also used when the base of a derivative is unclear or when the derivative senses seem to derive from various bases (e.g., *deboned*[ADJ], the senses of which are described in the OED as coming from two different bases, *boned*[ADJ] and *debone*[V]).[9] In the latter case, the results of the SR comparison may differ depending on the base to which the derivative is compared. Thus, the different senses for *deboned*[ADJ] are counted separately in the results section (as also specified within brackets in Table 5).
ii. (>) indicates that the SR of the derivatives is wider than the SR of the base, i.e., the derivatives seem to cover the SR of the base and present additional senses too, e.g., *lousy*[ADJ].
iii. (≈) indicates that the SR of the derivatives is similar to the SR of their base. This includes (i) derivatives taking fairly equivalent senses to the ones in the base but with the semantic change associated with the change in word-class category, and for which specification or restrictions, if any, seem similar too; (ii) derivatives described in the OED as taking a sense 'in all of the senses of the base'; (iii) derivatives described using a SP typical of a derivative which seems to be able to cover the SR of the base, e.g., *stonify*[V] 'to make stony, or turn into stone; to petrify' > *stonifiable*[ADJ] 'capable of being stonified'; or derivatives for which no definition is provided but for which the bases present only one sense, e.g. *stonified*[ADJ].

9 The senses provided in the OED for *deboned*[ADJ] are the following:
1. Of a corset: not stiffened with whalebone. Cf. boned *adj.* 2a *rare*.
2. Of meat or fish: that has had the bones removed.
The OED specifies the etymology for these senses: "In sense 1 < de- *prefix* + boned *adj.* In sense 2 < debone *v.* + -ed *suffix*[1].".

iv. (≲) indicates that the SR of the derivatives is slightly narrower or very similar to the SR of the base. This includes (i) derivatives which seem to take the main senses of the base, but with the exclusion of very few specific or restricted senses or subsenses; (ii) derivatives described in the OED as taking a sense 'in various senses of the base' without specification, thus, it is unclear whether the SR of the derivative is similar to that of the base but with the changes associated to the word-class change, or narrower; (iii) derivatives which appear within a polysemous entry in the OED but for which no senses or restrictions are provided. It is thus assumed that the SR may be smaller or similar to that of the base, e.g., *delousing*$^{ADJ/N}$ in *delouse*^{V} or *stonelessness*^{N} in *stoneless*^{ADJ}.

v. (<) indicates that the SR of the derivatives is narrower than the SR of the base, the derivatives typically taking fewer senses, or for which senses are more specific or restricted, e.g., *drinky* ^{ADJ}.

BASE	D1	D2	SR	New/unrelated senses
bone^{N}				
	boned^{ADJ}		≲	
	boneless^{ADJ}		<	
	boneless^{N}		<	
		bonelessly^{ADV}	≲	
		bonelessness^{N}	≲	
	bony^{*ADJ}		≲	
	bony^{N}		<	
	bony^{V}		<	
		bonily^{ADV}	?	
		boniness^{N}	≈	
	boning^{N}		<	
	boner^{N}		<	2b, 3
	boneish^{ADJ}		<	
	debone^{V}		<	
		deboned^{ADJ}	? (≈/<)	
		deboning^{N}	<	

TABLE 5. Semantic range in the paradigm of *bone*^{N} (OED) (≈: similar SR / >: wider SR / <: narrower SR / ≲: narrower/close to similar SR / ?: unclear)

Table 5 shows that overall, for the paradigm from *bone*^{N}, the semantic range of the derivatives seems to be significantly narrower (<) or slightly narrower or very similar to the SR of the base (≲). See Section 4.4 for overall results of the nominal, adjectival and verbal paradigms in our sample.

3.2.4.2 NUMBER OF SENSES

In relation to the criterion of SR, an analysis of the number of senses (*nSenses*) of each lexeme in the paradigms was carried out too. For this, the Arabic-numbered senses

that each lexeme takes in the OED were noted down and a base-derivative comparison was made.

BASE	D1	D2	nSenses
bone^{N}			22
	boned^{ADJ}		3
	boneless^{ADJ}		3
	boneless^{N}		* (1)
		bonelessly^{ADV}	1
		bonelessness^{N}	1
	*bony**^{ADJ}		3
	bony^{N}		1
	bony^{V}		1
		bonily^{ADV}	- (1)
		boniness^{N}	1
	boning^{N}		4
	boner^{N}		4
	boneish^{ADJ}		2
	debone^{V}		1
		deboned^{ADJ}	2
		deboning^{N}	1
Total			**30**

TABLE 6. Number of senses for the lexemes in the paradigm of *bone*^{N}

In Table 6 for the paradigm of *bone*^{N}, e.g., it can be seen that the number of senses that each lexeme takes following the OED's description seems to meet the expectations: the base of the paradigm typically takes a larger number of senses than its derivatives in D1, and derivatives in D2 also seem to take a similar or lower number of senses than their bases in D1, though this may not always be the case (e.g., *deboned*^{ADJ}).[10]

3.2.5 RANGE OF REGISTERS (REG)

The Reg of the lexemes was also measured as a quantitative criterion to see if it offers relevant results, and partly also in relation to the criterion of SR and RU, by assuming that the smaller the SR of a lexeme, or the more specific or restricted the senses, the smaller Reg it will show. Texts in the BNC are classified into various registers and sub-registers. To measure the Reg of the lexemes, this study considers the main registers into which the BNC is divided (spoken (10.35%), fiction (16.53%), magazine (7.54%), newspaper (10.87%), non-academic (17.14%), academic (15.93%), and miscel-

10 The information in the OED, however, specifies two different bases for the two senses in *deboned*^{ADJ} (*boned*^{ADJ} and *debone*^{V}, see footnote 9), which has an effect on the analysis of directionality in terms of senses.

laneous texts (21.64%)).[11] This criterion was measured at the level of lexeme by a comparison of the number of registers in which bases and derivatives appear in the BNC, as exemplified in Table 7 for the paradigm of *bone*[N].

BASE	D1	D2	nReg	Spok	Fiction	Magaz	Newsp	Non-Acad	Acad	Misc
bone[N]			7	+	+	+	+	+	+	+
	boned[ADJ]		6	+	+	+	+	+	–	+
	boneless[ADJ]		6	+	+	+	+	+	–	+
	boneless[N]		2	–	–	+	–	+	–	–
		bonelessly[ADV]	1	–	+	–	–	–	–	–
		bonelessness[N]		–	–	–	–	–	–	–
	*bony**[ADJ]		7	+	+	+	+	+	+	+
	*boney**[ADJ]		3	–	+	+	+	–	–	–
	bony[N]			–	–	–	–	–	–	–
	bony[V]			–	–	–	–	–	–	–
		bonily[ADV]	2	–	+	+	–	–	–	–
		boniness[N]	2	–	+	–	–	–	–	+
	boning[N]		2	+	–	–	+	–	–	–
	boner[N]			–	–	–	–	–	–	–
	boneish[ADJ]			–	–	–	–	–	–	–
	debone[V]		1	–	+	–	–	–	–	–
		deboned[ADJ]		–	–	–	–	–	–	–
		deboning[N]		–	–	–	–	–	–	–

TABLE 7. Range of registers in the paradigm of *bone*[N] (BNC) (+: attested / –: not attested)

Specifically for the paradigm from *bone*[N], it can be seen that the Reg in which the base is used is typically greater than that of the derivative. This is true, e.g., for derivatives in D2 as compared to their bases in D1 (*bonelessly*[ADV], nReg = 1 from *boneless*[ADJ], nReg = 6). There are derivatives in D1 however, showing a similar Reg to the base, e.g., *bony*[ADJ] (nReg = 7).

