A corpus-based study of the semantic distribution of denominal verb formation in English

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Abstract
The semantics of verb-deriving processes in English and, specifically, of conversion/zero-derivation and affixation has been extensively described in the literature from various theoretical and empirical points of view. Some studies have used a method whereby corpus concordances are classified semantically in order to assess the distribution of semantic categories across word-formation processes. This paper tests this method on a sample of 246 verbal hapaxes from the British National Corpus *manually classified into the various semantic categories traditionally used in the literature. The results obtained are consistent with previous studies regarding the semantic profile of denominal verbs. Methodologically, this study shows the relevance of the method used, but also points at some of its limitations to be addressed in future research.*

Keywords: *conversion, affixation, denominal verbs, semantics*

1 Introduction

The semantic categorization of derivatives has recently been a central concern, as well as a methodological enterprise, in word formation (see, for example, paradigm-based derivational morphology and related studies in Körtvélyessy et al. 2020). Few studies, however, have dealt with the quantification of the range of meanings of individual word-formation processes based on the contextual interpretation of the tokens. In practice, this means approaching the semantic distribution of word formation using corpus concordances where each token of a type is interpreted semantically in terms of the context of the concordance. This corpus-based approach seems particularly suitable when it comes to dealing with innovative derivations, since their interpretation often needs contextual information, which corpus data can adequately provide.

This study tests the latter methodological approach in the exploration of the semantic distribution of English denominal verb formation. The paper is organized as follows: sections 2 and 3 overview the literature regarding the formal and semantic features of verb-deriving affixes and conversion in English. Section 4 describes the method used for data collection and analysis. Section 5 discusses the results obtained on the semantics of the processes in the sample. Section 6 presents the conclusions of the study and prospective paths to explore in future research.

2 Denominal verb formation in English

Denominal verb formation in English is mainly the result of affixation and conversion. Of these, conversion has been described as the most productive denominal verbal formation process (Clark & Clark 1979: 768; Plag 1999: 117; Kastovsky 2005: 36), while *-ize* seems to show the highest productivity among the affixal processes (Bauer 1983: 223; Plag 1999: 117).

Semantically, conversion seems to show the widest range of meanings, while prefixes seem to show the most limited range. In what follows there is a review of the processes which are considered in this study (*de-*, *en-*, *-ate*, *-ify*, *-ize* and conversion, in this order), and which are often described in the literature as productive processes in the formation of denominal verbs. The review covers reference literature and corpus-based studies similar to the present study, whenever possible: Plag (1999) on 20th century verb neologisms and Gottfurcht (2008) on denominal verb formation, particularly as regards 20th century new formations.

The prefix *de-* is attached to both verbal (*deselect*, *dealign*) and nominal bases (*debug*, *deskin*) and is described as highly productive in contemporary English (Bauer et al. 2013: 363). Deverbal *de-* usually attaches to *-ize*, *-ify* and, to a lesser extent, *-ate* complex bases (*decolonize*, *decalcify*, *de-escalate*, respectively). Semantically, while deverbal *de-* verbs show REVERSATIVE meaning, denominal *de-* verbs show PRIVATIVE meaning. In the latter case, either the entity denoted by the base is removed (*debone*, 'remove the bones'), or the source is referred to (*dethrone*, 'removed from the throne') (Bauer et al. 2013: 369). It has been argued that verbal and denominal *de-* derivatives are very closely related, to the extent that sometimes it is difficult to interpret the derivative as either PRIVATIVE or REVERSATIVE: *dechlorinate* may be viewed as 'remove the chlorine from' or 'reverse the process of dechlorinating' (Bauer et al. 2013: 370). This distinction has important implications, as this paper covers only denominal bases. Further details on the derivatives selected here are given in §4.

The prefix *en-* is found mainly with nominal bases (*encapsule*, *encoffin*), but it can also be found in bound bases (*enamour*, *enfeeble*), adjectival bases (*enable*, *enlarge*) and verbal bases (*entrust*, *entwine*). Even if it has been described as unproductive (Plag 1999: 218; Bauer & Huddleston 2002: 1714; see also Bauer 1983: 217; Gottfurcht 2008: 112), its productivity has been confirmed later by Bauer et al. (2013: 268) after attesting occasional derivatives in the *Oxford English Dictionary* (OED) in the past century, and also in corpus data, namely the *British National Corpus* (BNC) and the *Corpus of Contemporary American English* (COCA). Many of the formations in these resources are denominal, which, according to the authors, confirms the category-changing status of the prefix. The prefix encompasses the allomorph /im/ (spelt <em->) which is phonologically constrained (assimilation before bilabials) and the spelling variants <in-> and <im-> (Bauer et al. 2013: 268). The meanings associated with denominal *en-* formations include mainly LOCATIVE (*entrap*, *encircle*), but also RESULTATIVE (*enslave*, *encash*) and ORNATIVE (*enhat*, *embalm*) (Plag 1999: 218; Bauer et al. 2013: 282; see also Bauer & Huddleston 2002: 1714). Albeit based on a low number of attestations (only six types), Gottfurcht (2008: 150) confirms the major semantic categories described for this prefix in new 20th century formations, except that RESULTATIVE ranks first followed by LOCATIVE and ORNATIVE.

Bauer & Huddleston (2002: 1713ff) describe *-ate* verbs as mainly based on Latin bases or as direct loans from Latin. This may explain why most of the bases are bound. English word formation is, however, primarily based on nominal bases (*hyphenate*, *orchestrate*), which is reported to be productive and to exhibit certain regularities (Bauer et al. 2013: 275). It also attaches to adjectival bases (*activate*) and, to a much lesser extent, verbal bases (*prolongate*). Semantically, ORNATIVE and RESULTATIVE meanings (*nitrogenate*, *methanate*, respectively) can be found, especially where the bases denote chemical substances, which seems to be the productive pattern (Plag 1999: 205–206; see also Bauer et al. 2013: 284). Gottfurcht (2008: 164) also reports RESULTATIVE and ORNATIVE as the highest ranking categories, in this order. Other categories described in Gottfurcht (2008: 164) are INSTRUMENT, in an intermediate position, and PERFORMATIVE, PRIVATIVE and LOCATIVE, which rank lowest.

