The Role of Conversion in Derivational Networks

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The model of Derivational Networks, as developed by Körtvélyessy et al. (2020), examines the word-formational potential of lexemes from a unique three-dimensional perspective. However, the original model deliberately excludes all non-affixal word-formation processes, such as conversion, transflexion, and morphological motivation. As noted by Popova (2020), this exclusion results in relatively shallow and sparsely populated networks, particularly in languages where conversion plays a highly productive role in word-formation. This paper aims to provide a more comprehensive perspective on the role of conversion in derivational networks by contrasting the findings of Körtvélyessy et al. (2020) with those of networks where conversion is systematically incorporated. To achieve this, the study reconstructs the original English networks, as compiled by Popova (2020), and the Slovak networks, as compiled by Ivanová (2020), integrating conversion, transflexion and morphological motivation. Given that English relies heavily on conversion, while Slovak exhibits limited productivity in this regard, the comparison of these two languages offers valuable insights. The study seeks to determine whether the inclusion of non-affixal processes significantly alters the structure and density of derivational networks, thereby refining our understanding of word-formation patterns across languages.

Keywords: *derivational networks, conversion, word-formation, transflexion, morphological motivation*

1 Introduction

The model of Derivational Networks, as developed by Körtvélyessy, Bagasheva, and Štekauer (2020), represents a significant advancement in the empirical investigation of word-formation across languages. By organizing lexemes into interconnected networks based on derivational relations, the model offers a dynamic and multidimensional view of word-formation productivity. It allows for the research of several different properties, most importantly derivational depth (i.e., the number of derivational steps from a base form), derivational capacity (i.e., the range of all derivatives from a base), and derivational saturation (i.e., how densely a network is populated). These dimensions provide a formal apparatus for comparing the structural complexity of derivational systems across languages. The model therefore accounts not only for the word-formational potential of individual lexemes but can also capture the cross-linguistic variation.

However, the original model introduces a critical methodological limitation: it deliberately excludes all *non-affixal* word-formation processes, such as conversion, transflexion, and morphological motivation. While the decision itself is understandable in the context of the scope of the original research, thus ensuring a uniform treatment of affix-based derivation across the whole sample, it potentially omits a considerable portion of the derivatives, especially in languages where non-affixal processes play a central role. As Popova (2020) observes, this restriction results in relatively shallow and sparsely populated networks, particularly for languages like English, where conversion is a highly productive mechanism of word-formation. Consequently, while the Derivational Network model succeeds in

highlighting affixal productivity, it may underrepresent the true extent and complexity of derivational relationships.

This paper aims to address this limitation by offering a more comprehensive perspective on the structure of derivational networks, that systematically incorporates conversion, transflexion, and morphological motivation. To this end, the study revisits the original derivational networks for English and Slovak, as compiled by Popova (2020) and Ivanová (2020), respectively. The English networks, in particular, provide a compelling test case due to the central role that conversion plays in the development of new lexical items. In contrast, Slovak exhibits relatively low productivity of non-affixal processes. Additionally, while English generated shallow networks in the original research, Slovak networks were already expansive and complex. This typological contrast between English and Slovak serves as the foundation for a comparative analysis that investigates how the inclusion of non-affixal processes affects the size, structure, and complexity of derivational networks.

The main aim of this study is to determine whether the integration of these non-affixal processes fundamentally changes derivational networks on the sample of two typologically opposite languages. By doing so, the paper contributes to the model of derivational networks with a more careful methodology. It also raises important questions about how different word-formation processes (e.g., affixation, conversion, transflexion, and morphological motivation) interact within a language's lexicon, and how these strategies may influence each other across languages with varying morphological typologies.

2 Derivational networks

The model of derivational networks was described in detail in Körtvélyessy, Bagasheva, and Štekauer (2020), where it was introduced for large-scale empirical research into word-formation across 40 European languages. The present chapter briefly revisits the model, focusing not on its theoretical background, but on its practical purpose, structure, and operational mechanisms relevant to the current analysis.

2.1 Dokulil, Horecký, Furdík

The model of derivational networks builds upon the principles set up by Dokulil (1962), Horecký et al. (1989), and Furdík (2004). In his highly influential work on Czech word-formation, Dokulil (1962) speaks of word-formation family, which groups all lexemes morphologically motivated by the original core lexeme. The lexemes of such family are organised in two ways, either in bundles or lines.[1] The former relationship represents lexemes that are all motivated by the same base, the latter is a chain of lexemes motivated one from another.

Dokulil (1962, p. 13) provides an example of one such word-formation family, built around the core lexeme *med* 'honey'. It is provided in Figure 1 below. In the family, all lexemes derived directly from the core lexeme form a bundle. In Figure 1, they are listed around their core, proceeding counterclockwise as *medíček* 'little honey', *medák* 'honeypot', *mediště* 'honeycomb', *mednice* 'honey jar', *medník* 'beehive', *medný* 'related to honey', etc. As indicated by arrows, they are all derived directly from *med* 'honey'. Near the bottom of Figure

[1] In original Czech, it is *slovotvorá čeleď* 'word-formation family', *svazek* 'bundle', and *řád* 'line'.