3.2.6 FREQUENCY OF OCCURRENCE (FREQ)

This study compares the Freq of bases and derivatives with the aim to see if this criterion is applicable and indicates directionality correctly. Freq was measured in this study at the level of lexeme, by a comparison of the normalized frequency (NF, here referring to the number of occurrences of a lexeme per million tokens) of bases and derivatives in the BNC, as exemplified in Table 8 for the paradigm of *bone*[N].

11 The number of words in the different sections of the BNC is taken from the section *Texts* on the webpage https://www.english-corpora.org/bnc.

BASE	D1	D2	NF
bone^{N}			45.60
	boned^{ADJ}		0.33
	boneless^{ADJ}		0.46
	boneless^{N}		0.03
		bonelessly^{ADV}	0.02
		bonelessness^{N}	
	bony/boney*^{ADJ}		3.36
	bony^{N}		
	bony^{V}		
		bonily^{ADV}	0.02
		boniness^{N}	0.02
	boning^{N}		0.03
	boner^{N}		
	boneish^{ADJ}		
	debone^{V}		0.01
		deboned^{ADJ}	
		deboning^{N}	

TABLE 8. Normalized frequency of occurrence (NF) in the paradigm of *bone*^{N} (BNC) (blank when the derivatives are not attested)

In the paradigm from *bone*^{N}, the nominal base is found to be used far more frequently than any of its derivatives. Specifically, *bone*^{N} has a NF of 45.6, while its most frequent derivative, *bony*^{ADJ}, has a NF of 3.36. The rest of derivatives appear with even lower frequency. It is typical of lexemes in D1 to have a higher Freq than their derivatives in D2.

3.2.7 RECAPITULATION

Section 3.2 introduced the criteria tested in this study, and exemplified how each criterion was applied and analyzed. Table 9 presents a simplified version of the application of the criteria to the word-class changing derivational paradigm by affixation for the nominal base *bone*.

In Table 9, columns *NF* and *nReg* are based on the data from the BNC, while columns *SR*, *nSenses*, *nSD*, *nRU*, and *nSP* are based on the information provided from the OED. Specifically, Column *NF* presents the normalized frequency of occurrence for each lexeme in the paradigm, column *nReg* presents the total number of registers in which each lexeme is registered in the corpus. Column *nSenses* presents the number of senses that each lexeme takes in the OED. Column *SR* presents a qualitative analysis of the criterion of semantic range for each derivative as compared to their immediate bases. Column *nRU* presents the number of senses for each derivative showing restrictions of use in the dictionary. Finally, columns *nSD* and *nSP* present the number of senses which show semantic dependence towards the base and a semantic pattern typical of a derivative, respectively.

BASE	D1	D2	NF	SR	nReg	nSenses	nSD	nSP	nRU
bone^{N}			45.60		7	22			15
	boned^{ADJ}		0.33	≲	6	3	3	3	1
	boneless^{ADJ}		0.46	<	6	3	2	3	1
	boneless^{N}		0.03	<	2	* (1)	1	1	1
		bonelessly^{ADV}	0.02	≲	1	1	1	1	1
		bonelessness^{N}		≲		1	1	1	0
	bony^{ADJ}/ *boney*^{ADJ}		3.36	≲	7	3	2	3	1
	bony^{N}			<		1	1	0	1
	bony^{V}			<		1	1	1	1
		bonily^{ADV}	0.02	?	2	- (1)	1	1	0
		boniness^{N}	0.02	≈	2	1	1	1	0
	boning^{N}		0.03	<	2	4	2.5	3.5	4
	boner^{N}			<		4	1.5	0.5	3
	boneish^{ADJ}			<		2	2	2	1
	debone^{V}		0.01	<	1	1	1	1	0
		deboned^{ADJ}		?		2	2	2	1
		deboning^{N}		<		1	1	1	1

TABLE 9. Application of the semantic criteria for directionality in the paradigm of *bone*^{N}

The questions now are whether the criteria prove applicable for the study of directionality in a sample of word-class changing affixation in English, and whether these criteria prove applicable at the level of sense. Section 4 presents the results of the study.

4 RESULTS

In this section, the results concerning the applicability of the criteria in a sample of word-class changing affixation in English are presented, organized by criterion. Section 4.1 focuses on the criterion of semantic dependence (SD), Section 4.2 on semantic pattern (SP), Section 4.3 on restrictions of usage (RU), Section 4.4 on semantic range (SR), providing a qualitative analysis of the criterion (4.4.1) as well as comparison of the number of senses in the OED (4.4.2), Section 4.5 presents the results of a comparison of the lexemes' range of registers (Reg) in the BNC, and Section 4.6 gives the results of a comparison of the lexemes' frequency of occurrence (Freq) in the BNC. For convenience, Tables 10–30, which present the results of the analysis of the criteria, can be found in the appendix. Reference to the tables is made in the corresponding sections (4.1–4.6), and the appendix is organized by headings with the same titles as those in the results sections.

4.1 SEMANTIC DEPENDENCE (SD)

The quantitative results of the analysis of the criterion of SD are presented in Tables 10, 11, and 12 in the appendix (A.1), for the nominal, adjectival and verbal bases, respectively. The tables present the number of senses showing SD towards the base out of the total number of senses for the derivatives by order of derivation,[12] based on information from the OED, and only for those derivatives recorded in the dictionary.

From the results in Tables 10–12, the criterion of SD applied at the level of sense seems to give fairly clear indications as to the directionality of the lexemes in the paradigms studied, i.e., most of the senses for the derivatives in D1, D2, or D3 seem to show SD towards their bases. This is more obvious for derivatives in D2 or D3, which seem to take fewer senses, these being more specific and typically using the semantics of the base more directly in their description. Still, it can be seen that not all senses in the derivatives do show SD towards the base. Some examples of senses not showing SD to the base are presented in examples (7–9):

(7) *boner*^{N} 2b. Attributive. Cow of poor quality whose meat is used for low-quality beef products.

(8) *dayless*^{ADJ} †1. Without redress or reward; without a desired result or effect. *Obsolete*.

(9) *warming*^{N} 2. A thrashing, trouncing. Also figurative.

In examples (7–9), the senses listed do not appear to be related to or derived from any of the senses listed for their bases in the OED. Our interpretation is that, for those specific senses, there is no SD towards the bases, even if a relation may be perceived by a community of speakers in some cases, e.g., in example (9), for which sense 2 seems to have emerged through metonymy, i.e., a *warming*^{N}, which is the result of 'a thrashing, trouncing' is used to name the action. Other senses for the same lexemes in the examples are directly related to the senses in the base and show SD, e.g., sense 1a for *warming*^{N} 'the action of making warm; the state of becoming warm'.[13]

4.2 SEMANTIC PATTERN (SP)

The quantitative results of the analysis of the criterion of SP are presented in Tables 13, 14, and 15 in the appendix (A.2), for the nominal, adjectival and verbal bases, respectively. Based on the definitions in the OED, the tables present the number of senses showing SP out of the total number of senses for each derivative by order of derivation. The tables present the data only for the derivatives recorded in the OED.

12 SD for derivatives in D2 is measured in relation to their bases in D1.

13 Because the focus of this study is on overt affixes only and converted lexemes are not included, derivatives taking one derivational affix are always compared to the bases of the paradigms, but these may be derived, or at least some of their senses may be more closely related to the converted counterparts of the bases, as seems to be the case in *warming*^{N} (its senses being more closely related to *warm*^{V}). This is common for derivatives in *-ing* and *-ed* in the nominal and adjectival bases.