The two last types of suffixed formations under consideration here, *-ize* and *-ify*, are reviewed together for their similarities. These formations consist mainly of Latinate bases, even if the words were coined in English and not in Latin (Bauer & Huddleston 2002: 1713ff). In addition to bound bases (*baptize*, *maximize*, *electrify*, *identify*) and nouns (*standardize*, *hospitalize*, *classify*, *notify*), among which proper nouns are well-attested for *-ify* formations (*Kurdify*, *Finlandize*), *-ize* and *-ify* formations are also found with adjectival bases (*equalize*, *nativize*, *diversity*, *falsify*) (Bauer et al. 2013: 269–270). Bauer et al. (2013: 271) note that *-ify* and *-ize* could actually be treated as phonologically-conditioned allomorphs, since they operate in two different phonological environments showing the same range of meanings. Semantically, the suffixes have been associated with the categories INCHOATIVE (*calcify*, *oxidize*), CAUSATIVE (*diversify*, *standardize*), RESULTATIVE (*yuppify*, *crystalize*), ORNATIVE (*glorify*, *accessorize*), LOCATIVE (*codify*, *hospitalize*) and SIMILATIVE (*Lewisify*) (Plag 1999: 124ff; see also Bauer et al. 2013: 282–284). Lieber (2004: 78, 89) proposes a scale of productivity for *-ify* and *-ize* derivatives in terms of their semantic characteristics. Goal-oriented verbs (e.g. CAUSATIVE, RESULTATIVE and LOCATIVE) are the most productive, while theme-oriented verbs (e.g. ORNATIVE) are less productive. PERFORMATIVE and SIMILATIVE are not core cases, but arise from a process of sense extension. The latter two are the least productive types of derivatives, especially for *-ify* (see also Lieber 2004: 81–89). Relatedly, Bauer et al. (2013: 284) claims that non-causative verbal meanings are largely expressed by conversion instead. Gottfurcht (2008: 156, 180) reports the highest number of attestations in the category RESULTATIVE for both *-ify* and *-ize* formations, but ORNATIVE derivations rank next. The category LOCATIVE is also attested for the two suffixes reviewed here in Gottfurcht (2008), but it ranks much lower than RESULTATIVE or ORNATIVE.

Noun-based conversion into verbs is a highly productive process in English. Noun-to-verb conversion seems to be more common overall than from any other base, including adjectives (*cruel*, *young*), onomatopoeic expressions (*burp*, *oink*), phrases (*hands-up*, *cold*, *call*) and adverbs and prepositions (*backward*, *in*) (Bauer et al. 2013: 278). Nominal bases seem to be largely simplex bases, though other types are attested, such as compounds (*filmset*, *eyeball*, *highlight*). In fact, conversion seems to be the major source of verb compounds (Plag 1999: 232). To a lesser extent, noun bases also include derivatives (*clipper*, *interface*, *sleeper*), proper nouns (*Amazon*, *Dell*, *Nasdaq*) and acronyms (*RIF*) (Bauer & Huddleston 2002: 1641ff; Bauer et al. 2013: 278).

Semantically, verbs formed by conversion show a wide range of meanings and high semantic flexibility (or indeterminacy), often motivated by the discourse context (Biese 1941: 429–431; Clark & Clark 1979; Cetnarowska 1993; Plag 1999: 220). This is so to the extent that opposite interpretations may be found for the same verb formed by conversion (*bark*: PRIVATIVE and ORNATIVE) (Bauer et al. 2013: 285). The meanings include LOCATIVE (*archive*, *jail*), ORNATIVE (*mustard*, *staff*), RESULTATIVE (*bundle*, *package*), INCHOATIVE (*jelly*, *gel*), PERFORMATIVE (*counterattack*, *sanction*), SIMILATIVE (*peacock*, *chauffeur*), INSTRUMENTAL (*hammer*, *glue*), PRIVATIVE (*bark*, *skin*), and STATIVE (*bay*, *landmark*). Non-causative verbal meanings seem to be expressed by conversion instead of by affixation (Bauer et al. 2013: 284). Among them, INSTRUMENTAL seems the most characteristic semantic category of denominal verbs formed by conversion (Plag 1999: 221), and there seems to be far more PERFORMATIVE and SIMILATIVE verbs formed by conversion than in any of the other categories (Lieber 2004: 93). In addition, conversion seems to express meanings that cut across the categories listed and which are not expressed by other word-formation processes, in particular motion meanings ('move in X manner', 'move on/at X', 'move using X') (Lieber 2004: 91, see also Plag 1999:

220). Gottfurcht (2008: 172) supports the preference of conversion to express INSTRUMENTAL and SIMILATIVE meanings, as these categories rank highest in her study. Still, SIMILATIVE is closely followed by ORNATIVE, RESULTATIVE and LOCATIVE, which seems to confirm that, even if conversion covers the area of non-causative meanings, it also covers causative meanings which stand in the semantic area usually associated with affixation (cf. similarly Valera 2020: 320).

3 The semantic characterization of denominal verbal derivation

A number of studies have dealt with the semantic characterization of English verbal derivation, whether with a focus on polysemy (Plag 1998), productivity (Plag 1999; Morita 2022) or competition (Schneider 1987; Gottfurcht 2008; Bauer et al. 2010; Fernández-Alcaina 2017, 2021) (see Baeskow 2019 for an overview of denominal verb formation). The latter two perspectives are highly interconnected, since the existence of competing processes is partly responsible for changes in productivity (Scherer 2015: 345), and this may result in either the decrease in the productivity of a particular process (e.g. *-en* suffixation, Bauer 1983: 223; Plag 1999: 219), or the specialization of a particular process (e.g. *-ify* and *-ize* express the same range of categories but are phonologically restricted). While several factors have been described as ruling the resolution of competition, and thus affecting the productivity of the processes involved, competition has been defined almost exclusively in terms of semantic equivalence (Huyghe & Varvara 2023: 3), especially, regarding the equivalence of the outputs. This is not without problems: i) semantic types in word formation are usually described in abstract terms, thus often resulting in the use of "medium- or coarse-grained meanings", and ii) there is no consensus regarding the degree of equivalence required to consider processes as rivals (for a review, cf. Fernández-Alcaina 2021: 22–25).

Despite the limitations inherent to semantic analysis, a typology (with minor variations) which is often used for the semantic characterization of verbal derivation comprises the following categories (Table 1, cf. Marchand 1969; Plag 1998, 1999; Gottfurcht 2008; Bauer et al. 2013):

Table 1: Verbal semantic categories

CAUSATIVE	'make x'
INCHOATIVE	'become x'
INSTRUMENTAL	'use x'
LOCATIVE	'put (in)to x'
ORNATIVE	'provide with x'
PERFORMATIVE	'perform x'
PRIVATIVE	'remove x'
RESULTATIVE	'make into x'
SIMILATIVE	'act like x'
STATIVE	'be x'

While these semantic categories have been widely used, as with any other analytical tool, the typology is not unproblematic. Valera (2020: 313–314) argues that these categories are not as comprehensive as required by the data, specifically the category EFFECTED, missing in the typology. Valera (2020) also notes that these semantic categories show different degrees of granularity, e.g. with regard to DIRECTIONAL and LOCATIVE, and INCHOATIVE and STATIVE as specifications of space locations and attributes, respectively. Relatedly, Plag (1999: 132) also discusses the case of (denominal) RESULTATIVE and (deadjectival) CAUSATIVE (see also Plag 1998: 228 cited in Baeskow 2019: 8). As the distinction is conceptually unmotivated, Plag merges both categories into one (cf. also Morita 2022 for other types of category-merging practices in the analysis of verbal derivation in English). While the latter issues affect the structure of the typology, its application presents two additional issues in practice. One is the possibility of an item to be classified into more than one category (cf. polysemy as reviewed above). A second issue, and related to the latter, is the analyst's variability of category selection. Arguably, however, the latter difficulties are intrinsic to any analytic tool.

Few studies have dealt with the quantification of the range of meanings of individual word-formation processes. The meaning exhibited by innovative derivations may be taken as an indication of the semantic categories which are productive for a given word-formation process. Still, the semantic interpretation of innovative derivations often requires the use of contextual information, generic knowledge and communicative-pragmatic knowledge (Clark & Clark 1979; Plag 1999: 220; Baeskow 2019: 2), which raises questions as to the most suitable methodological approach. This paper uses corpus concordances to interpret semantically each token of a denominal verb type and identify the semantic specialization of productive denominal verb formation processes in English (cf. similarly Valera 2020 and Ševčíková et al. this volume).

4 Method

4.1 *Data collection*

The denominal verbal processes under study are those cited as productive in the literature and revised in §2 above, namely *de-*, *en-*, *-ate*, *-ify*, *-ize* and conversion.[1] The collection of such derivatives relied on a combination of lexicographic and corpus resources. Specifically, data were primarily collected from the *British National Corpus Frequency List* (Kilgarriff 1997) as it can be easily exploited using the software *Scáthach* (Lara-Clares & Lara-Clares 2016). The tool allows to filter data by: part of speech, specific strings of characters at the beginning or end, and discarding unwanted units containing non-alphabetical characters. It also enables users to filter data by frequency range. For this study, the search was restricted to verbal types with frequency 1 in the corpus. The list of verbs extracted (discarding entries containing non-alphabetical characters) amounted to 14,383 verbal types. In order to keep only relevant verbal

[1] *Un*-derivatives were discarded from the final sample because it was sometimes difficult to determine from the context whether the derivatives were denominal, hence expressing PRIVATIVE meaning, or deverbal, hence expressing REVERSATIVE meaning (see Bauer & Huddleston 2002: 1689–1690; Bauer et al. 2013: 369–370 on this issue). The initial sample also contained a PRIVATIVE verb prefixed by *dis-* (*dispark*), but it was excluded because of its very limited representation in the sample (one derivative), and because, ultimately, it is described as only occasionally category-changing in the literature (Bauer et al. 2013: 358).

types, the list was filtered automatically by comparing it to the list of verbal entries listed in the English version of the *Wiktionary* (35,676 entries as of November 2022).[2]

The *Wiktionary* is built by users, not by lexicographers, but its relevance for linguistic research is supported by other studies where the resource is either used for data collection (Bonami & Thuilier 2019; Hilpert et al. 2021), or in combination with other traditional resources, such as the OED (Mattiello & Dressler 2022). As Lieber (2009: 28) points out, the *Wiktionary* presents several advantages that qualify it to be used in research, as it requires entries to be attested in at least three relevant works of refereed publication over more than a year. New *Wiktionary* entries need to follow a consistent structure and their glosses must be clear and easy to understand. The latter is particularly relevant in semantic classification tasks, for a better understanding of senses.[3]

The intersection of the lists extracted from the two resources described above shortlists 1,947 verbs. Concordances were automatically extracted from the BNC through the *KonText* interface API (*Czech National Corpus*)[4] using the advanced query [lemma = "VERB" & tag = "V.*"]. Due to mismatches between the frequency list and the corpus interface used, the list of concordances amounted to 2,100 types. The discrepancy arises because some verbs are recorded in the corpus with a frequency higher than the one indicated in Kilgarrif's list (e.g. *zone* is listed with frequency 1 in the list but returns 23 hits in the corpus). Other verbs in the list were spelling variants of the types recorded in the corpus with a higher frequency (e.g. *chastize*: one hit, *chastise*: 79 hits). In both cases, verbs not meeting the frequency criterion (considering all their variants) were discarded. Finally, other verbs are not recorded in the corpus interface used (e.g. *kaleidoscope*). Although their search returned results in other interfaces of the BNC, these verbs were discarded from the final list of denominal verbs in order to keep close to the original data source.