Tables 13–15 show that the criterion of SP also seems to indicate directionality when considering senses, i.e., most senses for the derivatives in D1, D2, or D3 are described in the OED by using a SP typical of a derivative, although results differ for each paradigm, and cases are found too where this criterion is not fulfilled. Examples (10) and (11) are senses which do not clearly show a SP typical of a derivative:

(10) *cutting*^{N} † 2. An intersection; also a section. *Obsolete*.
(11) *narrowly*^{ADV} 4. †a. Barely, scarcely. *Obsolete*. *rare*.

Still, overall results show that in D1 most senses seem to take a SP typical of a derivative, and that senses in D2 and D3 do so even more strongly. It seems that the more complex a lexeme is in terms of the number of affixes it takes, the more derivative-like its senses tend to be (or at least be described as such).

4.3 RESTRICTIONS OF USAGE (RU)

The quantitative results of the analysis of the criterion of RU are presented in Tables 16, 17, and 18 in the appendix (A.3), for the nominal, adjectival and verbal bases, respectively. Following the information in the OED, this criterion was measured by calculating the number of senses showing RU out of the total number of senses for each lexeme. The tables offer results for the senses of the derivatives which appear in the OED. Also, they present the restrictions for the base and derivatives in each paradigm, by order of derivation, to stress the fact that not only derivatives show RU, but senses in the bases do so too.

From Tables 16–18, it can be observed that the picture changes from paradigm to paradigm, but for paradigms in which derivatives show a considerably high percentage of restricted senses, the percentage of restricted senses seems to be typically high for the bases of the paradigms too.

Example (12) illustrates how restricted senses in the derivatives are typically related to senses which are also restricted in the base. Here, sense 2e for the derivative *pulling*^{N}, marked as 'British slang' in the OED, is directly related to sense 12a for the base *pull*^{V}, also indicated as 'British slang':

(12) *pulling*^{N} 2. e. British slang. The action of picking up a sexual partner.
pull^{V} 12. a. transitive. British slang. To pick up (a partner), esp. for sexual intercourse; to seduce.

4.4 SEMANTIC RANGE (SR)

The qualitative results of the analysis of the criterion of SR are given in Section 4.4.1 and results of a comparison of the number of senses of each lexeme in the OED are provided in Section 4.4.2.

4.4.1 QUALITATIVE ANALYSIS OF SR

The qualitative results of the analysis of the criterion of SR are presented in Tables 19, 20, and 21 in the appendix (A.4.1), for the nominal, adjectival and verbal bases, respectively. The tables present the number of derivatives showing a similar (≈), slightly

narrower or very similar (≲), narrower (<), or wider (>) SR than that of their base by order of derivation, based on information from the OED. Column *?/na OED* lists unclear cases and those not attested in the OED.

The criterion of SR was measured qualitatively partly because it is difficult to make any claims when the number of senses for bases and derivatives in the OED is low, and partly because of inconsistencies in the organization of senses in the OED, e.g., senses which appear as main senses in the base may appear as subsenses in the derivative, or the other way around. Also, some derivatives are defined as taking a sense 'in all of the senses of the base' or 'in various senses', e.g.:

(13) *eyelessness*^{N2} 'The state or condition of being eyeless (in various senses)'.

The results of the analysis reveal that most derivatives in our sample seem to take a narrower SR, or their SR seems to be slightly narrower or very similar to that of the base, but with the semantic change associated to the word-class category change. Few lexemes show a similar or a wider SR, and overall, it seems that taking a very similar or slightly narrower SR is more typical the more formally complex a lexeme is.

4.4.2 NUMBER OF SENSES

In relation to the criterion of SR, the number of senses in the OED for each lexeme was considered to see if, as expected, the bases do take more senses than their derivatives, these being more specific or covering a smaller SR. Tables 22–24 in the appendix (A.4.2) present the number of derivatives taking, as expected, a lower number of senses in use than their bases (>), or in contrast to the expectation for derivatives, taking the same (=) or a higher (<) number of senses than their bases for each lexeme in the nominal, adjectival, and verbal paradigms considered, by order of derivation. As the study of this criterion is based on the representation of lexemes in a lexicographic source, the tables also provide the number of derivatives for which no information on the senses was supplied in the OED (in column *No info*, by order of derivation).

Tables 22–24 show that, for most cases in this study, derivatives seem to take a lower number of senses in the OED, independently of the order of derivation. For most paradigms, a picture like the one in Figure 1 below for the paradigm of *black*^{ADJ} is obtained.

In the paradigm of *black*^{ADJ}, the derivatives in D1 seem to take a much more reduced number of senses than the base, and derivatives in D2 seem to take fewer senses than their bases in D1, e.g., *blacken*^{V} (D1) has a higher number of senses in the OED (n = 4) than its derivatives in D2, *blackened*^{ADJ} (n = 2), *blackening*^{N} (n = 2), *blackening*^{ADJ} (n = 1), or *blackener*^{N} (n = 1). As Tables 22–24 show, where this is not true, the number of senses is in most cases equivalent, and there are only a few exceptions in which the derivatives take a higher number of senses than the base.

4.5 RANGE OF REGISTERS (REG)

Tables 25–27 in the appendix (A.5) present the quantitative results of the analysis of Reg of the lexemes, i.e., they provide the number of derivatives for which Reg in the

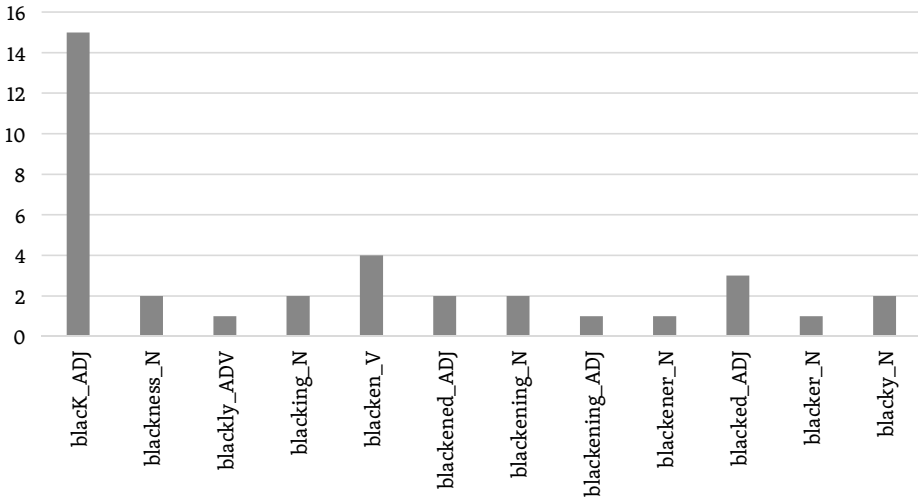

FIGURE 1. Number of senses for each lemma in the paradigm (by word-class changing affixation) of *black*[ADJ]

BNC is lower (<), equivalent (=), or higher (>) as compared to the Reg of the bases in the nominal, adjectival, and verbal paradigms considered, by order of derivation.

Tables 25–27 show that in our sample, even though there are cases for which the Reg of derivatives is more restricted than that of their base, there are many examples of derivatives used in the same number of registers as their base too.

Thus, a look at the number of registers in which each base and derivative appears in the BNC does not seem to prove as useful or conclusive for the purpose of this study, at least when the lexemes in the paradigms are as frequent as the ones in this study.

4.6 FREQUENCY OF OCCURRENCE (FREQ)

Tables 28–30 in the appendix (A.6) present the quantitative results of the analysis of the lexemes' Freq, i.e., the number of derivatives for which the normalized frequency of occurrence in the BNC is lower (<) or in contrast higher (>) to that of the bases for the lexemes in the nominal, adjectival, and verbal paradigms, by order of derivation. Data is presented for derivatives in the corpus, and the percentage for the derivatives not represented in the BNC by order of derivation is given too (*Not attested D1/D2/D3*).