Based on the information provided by the OED and by the *Wiktionary*, the list was filtered by three annotators, both prior to and during semantic analysis, in order to discard unwanted units such as:

i. wrongly-tagged types (e.g. *Whoomp*);
ii. typos (e.g. *decypher* instead of *decipher*);
iii. non-denominal verbs (e.g. *saponify*);
iv. verbs derived by processes other than affixation or conversion according to the OED, such as back-formation (e.g. *tatter*), compounding (e.g. *divebomb*) or parasynthesis (e.g. *deionise*);
v. verbs derived by affixes other than *de-*, *en-*, *-ate-*, *-ify*, *-ize* and conversion, described as productive in the literature on English verb-deriving processes (Plag 1999; Lieber 2004; Bauer et al. 2013);
vi. verbs attested in the corpus but described as 'obsolete', 'rare' or 'archaic' in the OED and/or the *Wiktionary* (e.g. *mercy*); and
vii. *-ed* and *-ing* forms in prenominal and nominal position respectively (e.g. *bowed trees*, *mezzotinting*).

[2] https://www.wiktionary.org/ (Accessed November 23, 2023).
[3] As noted by one of the reviewers, the use of the *Wiktionary* to facilitate the process of data extraction may be contrary to the use of hapaxes (since entries in the *Wiktionary* are necessarily attested in at least three sources). While we agree with this objection, we must note that the use of hapaxes is just a methodological decision aimed at reducing the difficulties that (highly) polysemous and/or lexicalized units may pose. Although the possible loss of hapaxes may be problematic in studies on neologisms, this is beyond the scope of this paper.
[4] https://korpus.cz/ (Accessed July 5, 2023).

The list of denominal verbs thus obtained and therefore classified semantically amounted to 246 verbs (Table 2). Of these, 174 verbs are derived by conversion and 72 by affixation.

Table 2: Sample sizes per process/affix

de-	***en-***	***-ate***	***-ify***	***-ize***	**Conversion**
9	6	9	4	44	174

The directionality of conversion is known to be a complex issue (see, for example, Iordăchioaia et al. 2020: 125 on deverbal noun formation) and the applicability of the criteria available in the literature varies. For this study, lemmas were retained in the sample only if they fit any of the semantic categories described in the literature as patterns for noun-to-verb conversion (cf. Marchand 1963, 1964). Semantic categorization allowed to confirm semantic dependence too, i.e. the necessary existence of the entity denoted by the nominal base prior to the existence of the converted verb, e.g. *lotion* 'apply lotion to the skin' (ORNATIVE), *mistress* 'behave like a mistress' (SIMILATIVE), which was confirmed by the dictionary. The low frequency range researched (frequency 1) may also be taken as evidence of the directionality noun to verb for the verbs in our sample (Plag 2018: 107).

4.2 *Data processing and analysis*

The concordances described in the previous section were semantically classified independently by three annotators, two of whom are also the authors of this paper. The two annotators agreed on the semantic classification of 122 (50%) of the 246 verbs in the sample. Partial agreement (i.e. both annotators chose the same category but one of them was unsure about the choice) occurred in 30 verbs (12%). The annotators disagreed in the annotation of 94 verbs (38%). Cases of disagreement were discussed, and the third annotator's annotations were used whenever the semantic classification differed. The semantic classification was based on the definitions provided by the OED and the *Wiktionary* (whenever available). In essence, the classification aimed to align as closely as possible with the correspondence between the terms in the definitions and the paraphrase associated with each semantic category. In certain verbs, this alignment was complete: *aerosol* is defined as 'make into an aerosol' in the OED and thus classified as RESULTATIVE ('make into N'). In other cases, approximate definitions were needed: *world* is defined in the OED as 'to bring (a child) into the world at birth', approximated as 'put a child into the world' and thus classified as LOCATIVE ('put into N'). If none of the senses provided by the OED or the *Wiktionary* fits the interpretation of the concordance, both the extended context of the concordance and Internet searches were of help in order to determine the meaning expressed by the verb in that particular context.

The classification was for the sense identified in the concordance line and its extended corpus context whenever necessary. The sense expressed by the verb in the concordance was contrasted against the definitions provided by the OED and the *Wiktionary*, so as to gain a better understanding of its meaning. When the sense provided by the concordance did not match any of the senses listed in the two latter resources, the semantic category was based on the sense expressed by the verb in the specific context of the concordance. If, in contrast, the sense appeared in any of the resources but was labelled as 'archaic' or 'obsolete', the verb was discarded from the sample.

The semantic categories used for the semantic classification are the categories described in the literature and identified in corpus attestations. Table 3 presents the complete list of categories used for classification:[5]

Table 3: Semantic categories used for concordance classification with examples from Marchand (1969), Plag (1999), Bauer et al. (2013) and Valera (2023)

Semantic category	Definition	Examples
LOCATIVE	'put (in)to N'	*hospitalize*
ORNATIVE	'provide with N'	*enhat*
CAUSATIVE	'make (more) N'	*standardize*
RESULTATIVE	'make into N'	*yuppify*
INCHOATIVE	'become N'	*oxidize*
PERFORMATIVE	'perform N'	*speechify*
SIMILATIVE	'act like N'	*bullock*
INSTRUMENTAL	'use N'	*hammer*
PRIVATIVE	'remove N'	*debone*
STATIVE	'be N'	*landmark*
EFFECTED	'bring N into existence'	*receipt*
DIRECTIONAL	'go/move to N'	*nightclub*

Some of the verbs in the sample did not have a straightforward semantic classification based on the corpus concordances and the definition of the categories (for a discussion of similar cases, cf. Ševčíková et al., this volume)

The distinction between INSTRUMENTAL and ORNATIVE categories posed notable challenges in previous related research, as reported by Hsiao (2022: 57). This difficulty arises from the occurrence of verbs conveying both senses, in some cases with no clear demarcation. This may be partly a consequence of the limitations of lexicographic resources in terms of sense separation. The degree of difficulty in the analysis varies among verbs, with units allowing for a more straightforward classification than others. For example, *boobytrap* can express both meanings, which are clearly delimited in the OED: i) 'to surprise with or catch by means of a booby trap' (INSTRUMENTAL), and ii) 'to place a booby trap in (a place)' (ORNATIVE), also figuratively as 'to cause (something) to have or include hidden difficulties or pitfalls'. Only the ORNATIVE sense is attested in the concordance of our sample:

(1) *Everyday conversation became a minefield, peppered by sentences* ***boobytrapped*** *by Wayne's trademark deflationary suffix, `Not!*

[5] The categories EFFECTED and DIRECTIONAL (and their examples) are proposed by Valera (2023: 161) and, to the best of our knowledge, are not identified as such elsewhere, except for the Spanish counterpart to EFFECTED in Rainer (1993).

Other verbs pose more problems in their classification, as the two categories are merged into the same gloss in the dictionary. For example, *putty* is defined in the OED as 'to cover or smear with putty; to fix, mend or join with putty; to fill up (a hole, joint, etc.) with putty' and, in simpler terms, as 'to fix or fill using putty' in the *Wiktionary*. If solely based on the definition of both semantic categories, both the INSTRUMENTAL ('fix with putty') and the ORNATIVE ('fill/cover with putty') interpretations are possible, thus entailing different classifications for the same form. To reduce ambiguity in cases like this, verbs were classified as ORNATIVE, if the entity referred by the nominal base of the verb becomes part of the affected entity. Verbs were classified as INSTRUMENT if the entity referred by the nominal base has an assisting role in the realization of the action. The contrast is shown in example (2), where *putty* (in our sample) is classified as ORNATIVE, while *hammer* (also in the example but not in our sample) typically conveys an INSTRUMENTAL meaning:

(2) *…said Ellen, and meant it. Bernard hammered and* ***puttied****, putting their home to rights, at one with…*

The status of CAUSATIVE and RESULTATIVE as two different categories (Rodrigues 2008; Valera 2020) or merged as one (Plag 1999: 132; Gottfurcht 2008: 49, 56, 84) has been discussed in previous research on denominal verb formation, as mentioned earlier. For our purposes, we keep the two categories separate based on the contrast expressed by the verbs in our sample: 'make (more) N' (CAUSATIVE), and 'make into N' (RESULTATIVE). Regarding the category RESULTATIVE, this is different from the category EFFECTED in that the latter implies the production of an entity (EFFECTED) (e.g. *kitten* 'to bring kittens into existence') rather than the transformation of a previous existing entity (AFFECTED) into a new one (e.g. *carbonify* 'to convert into coal') (Valera 2020: 326). Finally, the categories LOCATIVE and DIRECTIONAL can be seen as "variants of spatial reference" (Valera 2020: 314), each category denoting a different location in space (e.g. *cat* 'to move towards the cathead' vs *encapsule* 'to put into a capsule').

5 Results

5.1 *The semantic distribution of English denominal verb formation*

Out of the 246 derived verbs with frequency 1 extracted from the BNC, 174 verbs (71%) were derived through conversion and 72 (29%) through affixation. Most of the affixed verbs were *-ize* formations (44 verbs, 61%), followed by *-ate* (nine verbs, 13%) and *de-* (nine verbs, 13%), *en-* (six verbs, 8%) and *-ify* (four verbs, 5%). In terms of their meaning, a total of 12 categories (plus a category for unclassified meaning labelled as OTHER) were expressed by at least one verb in the sample.[6] Table 4 shows the distribution of the processes into semantic categories:

[6] The use of the category OTHER is compatible with previous studies on the semantics of verb-forming processes (Gottfurcht 2008; Valera 2020, 2023), especially since innovative verbs may show ranges of meanings outside the categories traditionally listed for these processes, e.g. conversion (Baeskow 2020: 95).

Table 4: Sample size by process and semantic category

	de-		*en-*		*-ate*		*-ify*		*-ize*		**Conversion**	
CAUSATIVE	0	0%	0	0%	0	0%	2	50%	3	7%	1	1%
DIRECTIONAL	0	0%	0	0%	0	0%	0	0%	0	0%	3	2%
EFFECTED	0	0%	0	0%	0	0%	0	0%	1	2%	3	2%
INCHOATIVE	0	0%	0	0%	3	34%	0	0%	1	2%	1	1%
INSTRUMENTAL	0	0%	0	0%	2	22%	0	0%	3	7%	34	19%
LOCATIVE	0	0%	3	50%	0	0%	0	0%	2	5%	6	3%
ORNATIVE	0	0%	1	17%	2	22%	0	0%	10	23%	29	17%
OTHER	0	0%	0	0%	0	0%	0	0%	1	2%	2	1%
PERFORMATIVE	0	0%	0	0%	1	11%	0	0%	4	9%	45	26%
PRIVATIVE	9	100%	0	0%	0	0%	0	0%	0	0%	2	1%
RESULTATIVE	0	0%	2	33%	1	11%	2	50%	15	34%	18	10%
SIMILATIVE	0	0%	0	0%	0	0%	0	0%	3	7%	26	15%
STATIVE	0	0%	0	0%	0	0%	0	0%	1	2%	4	2%
	9		**6**		**9**		**4**		**44**		**174**	

In line with previous studies (Plag 1999: 219–220; Bauer et al. 2013: 281–282; Valera 2020: 322), conversion shows the widest semantic range, and is actually the only process for which all the semantic categories are attested (twelve categories). Conversion is followed in this respect by *-ize* suffixation (ten categories) and *-ate* suffixation (five categories), *en-* suffixation (three categories), *-ify* suffixation (two categories) and *de-* prefixation (one category). RESULTATIVE is the only category found across all the processes considered (although with variable frequency within each process), while some categories were attested only for conversion: DIRECTIONAL (three attestations). The distribution of semantic categories by process is represented graphically in Figure 1:

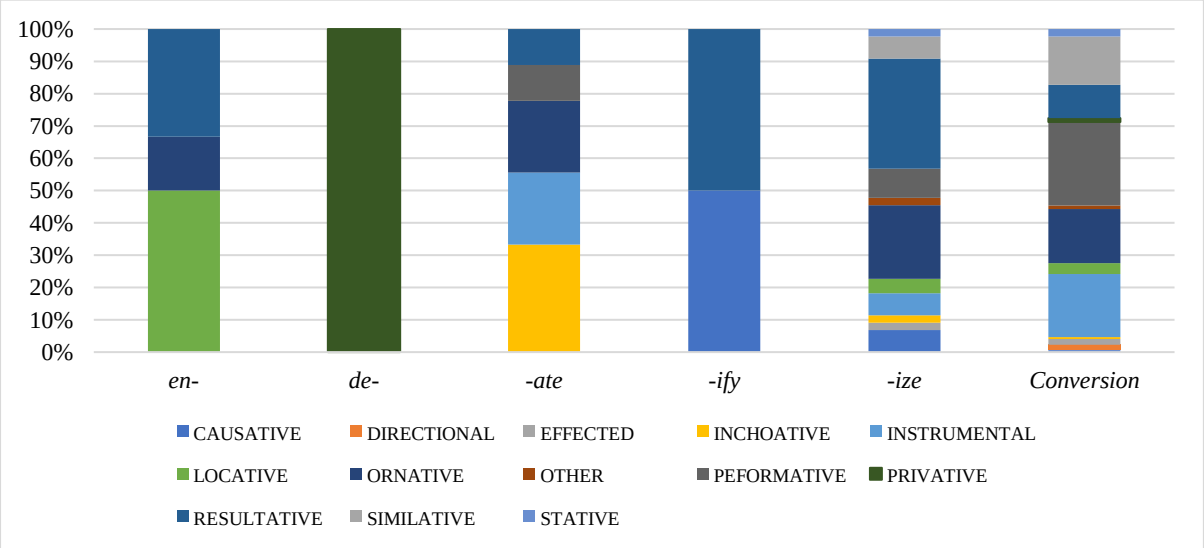

Figure 1: Semantic distribution by process/affix in the sample

Regarding the semantics of *en-*, *-ate* and *-ify* formations, their low sample size makes it difficult to draw conclusions. As to *en-* formations, the most common category is LOCATIVE (50%, three types), followed by RESULTATIVE (33%, two types) and ORNATIVE (17%, one type). These three semantic categories have been reported in the literature as major semantic categories for *en-* derivatives too (Plag 1999: 218; Gottfurcht 2008: 150; Bauer et al. 2013: 282). The ranking of these categories may be different, which is readily explained in the low type frequency of this prefix here and also elsewhere.[7] As to *-ate* derivatives, INCHOATIVE (34%, three types), which ranks the highest in the present study, is not mentioned elsewhere. All the other semantic categories attested for *-ate* have often been described for these formations, including the major ones this process has been associated with, namely ORNATIVE (22%, two types) and RESULTATIVE (11%, one type). The results for *-ify* derivatives refer to the categories CAUSATIVE (25%, two types) and RESULTATIVE (50%, two types), and agree with the CAUSATIVE meaning that other studies report for *-ify* derivatives (Plag 1999: 124ff; Lieber 2004: 78ff; Gottfurcht 2008: 156).

Derivatives on *de-* are also among those with the most limited corpus size (nine types). Unlike the latter, *de-* derivatives clearly show specialization in PRIVATIVE meaning, gathering 100% of *de-* derivatives, as claimed elsewhere (Bauer et al. 2013: 369). In two of the sample verbs, consisting in both cases of abstract bases, dictionary definitions identify the prefix with the related meaning 'reduce', rather than with 'remove': *deloft* ('reduce the loft of a strike') and *deskill* ('reduce the necessary skill to carry out a task'). In the rest of the cases, the bases are concrete nouns and the derivative expresses removal of the entity denoted by the base (*destalk*, *debulk*).

Regarding *-ize* suffixation, RESULTATIVE (34%, 15 types) ranks highest followed by ORNATIVE (23%, 10 types). At the opposite end of the continuum, EFFECTED, INCHOATIVE and STATIVE are attested only once (2%). This is in line with the semantics of these formations reported in the literature, which claims a causative/goal-oriented meaning (RESULTATIVE and LOCATIVE) for *-ize* formations (Plag 1999: 124ff; Lieber 2004: 78, 89; Gottfurcht 2008: 180). However, the results contrast with Plag's (1999) and Lieber's (2004) observations that LOCATIVE is as frequent as RESULTATIVE and that ORNATIVE is less frequent. In our data ORNATIVE is also high and LOCATIVE is much lower, as in Gottfurcht (2008: 180).

Regarding conversion, PERFORMATIVE (26%, 45 types) is the most frequent category expressed in the sample, followed by INSTRUMENTAL (19%, 34 types), ORNATIVE (17%, 29 types), SIMILATIVE (15%, 26 types) and RESULTATIVE (10%, 18 types). All the other categories show percentages below 5%. The literature also reports non-causative meanings (INSTRUMENTAL, PERFORMATIVE, and SIMILATIVE in our results) to be more strongly associated with conversion. However, ORNATIVE and, even if less so, RESULTATIVE also seem to stand among the categories ranking higher for conversion in our results (see also Gottfurcht 2008: 172; Valera 2020: 320). Additionally, conversion is the only process to express DIRECTIONAL meaning. This may be in line with Lieber's (2004: 91) remark that conversion expresses motion meanings that are rarely found in association with other processes.

Verbal derivations by *-ize* and conversion are the most frequent in our sample. Their distribution into categories is compared in Table 5 below:

[7] Type frequency for *en-* derivations is 7 in Plag (1999: 104), and 6 in Gottfurcht (2008: 113) and in the present study.