Tables 28–30 show that the Freq of the lexemes proves applicable in the sense that most derivatives in the BNC have a lower frequency than their base. The paradigms in this study present themselves as cases in which bases are more frequent than their derivatives in D1, and at the same time, bases in D1 are typically more frequent than their related derivatives in D2, and so on. This is exemplified, e.g., by the paradigm of *bone*[N] in Table 8 (Section 3.2.6).

Just a few examples were encountered where Freq of one of the derivatives was higher than that of their base, e.g., *lousy*[ADJ] in Table 31:

Lexeme	Freq	NF
louse^{N}	192	1.99
lousy^{ADJ}	221	2.29

TABLE 31. Frequency of occurrence of *louse*^{N} and *lousy*^{ADJ} (BNC)

The reason for the derivative to show a higher Freq than the base may be identified if the semantics of the lexemes are considered, as in Table 31. In this case, the base *louse*^{N} is used mainly to refer to the insect, and sometimes with an extended or transferred use to refer to human beings with some characteristics associated with the insect. On the other hand, *lousy*^{ADJ} denotes in one sense the property 'full of lice' (with subsenses), which is the most literal sense, and it also takes a figurative or extended sense used to characterize people or things in various related ways associated with the noun 'dirty, filthy, obscene. Also as a general term of abuse: Mean, scurvy, sorry, vile, contemptible. Also, inferior, poor, bad; ill; in low health or spirits'. This would explain the higher Freq of the derivative, as it seems more likely that one may use the characterization of the adjective and describe someone or something as *lousy* in any of the senses of the adjective than to use the base to refer to the insect, or in its extended/transferred sense to refer to someone as a *louse*.

5 DISCUSSION

The results of testing the criteria for directionality in affixation were presented in Section 4, and a discussion follows on the issues if semantic criteria for directionality are applicable in affixation and if directionality is indeed predictable on the basis of semantic analysis, and to which extent directionality criteria are applicable at the level of sense or lexeme. To help the reader follow the discussion below, results are examined by criterion, too. Based on the results of this study, Section 5.1 focuses on the applicability of the criterion of semantic dependence (SD), Section 5.2 on semantic pattern (SP), Section 5.3 on restrictions of usage (RU), and Section 5.4 on semantic range (SR), all based on data from the OED. Finally, Sections 5.5 and 5.6 focus on the range of registers (Reg) and on the frequency of occurrence of the lexemes in the BNC (Freq), respectively.

5.1 SEMANTIC DEPENDENCE (SD)

The results in Section 4.1 show that the criterion of SD is applicable at the level of sense and it is useful in predicting the direction in affixation. It indicates the expected directionality, from the base to the formally more complex lexeme, for a large part of the senses in the derivatives of the paradigms in this study and even more strongly for second and third order derivatives. This is probably because the more complex the derivative, the fewer senses it seems to take, these being typically more specific and with a tendency to depend on the meaning of the base more directly. Even if not all senses in the derivatives do show SD towards the base, and

the degree to which SD indicates a base>derivative direction varies for each paradigm, and for each derivative, overall, the criterion is fulfilled for most senses in the derivatives and thus considered useful here for the study of directionality. A systematic assessment of instances in which a SD towards the base is not identified, or where various directions or patterns can be identified may provide further information in this regard.

5.2 SEMANTIC PATTERN (SP)

The results in Section 4.2 show that the criterion of SP is applicable at the level of sense and is useful in predicting a direction in affixation too, indicating the assumed base>derivative direction for a large part of the senses in the derivatives of the paradigms in this study. This is manifested even more strongly the more complex a derivative is, similarly to the results of the criterion of SD. Again, it must be noted that not all senses in the derivatives show a SP typical of a derivative, and it would be interesting to study if this occurs precisely because different directions may be involved in affixation.

5.3 RESTRICTIONS OF USAGE (RU)

The results in Section 4.3 indicate that the criterion of RU is applicable in affixation only for specific senses. It was shown that while it is true that many of the senses for the derivatives are restricted, this cannot be taken as evidence of directionality before a detailed analysis of the senses of the base and its derivatives is carried out. This is because senses in the bases may be restricted, and these restrictions will most probably be passed to the related derivative senses, independently of whether the sense is basic in the simpler or in the more complex lexeme. Only the identification of related senses which appear as restricted in one of the lexemes in a pair and as unrestricted in the other one would prove useful for the study of directionality. Thus, RU is applicable and relevant only at the level of sense, probably not offering conclusive results for an analysis of lexemes as a whole.

5.4 SEMANTIC RANGE (SR): QUALITATIVE AND QUANTITATIVE ANALYSIS OF SENSES

The results from a qualitative analysis of SR in Section 4.4.1 seem to confirm the conclusion that the senses in the derivatives typically show either a nearly similar SR or a significantly lower SR than the base but not including all the senses in the base. Few or no cases were found in which the derivative SR was higher or similar to that of the base. Thus, SR seems applicable for the study of directionality by senses in affixation. This method, however, proved to be time-consuming and not as easily measurable. Also, the use of semantic information from the OED complicated the analysis in terms of directionality because it includes obsolete senses,[14] as well as rare, specific or restricted senses.

14 The quantitative study of SR presents the results of considering only senses in use because the focus of this study is synchronic, but a diachronic study of directionality requires otherwise.

A comparison of the number of senses in the OED for lexemes in a pair (see Section 4.4.2) showed that the percentage of lexemes in D1 with a lower number of senses than their base was higher than, e.g., lexemes in D2 as compared to their base in D1, which were more frequently found to display an equivalent number of senses. The difference in the number of senses was also found to be lower the more complex the derivative in terms of the number of affixes. Although a comparison of the number of senses alone, without any further considerations, is definitely less time-consuming than the qualitative analysis carried out, it does not prove useful in identifying directionality in affixation. Also, it presents various challenges in its applicability at the level of sense, among them the fact that i) inconsistencies in the representation of senses in the OED are found, ii) the extent to which a difference in the number of senses between a pair, be it wider or narrower, may serve to indicate a difference in the SR of the lexemes is unclear.

It is here thus believed that SR for specific pairs may be more accurately described following a qualitative analysis as in Section 4.4.1. However, such an analysis would prove time-consuming for the analysis of large quantities of data.

5.5 RANGE OF REGISTERS (REG)

Reg may also be taken as an indication of the SR of a lexeme for specific cases. It is undeniably linked to the frequency and to the polysemanticity of lexemes, i.e., the general expectation is that the higher the number of senses of a lexeme or the wider its SR, the wider its Freq and Reg will be too.

The results in Section 4.5 show that at least for lexemes as frequent as the ones in this study, Reg does not prove to be as useful in deciding on the directionality between two lexemes. This is because many bases and derivatives in our paradigm are well-known and their use is widespread, and thus, many base-derivative pairs are found to appear in all the registers in the BNC. Also, results seem to vary from paradigm to paradigm, and by order of derivation. While it may seem to prove more useful when considering more complex derivatives, it is unclear whether this may just be related to a low Freq of the lexemes or whether it really indicates that the Reg of those derivatives is narrower.[15] To which extent a more in-depth classification into registers or by senses may offer results for the directionality in affixation remains unclear.