Table 5: Semantic categories expressed by conversion and *-ize* suffixation in the sample

	Conversion		***-ize* suffixation**
PERFORMATIVE	26%	RESULTATIVE	34%
INSTRUMENTAL	19%	ORNATIVE	23%
ORNATIVE	17%	PERFORMATIVE	9%
SIMILATIVE	15%	CAUSATIVE	7%
RESULTATIVE	10%	INSTRUMENTAL	7%
LOCATIVE	3%	SIMILATIVE	7%
STATIVE	2%	LOCATIVE	5%
DIRECTIONAL	2%	EFFECTED	2%
EFFECTED	2%	INCHOATIVE	2%
OTHER	1%	OTHER	2%
PRIVATIVE	1%	STATIVE	2%
CAUSATIVE	1%	DIRECTIONAL	0%
INCHOATIVE	1%	PRIVATIVE	0%

Similarly, Figure 2 compares the semantic distribution of *-ize* suffixation and conversion into the categories with the highest frequency in the sample:[8]

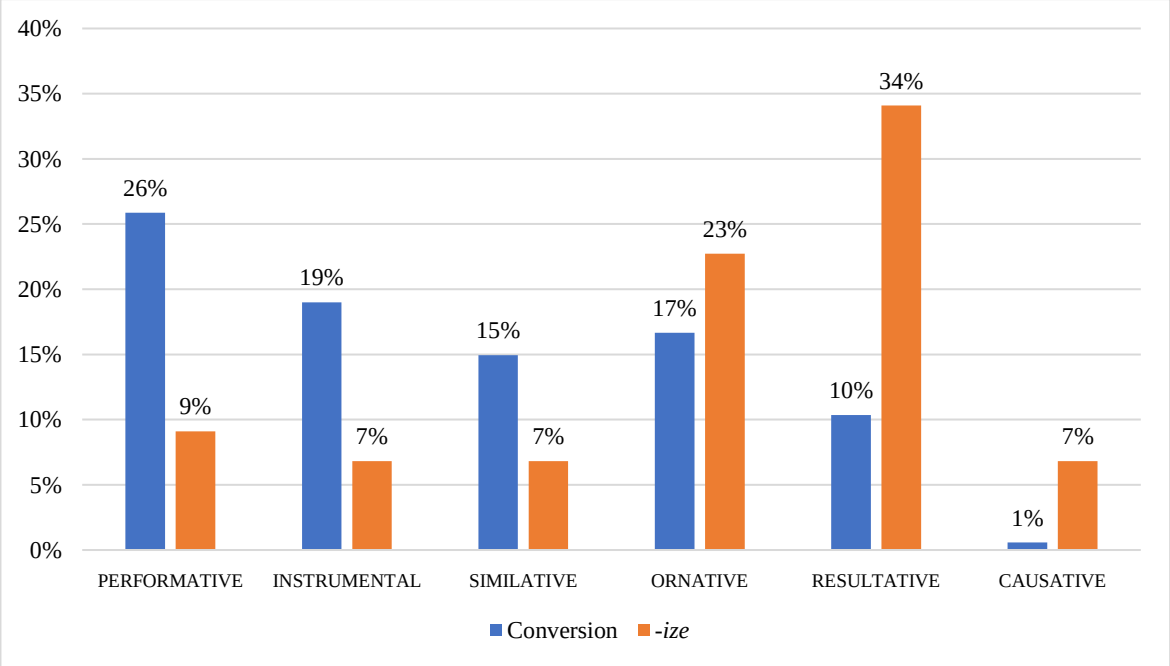

Figure 2: A comparison of the semantic categories expressed by conversion and *-ize* affixation (max. *y*-axis set at 40% for easier reading)

[8] CAUSATIVEs are represented in a small proportion in the sample. This is expected since CAUSATIVE is usually described in the literature as requiring adjectival bases (Plag 1999: 131; Gottfurcht 2008: 59). However, it has been included in Figure 2 to illustrate the bias towards conversion for the expression of non-causative meanings (Bauer et al. 2013: 284) as opposed to affixation.

In comparison, the five most frequent semantic categories in both processes amount to around 80% of the sample. Specifically, 87% of the sample for conversion and 80% of the sample for *-ize* suffixation express one of the highest-ranking categories. This suggests that they are biased towards specific categories. However, while conversion shows a more even distribution among the highest-ranking categories as regards frequency (PERFORMATIVE, INSTRUMENTAL, ORNATIVE, SIMILATIVE and RESULTATIVE), 57% of the verbs derived by *-ize* suffixation are distributed into two categories (RESULTATIVE and ORNATIVE). The category ORNATIVE obtains similar results for conversion and *-ize* suffixation in our sample. Finally, as to the rest of the meanings, except for DIRECTIONAL, which is attested only in verbs formed by conversion, and PRIVATIVE, which is only attested for conversion and *de-* prefixation, the rest of the categories (STATIVE, EFFECTED, PRIVATIVE, INCHOATIVE and OTHER) have similar results in both processes and in both cases with frequencies below three in the sample. The category LOCATIVE obtains a similar frequency in both processes (3% for conversion and 5% for *-ize* suffixation). Therefore, the results for *-ize* and verbs formed by conversion seem to confirm that conversion prefers non-causative meanings (PERFORMATIVE, INSTRUMENTAL and SIMILATIVE, 60% of the derivatives), while *-ize* affixation prefers ORNATIVE and RESULTATIVE (57% of the verbs in *-ize*). The results also show that, despite preferring non-causative meanings, conversion is also associated with causative meanings, specifically with the meanings *-ize* affixation is closely related to (27% of the converted verbs are classified as ORNATIVE and RESULTATIVE). As to the wide range of meanings associated with conversion, as opposed to affixation, Gottfurcht (2008: 320) argues that conversion has developed a back-up role in English word formation, and specifically so in competition: "[…] conversion becomes less associated with any one particular semantic category, and instead it is used more as the default when the other competitors are less likely to be chosen".