5.6 FREQUENCY OF OCCURRENCE (FREQ)

The results in Section 4.6 show that a study of the Freq of lexemes is applicable in affixation and seems to indicate the assumed directionality for most base-derivative pairs, the bases being typically more frequent than their derivatives in D1, D2, and D3. While it seems to offer results at the level of lexeme, it is here believed that considering Freq by senses would be useful in identifying directionality between lexemes in unclear cases, and in identifying pairs for which various directions of derivation may

15 If a lexeme appears just a couple of times in the BNC, it will naturally appear in a low number of registers, which may not mean that it cannot be used in other registers, but may just be due to a lack of representation of that specific lexeme.

exist. Otherwise, reaching more concrete results regarding Freq (and Reg), or identifying patterns of directionality in this respect will not be possible.

Also, the extent to which a difference in the Freq between a pair may be relevant or not is unclear and should be defined before undertaking a more accurate analysis of directionality in terms of Freq in unclear cases.

6 CONCLUSION

This paper aimed to investigate Marchand's (1964) directionality criteria in a sample of word-class changing affixation in English in order to test if the semantic criteria prove applicable outside conversion, and to determine how feasible it is to apply Marchand's semantic criteria at the level of sense and not of lexeme. An analysis of the criteria seems to indicate the following:

i. For most cases in our sample, both the criteria of SD and SP seem to indicate correctly a base>derivative direction of derivation. However, as has been shown above, this is not true for every sense, and some variation is found for the individual paradigms. Independently of the reasons why the criteria may not be satisfied in some cases, the same is expected to happen for other word-formation processes.
ii. The criterion of RU proves useful only at the level of sense on a base-derivative comparison, and only for specific cases.
iii. Most of the derivatives seem to take a narrower SR, but this is best measured qualitatively partly because of inconsistencies in the dictionary sense organization which make a quantitative analysis difficult, the number of senses not always offering relevant results. A qualitative analysis, however, proves time-consuming.
iv. Reg may be a reliable diagnostic if studied by senses, and perhaps only if a more fine-grained division of registers is considered. The investigation of the number of registers per se does not always lead to convincing conclusions.
v. Freq of the derivatives has been found to be typically lower than that of their bases for the paradigms studied. It must be noted, however, that Freq may serve as a useful diagnostic if studied by senses. Moreover, what should be determined first is to what extent and from which point a difference in Freq can be considered relevant. This is especially important for unclear cases.

It should be emphasized again that the criteria have been tested here with a sample of affixation in which the bases of the paradigms are typically much more frequent than the derivatives in the paradigm, and show a higher degree of polysemy too. Determining a direction between two lexemes, however, will be a challenge for pairs of lexemes which are both polysemous and which show, e.g., a similar SR, number of senses, Reg, and Freq. This is where an analysis by senses would prove most beneficial.

Also, it should be noted that the semantic criteria have synchronic relevance, in the sense that directionality is not rigidly determined, and may vary with time for the different senses which may emerge for a pair of paronymic lexemes.

Overall, this study serves to confirm that an analysis by senses, although time-consuming, is desirable for polysemous pairs of lexemes (in line with Plank 2010). The results reinforce the idea that an analysis by senses may offer more accurate results regarding directionality, the semantic development of lexemes and the patterns found between pairs and within derivational paradigms.

ABBREVIATIONS

BNC	*British National Corpus*
OED	*Oxford English Dictionary*
N	Noun
V	Verb
Der	Derivatives
DP	Derivational Paradigm
ADJ	Adjective
SD	Semantic dependence
SP	Semantic pattern
SR	Semantic range
RU	Restrictions of usage
Reg	Range of registers
Freq	Frequency of occurrence
NF	Normalized frequency of occurrence
D1	First-order derivation
D2	Second-order derivation

Acknowledgements

We would like to express our gratitude to Prof. Salvador Valera for his helpful comments on an earlier version of this article and to Cristina Fernández Alcaina and Cristina Lara Clares for their suggestions. We would also like to thank the editors and the two anonymous reviewers for their feedback. This publication has been supported by the project PID2020-119851GB-I00 MCIN/AEI/10.13039/501100011033, funded by the Spanish State Research Agency (AEI) and the Ministry of Science and Innovation (MCIN). The research activities were also co-financed by the funds granted under the Research Excellence Initiative of the University of Silesia in Katowice.

REFERENCES

Balteiro, I. (2007) *The Directionality of Conversion in English: A Dia-synchronic Study*. Berlin: Peter Lang.

Bauer, L. (1983) *English Word-Formation*. Cambridge: Cambridge University Press.

Bauer, L. (1997) Derivational paradigms. In: Booij, G. and J. van Marle (eds) *Yearbook of Morphology 1996*, 243–256. Dordrecht: Springer.

Bauer, L. and S. Valera (2005) Conversion or zero-derivation: an introduction. In: Bauer, L. and S. Valera (eds) *Approaches to Conversion / Zero-Derivation*, 7–15. Münster: Waxmann.

Beecher, H. (2004) Derivational paradigm in word formation. Unpublished research paper. Available at: citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.94.9071&rep=rep1&type=pdf [last accessed 14 August 2021].

Biese, Y. M. (1941) *Origin and development of conversions in English*. Helsinki: Annales Academiae Scientiarum Fennicae B XLV/2.

Bram, B. (2011) *Major Total Conversion in English: The Question of Directionality*. PhD Thesis, Victoria University of Wellington.

Cetnarowska, B. (1993) *The Syntax, Semantics and Derivation of Bare Nominalisations in English*. Katowice: Uniwersytet Śląski.

Cruse, A. (1986) *Lexical Semantics*. Cambridge: Cambridge University Press.

Davies, M. (2004–) *British National Corpus* (from Oxford University Press). Available at https://www.english-corpora.org/bnc/ [last accessed 30 October 2021].

Don, J. (2003) A note on conversion in Dutch and German. In: Cornips, L. and P. Fikkert (eds) *Linguistics in the Netherlands*, 33–43. Amsterdam: John Benjamins. https://doi.org/10.1075/avt.20.07don

Fernández-Alcaina, C. and J. Čermák (2018) Derivational paradigms and competition in English: a diachronic study on competing causative verbs and their derivatives. *SKASE Journal of Theoretical Linguistics* 15/3, 69–97. http://www.skase.sk/Volumes/JTL38/pdf_doc/04.pdf

Fernández-Domínguez, J., A. Bagasheva and C. Lara-Clares (eds) (2020) *Paradigmatic Relations in Word Formation*. Leiden: Brill. https://doi.org/10.1163/9789004433410

Körtvélyessy, L., A. Bagasheva and P. Štekauer (eds) (2020) *Derivational Networks Across Languages*. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110686630

Lohmann, A. (2017) Phonological properties of word classes and directionality in conversion. *Word Structure* 10/2, 204–234. https://doi.org/10.3366/word.2017.0108

Lyons, J. (1977) *Semantics*. Cambridge: Cambridge University Press.

Marchand, H. (1963) On a question of contrary analysis with derivationally connected but morphologically uncharacterized words. *English Studies* 44, 176–187.

Marchand, H. (1964) A set of criteria for the establishing of derivational relationship between words unmarked by derivational morphemes. *Indogermanische Forschungen* 69, 10–19.

Marchand, H. (1969) *The Categories and Types of Present-Day English Word-Formation. A Synchronic—Diachronic Approach*, 2nd edn, x–xxvii, 1–545. München: Verlag C. H. Beck.

Oxford English Dictionary (OED). Oxford: Oxford University Press. Available at https://oed.com/ [last accessed 30 October 2021].

Plag, I. (2003) *Word-Formation in English*. Cambridge: Cambridge University Press.

Plank, F. (2010) Variable direction in zero-derivation and the unity of polysemous lexical items. *Word Structure* 3/1, 82–97. https://doi.org/10.3366/E1750124510000498

Popova, G. (2020) Derivational networks in English. In: Körtvélyessy, L., A. Bagasheva and P. Štekauer (eds) *Derivational Networks Across Languages*, 147–156. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110686630-015

Quirk, R., S. Greenbaum, G. Leech and J. Svartvik (1985) *A Comprehensive Grammar of the English Language*. London: Longman.

Stockwell, R. and D. Minkova (2001) *English Words: History and Structure*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511791161

Ševčíková, M. (2021) Action nouns vs. nouns as bases for denominal verbs in Czech: A case study on directionality in derivation. *Word Structure* 14, 97–128. https://doi.org/10.3366/word.2021.0181

Štekauer, P. (1996) *A Theory of Conversion in English*. Berlin: Peter Lang.

Tribout, D. (2020) Nominalization, verbalization or both? Insights from the directionality of noun-verb conversion in French. *Zeitschrift für Wortbildung* 4/2, 187–207. https://doi.org/10.3726/zwjw.2020.02.10

Twardzisz, P. (1997) *Zero Derivation in English: A Cognitive Grammar Approach*. Lublin: Wydawnictwo UMCS.

Alba E. Ruz
c/o Salvador Valera Hernández
Department of English and German Philology
Campus de Cartuja s/n
University of Granada
Granada 18071, Spain
ORCID ID: 0000-0001-5336-3938
albaruz94@correo.ugr.es

Bożena Cetnarowska
Institute of Linguistics
Faculty of Humanities
ul. Grota Roweckiego 5
41-200 Sosnowiec, Poland
ORCID ID: 0000-0001-8642-6827
bozena.cetnarowska@us.edu.pl

APPENDIX

A.1 SEMANTIC DEPENDENCE (SD)

N	D1		D2	
bone	17/23	74%	7/7	100%
day	7/10	70%	1/1	100%
dog	18,5/22	84%	6/6	100%
eye	16/20	80%	2/2	100%
fire	14/29	48%	1/1	100%
louse	3/7	43%	2/2	100%
name	15,14/25	61%	4/4	100%
stone	25,5/29	88%	4/5	80%
tooth	20,16/29	70%	1/2	100%
water	39/54	72%	7/7	100%

TABLE 10. Senses of the derivatives from the nominal bases showing SD by order of derivation (OED)

ADJ	D1		D2	
bad	13/13	100%		
black	13,83/17	81%	4,5/6	75%
long	10/15	67%	1/2	50%
narrow	13/14	93%	1/1	100%
new	7/11	64%		
old	5/5	100%	3/3	100%
straight	8/10	80%	3/3	100%
thick	16/18	89%	6/6	100%
thin	12/12	100%		
warm	15/17	88%	–	–

TABLE 11. Senses of the derivatives from the adjectival bases showing SD by order of derivation (OED)

V	D1		D2		D3	
burn	19/22	86%	1/2	50%		
cut	18/32	56%	2/2	100%		
dig	9/13	69%	1/1	100%		
drink	13/16	81%	–	–		
give	10/11	91%				
hold	18/28	64%	8/10	80%	1/1	100%
know	17/19	89%	4/5	80%		
pull	17,5/20	88%				
sew	6/6	100%	–	–		
throw	10/10	100%	0/2	0%		

TABLE 12. Senses of the derivatives from the verbal bases showing SD by order of derivation (OED)

A.2 SEMANTIC PATTERN (SP)

N	D1		D2	
bone	18/23	78%	7/7	100%
day	6/10	60%	1/1	100%
dog	17/22	77%	6/6	100%
eye	17/20	85%	2/2	100%
fire	13/29	45%	1/1	100%
louse	4/7	57%	2/2	100%
name	15/25	60%	2/4	50%
stone	25/29	86%	5/5	100%
tooth	20/29	69%	2/2	100%
water	33/54	61%	7/7	100%

TABLE 13. Senses of the derivatives from the nominal bases showing SP by order of derivation (OED)

ADJ	D1		D2	
bad	13/13	100%		
black	14/17	82%	6/6	100%
long	13/15	87%	2/2	100%
narrow	6,5/14	46%	1/1	100%
new	8/11	73%		
old	5/5	100%	3/3	100%
straight	7/10	70%	3/3	100%
thick	18/18	100%	6/6	100%
thin	12/12	100%		
warm	16/17	94%	–	–

TABLE 14. Senses of the derivatives from the adjectival bases showing SP by order of derivation (OED)

V	D1		D2		D3	
burn	21/22	95%	1/2	50%		
cut	18/32	56%	2/2	100%		
dig	9/13	69%	1/1	100%		
drink	13/16	81%	3/3	100%		
give	10/11	91%				
hold	25/28	89%	5/10	50%	1/1	100%
know	15/19	79%	5/5	100%		
pull	17/20	85%				
sew	5/6	83%	–	–		
throw	10/10	100%	2/2	100%		

TABLE 15. Senses of the derivatives from the verbal bases showing SP by order of derivation (OED)

A.3 RESTRICTIONS OF USAGE (RU)

N	Base		D1		D2	
bone	15/22	68%	14/23	61%	3/7	43%
day	10/23	43%	5/10	50%	0/1	0%
dog	17/31	55%	14/22	64%	3/6	50%
eye	6/24	25%	15/20	75%	0/2	0%
fire	6/18	33%	17/29	59%	1/1	100%
louse	1/2	50%	4/7	57%	1/2	50%
name	4/11	36%	14/25	56%	0/4	0%
stone	4/18	22%	11/29	38%	1/5	20%
tooth	1/3	33%	11/29	38%	0/2	0%
water	10/32	31%	29/54	54%	4/7	57%

TABLE 16. Senses showing RU for the nominal bases and their derivatives by order of derivation (OED)

ADJ	Base		D1		D2	
bad	3/13	23%	5/13	38%		
black	9/15	60%	11/17	65%	0,5/6	8%
long	1/16	6%	10/15	67%	–	
narrow	2/6	33%	6/14	43%	1/1	100%
new	1/9	11%	7/11	64%		
old	6/16	38%	2,5/5	50%	–	
straight	3/10	30%	3/10	30%	–	
thick	5/10	50%	4/18	22%	1/6	17%
thin	1,5/4	38%	4/12	33%		
warm	3/16	19%	9/17	53%	–	

TABLE 17. Senses showing RU for the adjectival bases and their derivatives by order of derivation (OED)

V	Base		D1		D2		D3	
burn	12/21	57%	10,5/22	48%	1/2	50%		
cut	9/38	24%	20/32	63%	1/2	50%		
dig	1/9	11%	5/13	38%	1/1	100%		
drink	4/16	25%	8/16	50%	–			
give	9/49	18%	5/11	45%				
hold	5/28	18%	17/28	61%	7/10	70%	1/1	100%
know	7/17	41%	11/19	58%	2/5	40%		
pull	14/38	37%	10/20	50%				
sew	2/4	50%	2/6	33%	–			
throw	15/41	37%	6/10	60%	2/2	100%		

TABLE 18. Senses showing RU for the verbal bases and their derivatives by order of derivation (OED)