5.2 *Methodological observations*

As discussed in §5.1, our findings align with previous research in the main (Plag 1999; Lieber 2004; Gottfurcht 2008; Valera 2020) concerning the semantics of verb-deriving processes: PERFORMATIVE, INSTRUMENTAL, ORNATIVE, SIMILATIVE, RESULTATIVE are the most common categories expressed in denominal verb formation, followed by LOCATIVE and CAUSATIVE. The categories PRIVATIVE and STATIVE, although often mentioned in the literature, are found to be much less frequent. The categories EFFECTED and DIRECTIONAL, proposed elsewhere (Valera 2020), are attested in our results with a limited frequency.

Differences in the ranking of the categories may inevitably arise due to each study's methodological decisions, specifically with regard to the semantic typology used and the frequency criterion used for sample selection. Regarding the former, the ambiguity of some categories has been discussed in the literature (see, for example, Plag 1999 in Lieber 2004: 78 and Hsiao 2022: 56), although probably not sufficiently and with no apparent resolution. The diverse interpretations of the categories in the typology become especially apparent when the analysis is by multiple analysts. This is not necessarily an issue concerning the data or the analysts themselves, but partly as a result of the typology in question and/or the lack of detailed descriptions of its categories. The use of concordance lines has proved particularly helpful in the identification of the sense expressed by each verb in context, given that, in many cases, a verb which is without or with limited context may often be associated with more than one sense. Still, even if the use of concordance lines narrows down the number of possible interpretations, conflicting analyses may persist.

Concerning the sample, the use of (near) hapaxes presents limitations that need to be considered for the correct understanding of the results obtained. First, restricting the sample by frequency results in an uneven distribution of the derivatives into word-formation processes due to differences in their productivity. For some processes, such as *-ify*, the limited size of the sample (four types) prevents drawing any firm conclusion regarding its semantics.

Second, some of the types in the sample express the semantic category as other verbs derived from the same base, except that by a different process. These are often attested in the corpus with a higher frequency, and thus excluded from the sample. The implications of this methodological choice may affect the results in that the quantification of semantics is only considered for the verbs extracted in the sample, even if this is the less frequent alternative. For example, *pauper*^{V} is attested in the sample as RESULTATIVE 'turn into a pauper' (3) but an alternative verb in *-ize* is also recorded in the corpus (*pauperize*, three hits) for the same meaning (4):

(3) *You realise that if I'm unsuccessful, they will foreclose and we'll be* ***paupered****.*

(4) *Resources should be used to equip people to act in their own interests rather than to* ***pauperise*** *them by treating them as dependents.*

In other cases, affixed synonymous counterparts are attested in lexicographic sources, possibly as a consequence of the low frequency of the verbs. For example, both *anagram* (5) and *kosher* (6) have affixed counterparts recorded only in the dictionary for the same meaning, i.e. *anagramize* 'to rearrange the letters of (a word, phrase, or name) to form another word, phrase or name', and *kosherize* 'to make kosher', respectively:

(5) *He began* ***anagramming****, twisting letters round, keeping in mind where they had been going, where Mary was still going.*

(6) *And if you want your kitchen* ***koshered*** *we'll do it.*

A similar scenario is observed in ORNATIVE verbs formed by conversion. For example, the OED notes an overlap in almost all the senses listed for the verbs *character*^{V} (7) and *characterize* (with varying degrees of usage; Fernández-Alcaina 2021: 65). Although not analysed by sense, the BNC returns 2,676 hits for *characterize* (considering both spelling variants), which sharply contrasts with *character*^{V} (1 hit).

(7) [*T*]*he records of mankind's history and prehistory are to be found, whether in the ancient and strangely* ***charactered****, but nevertheless understandable by the learned, writings of bygone civilisations*.

Similarly, *serpentize* occurs in the sample as SIMILATIVE 'move in a serpentine manner' (8), but this is labelled as 'rare' in the OED (version 2) and provides a synonym formed by conversion (*serpentine*^{V}) as the definition of the entry, which is attested once in the BNC for the same meaning too (9).

(8) *The treatment of the two sisters as objects for possession and domination is given a further and perhaps more insidious turn by their mother, Eleonora, who by '**serpentizing** Fraud' uses her daughters to gain political advantage.*

(9) *Other bolts raced away into the night or else caroomed off vitrodur surfaces. D'Arquebus ice-danced on the roadway, spiralling, looping, **serpentining**.*

While these examples are doublets with no apparent difference in meaning, groups of verbs morphologically related may be found to be derived through different processes with slight differences in use. For example, both *opinionize* (10) and *opinionate* are recorded in lexicographic sources. The former is defined in the *Wiktionary* as 'to express one's opinion in a strong or assertive manner', while the latter is defined more generally as 'to have or express as an opinion; to opine' (*Wiktionary*). The OED specifies that, in its current use (although 'rare'), *opinionate* is 'to state or deliver an opinion formally' as well as *opine*^{V} (sense 3). These restrictions are overlooked by the semantic classification, as the labels proposed cover more general senses, but partly explain the possibility of co-existence of several verbs for the same semantic category.

(10) *All of us, to some degree and in our own way, are ready to lecture and **opinionize**, but too few to listen.*

6 Conclusions and limitations

This paper looks at the semantic distribution of English denominal verb formation using a methodological approach based on the use of corpus concordances for manual semantic classification. The results obtained are relevant in two ways: i) they support previous related studies on the semantics of verb-deriving processes, and ii) methodologically, this paper confirms the need for the use of corpus concordances towards semantic classification by sense rather than by the meaning of lemmas and, thus, it also uncovers methodological issues to be addressed in future research.

The selection of corpus hapaxes aimed at avoiding the possible bias introduced by the inclusion of lexicalized forms, but such a restriction was not without problems. Some of the units analysed are in fact in competition with other verbs with higher frequencies in the corpus derived from the same base. This calls into question that the simple attestation of a process expressing a certain category should be considered to be representative, at least in terms of prototypical categories.

At a practical level, the semantic categories used in this paper are shown to be in need of clearer definitions as regards their specifications for manual semantic classification of the data. The (statistical) evaluation of the semantic classification of the data by more than one researcher seems necessary.

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