A.4. SEMANTIC RANGE

A.4.1 QUALITATIVE ANALYSIS OF SR

	D1 (compared to the base)								D2 (compared to the base in D1)							
N	≲		<		>		? / na OED		≈		≲		<		? / na OED	
bone	0	0%	10/10	100%	0	0%			2/7	29%	1/7	14%	3/7	43%	1/7 na	14%
day	2/6	33%	4/6	67%	0	0%			1/1	100%	0	0%	0	0%		
dog	0	0%	12/12	100%	0	0%			0	0%	3/5	60%	0	0%	2/5 ?/na	40%
eye	0	0%	9/9	100%	0	0%			0	0%	1/2	50%	1/2	50%		
fire	0	0%	9/9	100%	0	0%			0	0%	0	0%	0	0%	1/1 ?	100%
louse	0	0%	2/5	40%	2/5	40%	1/5 na	20%	2/4	50%	2/4	50%	0	0%		
name	1/10	10%	7/10	70%	0	0%	2/10 ?	20%	1/4	25%	2/4	50%	1/4	25%		
stone	1/10	10%	9/10	90%	0	0%			2/5	40%	3/5	60%	0	0%		
tooth	2/14	14%	12/14	86%	0	0%			1/6	17%	4/6	67%	1/6	17%		
water	0	0%	9/10	90%	0	0%	1/10 na	10%	3/10	30%	3/10	30%	4/10	40%		

TABLE 19. Semantic range of the derivatives from the nominal bases by order of derivation (OED)

A brief explanation of the data in Table 19 may help the reader understand Tables 19–21. Table 19 shows that, in the paradigm from *bone*^{N}, all the derivatives found in first-order derivation (D1) present a narrower SR (<: 10/10) than the base of the paradigm, while out of the seven derivatives in second-order derivation (D2), three have a narrower semantic range (<: 3/7), one derivative exhibits a slightly narrower or very similar semantic range (≲: 1/7), and two derivatives show a similar semantic range (≈: 2/7) to their base in D1. Another derivative does not appear in the OED (na: 1/7), and thus no comparison of its SR is made.

For reasons of space, categories or types in which no derivatives were found are not represented in Tables 19–30, e.g., in Table 19, none of the derivatives in D2 were classified as having a wider SR (>) than their bases in D1, thus, this option is not portrayed in the table.

	D1 (compared to the base)				D2 (compared to the base in D1)					
ADJ	≲		<		≲		<		? / na OED	
bad	0	0%	4/4	100%						
black	4/7	57%	3/7	43%	4/4	100%	0	0%		
long	0	0%	9/9	100%	1/3	33%	2/3	67%		
narrow	2/6	33%	4/6	67%	1/1	100%	0	0%		
new	2/5	40%	3/5	60%						
old	1/3	33%	2/3	67%	3/3	100%	0	0%		
straight	1/5	20%	4/5	80%	4/4	100%	0	0%		
thick	5/7	71%	2/7	29%	4/7	57%	2/7	29%	1/7 na	14%
thin	4/7	57%	3/7	43%						
warm	0	0%	8/8	100%	0	0%	0	0%	1/1 na	100%

TABLE 20. Semantic range of the derivatives from the adjectival bases by order of derivation (OED)

	D1 (compared to base)								D2 (compared to D1 base)						D3 (c. to D2 b.)	
V	≈		≲		<		? / na OED		≲		<		? / na OED		<	
burn	2/7	29%	2/7	29%	4/7	57%	1/7 na	14%	1/1	100%	0	0%				
cut	0	0%	1/7	14%	6/7	86%			1/3	33%	2/3	67%				
dig	0	0%	2/7	29%	5/7	71%							1/1 -D1	100%		
drink	0	0%	0	0%	13/13	100%			3/3	100%	0	0%				
give	0	0%	3/7	43%	4/7	57%										
hold	0	0%	1/7	14%	5/7	71%	1/7 na	14%	1/7	14%	5/7	71%	1/7 na	14%	1/1	100%
know	0	0%	1/7	14%	6/7	86%			1/6	17%	5/6	83%				
pull	0	0%	3/5	60%	2/5	40%										
sew	0	0%	2/4	50%	2/4	50%			1/1	100%	0	0%				
throw	0	0%	1/5	20%	4/5	80%			0	0%	2/2	100%				

TABLE 21. Semantic range of the derivatives from the verbal bases by order of derivation (OED)

A.4.2 NUMBER OF SENSES

N	Base > D1		Base = D1		Base < D1		No info D1		D1 > D2		D1 = D2		No info D2	
bone	10/10	100%	0	0%	0	0%	0	0%	4/7	57%	2/7	29%	1/7	14%
day	6/6	100%	0	0%	0	0%	0	0%	1/1	100%	0	0%	0	0%
dog	12/12	100%	0	0%	0	0%	0	0%	2/5	40%	2/5	40%	1/5	20%
eye	9/9	100%	0	0%	0	0%	0	0%	2/2	100%	0	0%	0	0%
fire	9/9	100%	0	0%	0	0%	0	0%	0	0%	1/1	100%	0	0%
louse	2/5	40%	2/5	40%	0	0%	1/5	20%	0	0%	2/4	50%	2/4	50%
name	10/10	100%	0	0%	0	0%	0	0%	4/4	100%	0	0%	0	0%
stone	10/10	100%	0	0%	0	0%	0	0%	2/5	40%	1/5	20%	2/5	40%
tooth	8/14	57%	5/14	36%	1/14	7%	0	0%	1/6	17%	0	0%	5/6	83%
water	9/10	90%	0	0%	0	0%	1/10	10%	3/10	30%	0	0%	7/10	70%

TABLE 22. Number of senses for the derivatives from the nominal bases by order of derivation (OED)

No info columns in Tables 22–24 provide the number of derivatives not recorded in the OED or recorded but for which no senses are specified.

It can be observed, e.g., that in Table 22 all the ten derivatives found in D1 for the base *bone*^{N} present a lower number of senses than the base (Base > D1: 10/10), while of the seven derivatives found in D2, four have a lower number of senses than their base (D1 > D2: 4/7), two derivatives exhibit a similar number of senses (D1 = D2: 2/7), while the OED provides no description for one of the derivatives (No info: 1/7), therefore no comparison is made.

ADJ	Base > D1		Base = D1		No info D1		D1 > D2		D1 = D2		No info D2	
bad	4/4	100%	0	0%	0	0%						
black	7/7	100%	0	0%	0	0%	4/4	100%	0	0%	0	0%
long	9/9	100%	0	0%	0	0%	1/3	33%	1/3	33%	1/3	33%
narrow	5/6	83%	1/6	17%	0	0%	0	0%	0	0%	1/1	100%
new	5/5	100%	0	0%	0	0%						
old	3/3	100%	0	0%	0	0%	0	0%	0	0%	3/3	100%
straight	4/5	80%	0	0%	1/5	20%	3/4	75%	0	0%	1/4	25%
thick	6/7	86%	0	0%	1/7	14%	6/7	86%	0	0%	1/7	14%
thin	5/7	71%	2/7	29%	0	0%						
warm	8/8	100%	0	0%	0	0%	0	0%	0	0%	1/1	100%

TABLE 23. Number of senses for the derivatives from the adjectival bases by order of derivation (OED)

V	Base > D1		No info D1		D1 > D2		D1 = D2		D1 < D2		No info D2		D2 > D3	
burn	7/7	100%	0	0%	1/1	100%	0	0%	0	0%	0	0%		
cut	7/7	100%	0	0%	2/3	67%	0	0%	0	0%	1/3	33%		
dig	5/7	100%	2/7	29%	0	0%	0	0%	1/1?	100%	0	0%		
drink	12/13	92%	1/15	7%	0	0%	0	0%	0	0%	3/3	100%		
give	5/5	100%	0	0%	2/2	100%	0	0%	0	0%	0	0%		
hold	6/7	86%	1/7	14%	5/7	71%	0	0%	0	0%	2/7	29%	1/1	100%
know	6/7	86%	1/7	14%	1/6	17%	1/6	17%	0	0%	4/6	67%		
pull	5/5	100%	0	0%										
sew	4/4	100%	0	0%	0	0%	0	0%	0	0%	1/1	100%		
throw	5/5	100%	0	0%	2/2	100%	0	0%	0	0%	0	0%		

TABLE 24. Number of senses for the derivatives from the verbal bases by order of derivation (OED)

A.5 RANGE OF REGISTERS (REG)

N	Base > D1		Base = D1		Not attested D1		D1 > D2		D1 = D2		Not attested D2	
bone	5/6	83%	1/6	17%	3/10	30%	3/3	100%	0	0%	3/6	50%
day	0	0%	3/3	100%	3/6	50%	0/0	0%	0	0%	1/1	100%
dog	4/5	80%	1/5	20%	7/12	58%	1/4	25%	3/4	75%	1/5	20%
eye	4/5	80%	1/5	20%	5/9	56%	1/1	100%	0	0%	1/2	50%
fire	2/4	50%	2/4	50%	5/9	56%	0	0%	0	0%	1/1	100%
louse	2/3	67%	1/3	33%	2/5	40%	2/3	67%	1/3	33%	1/4	25%
name	2/6	33%	4/6	67%	4/10	40%	2/2	100%	0	0%	2/4	50%
stone	5/6	83%	1/6	17%	4/10	40%	2/2	100%	0	0%	3/5	60%
tooth	4/7	57%	3/7	43%	7/14	50%	3/3	100%	0	0%	3/6	50%
water	4/6	67%	2/6	33%	4/10	40%	1/1	100%	0	0%	9/10	90%

TABLE 25. Range of registers for the derivatives of the nominal bases by order of derivation (BNC)

In Table 25 it can be seen, e.g., that for the base *bone*^{N}, three out of the ten derivatives found in D1 are not attested in the BNC (under *Not attested D1* column in gray) therefore no comparison can initially be made, while five out of the six derivatives attested show a smaller Reg than the base (Base > D1: 5/6), and one derivative shows a similar Reg as the base, i.e., it appears in the same number of registers in the BNC (Base = D1: 1/6). Similarly, for the six derivatives found in D2, all derivatives attested in the BNC show a smaller Reg than their base (D1 > D2: 3/3), while for the other three not attested derivatives no comparison is made.

ADJ	Base > D1		Base = D1		Not attested D1		D1 > D2		D1 = D2		Not attested D2	
bad	2/4	50%	2/4	50%	1/5	20%						
black	4/6	67%	2/6	33%	1/7	14%	3/4	75%	0	0%	1/4	25%
long	1/1	100%	0	0%	8/9	89%	1/1	100%	0	0%	2/3	67%
narrow	2/5	40%	3/5	60%	1/6	17%	0	0%	0	0%	1/1	100%
new	0	0%	2/2	100%	3/5	60%						
old	1/1	100%	0	0%	2/3	67%	0	0%	0	0%	3/3	100%
straight	2/3	67%	1/3	33%	2/5	40%	4/4	100%	0	0%	0	0%
thick	1/4	25%	3/4	75%	3/7	43%	5/6	83%	1/6	17%	1/7	14%
thin	3/6	50%	3/6	50%	1/7	14%						
warm	2/5	40%	3/5	60%	3/8	38%	1/1	100%	0	0%	0	0%

TABLE 26. Range of registers for the derivatives of the adjectival bases by order of derivation (BNC)

V	Base > D1		Base = D1		Not attested D1		D1 > D2		D1 = D2		Not attested D2		D2 = D3	
burn	3/5	60%	2/5	40%	2/7	29%	1/1	100%	0	0%	0	0%		
cut	2/5	40%	3/5	60%	2/7	29%	1/1	100%	0	0%	2/3	67%		
dig	0	0%	3/3	100%	4/7	57%	0	0%	0	0%	1/1	100%		
drink	4/9	44%	5/9	56%	4/13	31%	1/1	100%	0	0%	2/3	67%		
give	1/3	33%	2/3	67%	4/7	57%								
hold	1/5	20%	4/5	80%	2/7	29%	2/4	50%	2/4	50%	3/7	43%	1/1	100%
know	3/4	75%	1/4	25%	3/7	43%	1/2	50%	1/2	50%	4/6	67%		
pull	1/4	25%	3/4	75%	1/5	20%								
sew	0	0%	2/2	100%	2/4	50%	0	0%	0	0%	1/1	100%		
throw	2/2	100%	0	0%	3/5	60%	0	0%	0	0%	2/2	100%		

TABLE 27. Range of registers for the derivatives of the verbal bases by order of derivation (BNC)

A.6 FREQUENCY OF OCCURRENCE (FREQ)

N	Base > D1		Base < D1		Not attested D1		D1 > D2		D1 < D2		Not attested D2	
bone	6/6	100%	0	0%	4/10	40%	3/3	100%	0	0%	3/6	50%
day	3/3	100%	0	0%	3/6	50%	0	0%	0	0%	1/1	100%
dog	5/5	100%	0	0%	7/12	58%	3/4	75%	1/4	25%	1/5	20%
eye	5/5	100%	0	0%	4/9	44%	1/1	100%	0	0%	1/2	50%
fire	4/4	100%	0	0%	5/9	56%	0	0%	0	0%	1/1	100%
louse	2/3	67%	1/3	33%	2/5	40%	3/3	100%	0	0%	1/4	25%
name	6/6	100%	0	0%	4/10	40%	2/2	100%	0	0%	2/4	50%
stone	6/6	100%	0	0%	4/10	40%	2/2	100%	0	0%	3/5	60%
tooth	7/7	100%	0	0%	7/14	50%	3/3	100%	0	0%	3/6	50%
water	6/6	100%	0	0%	4/10	40%	1/1	100%	0	0%	9/10	90%

TABLE 28. Normalized frequency of occurrence for the derivatives of the nominal bases by order of derivation (BNC)

ADJ	Base > D1		Not attested D1		D1 > D2		D1 < D2		Not attested D2	
bad	3/3	100%	1/4	25%						
black	6/6	100%	1/7	14%	2/3	67%	1/3	33%	1/4	25%
long	1/1	100%	8/9	89%	1/1	100%	0	0%	2/3	67%
narrow	5/5	100%	1/6	17%	0	0%	0	0%	1/1	100%
new	2/2	100%	3/5	60%						
old	1/1	100%	2/3	67%	0	0%	0	0%	3/3	100%
straight	3/3	100%	2/5	40%	4/4	100%	0	0%	0	0%
thick	4/4	100%	3/7	43%	6/6	100%	0	0%	1/7	14%
thin	6/6	100%	1/7	14%						
warm	5/5	100%	3/8	38%	1/1	100%	0	0%	0	0%

TABLE 29. Normalized frequency of occurrence for the derivatives of the adjectival bases by order of derivation (BNC)

V	Base > D1		Not attested D1		D1 > D2		D1 < D2		Not attested D2		D2 = D3	
burn	5/5	100%	2/7	29%	1/1	100%	0	0%	0	0%		
cut	5/5	100%	2/7	29%	1/1	100%	0	0%	2/3	67%		
dig	3/3	100%	4/7	57%	0	0%	0	0%	1(n-w)	100%		
drink	9/9	100%	4/13	31%	1/1	100%	0	0%	2/3	67%		
give	3/3	100%	4/7	57%								
hold	5/5	100%	2/7	29%	4/4	100%	0	0%	3/7	43%	1/1	100%
know	4/4	100%	3/7	43%	1/2	50%	1/2	50%	4/6	67%		
pull	4/4	100%	1/5	20%								
sew	2/2	100%	2/4	50%	0	0%	0	0%	1/1	100%		
throw	2/2	100%	3/5	60%	0	0%	0	0%	2/2	100%		

TABLE 30. Normalized frequency of occurrence for the derivatives of the verbal bases by order of derivation (BNC)