1 is lexeme *medařství* ‘beekeeping’, whose arrow indicates that it is derived from *medař* ‘beekeeper’, which in turn is derived from the original *med* ‘honey’. These three lexemes thus form the line *med* → *medař* → *medařství*.

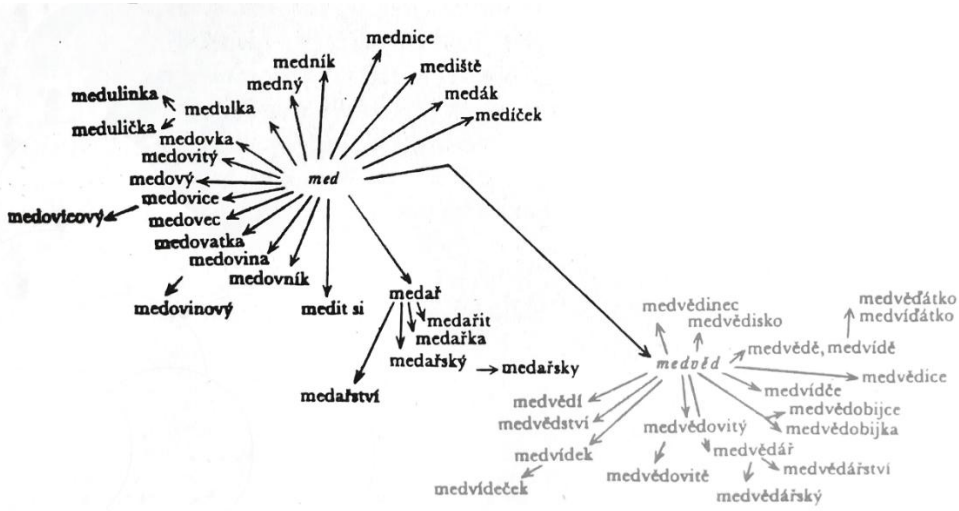

Figure 1 Word-formation family for med ‘honey’ (Dokulil 19622)

Finally, the lexemes *medařit* ‘to keep bees’, *medařka* ‘female beekeeper’, and *medařský* ‘related to beekeepers’, as well as the above-mentioned *medařství* ‘beekeeping’, together form another bundle, with *medař* ‘beekeeper’ as their common base of derivation. Hence, as evident, word-formation families can include several bundles and lines of lexemes, all structured around a central core lexeme.[2]

Horecký et al. (1989) and Furdík (2004) build upon Dokulil’s (1962) work and systemize his theory with precise definitions and altered terminology (Körtvélyessy et al. 2020). Instead of word-formation families they use word-formation nests, and what Dokulil (1962) calls bundles is changed by them to paradigms. The term line is retained, but chain is suggested as a possible synonym by Horecký et al. (1989).

The criteria, by which items are chosen as part of the nests/families are altered as well. Horecký et al. (1989, p. 39) define word-formation nest as “an organised set of words with the same root, between which real derivational relations (motivational relations) are vividly felt by members of the language community in the current language” (translated verbatim from Slovak). By emphasising the awareness of the derivational connections by the language community, Horecký et al. (1989) oppose the inclusion of lexemes such as *medvěd* ‘bear’ in Figure 1, as its motivation by med can only be attested through etymological analysis. Horecký et al. (1989) thus retain a purely synchronic perspective, as opposed to Dokulil’s (1962) diachronic approach. The same reasoning is reiterated also by Furdík (2004, p. 76).

Word-formation nests are therefore combinations of word-formation lines and paradigms, all structured around one simple underived base. Horecký et al. (1989) postulate that their study is crucial for understanding the dynamics of the lexicon, as their comparison can reveal empty or unfilled semantic slots. Such slots can be filled when the need for their existence arises due to changes in extralinguistic reality. The notion of unfilled semantic slots

[2] Regarding the nests, Dokulil (1962, p. 13) speaks of word-formation in general, including not only affixal derivation but also compounding. The original figure thus includes also all the compounds motivated by the lexeme *med* ‘honey’. These were excluded from its replica in Figure 1, to centre the focus on derivatives and avoid confusion.

was adopted and expanded by Körtvélyessy, Bagasheva, and Štekauer (2020), the result of which was a new model termed *derivational networks*.

2.2 Structure of derivational networks

Word-formation nests were restructured by Körtvélyessy et al. (2020) into derivational networks to accommodate the study of the above-mentioned semantic slots. The crucial point of departure was assignment of a *semantic category* to each new derivative, based on the last step of derivation. New terminology was also introduced, and mathematical methods of evaluation were developed.

Derivational networks thus operate in three dimensions – *paradigmatic*, *syntagmatic*, and *semantic*. The paradigmatic and syntagmatic dimensions correspond to Furdík's (2004) and Horecký et al.'s (1989) paradigms and lines, respectively, while the semantic dimension is an original addition by Körtvélyessy et al. (2020).

The paradigmatic dimension of a derivational network represents all direct and immediate derivatives of the simple underived word. For example, the Slovak lexeme *dom* 'house' serves as the base for lexemes *dom-ov* 'home', *dom-ček* 'little house', *dom-ík* 'little house', or *dom-isko* 'large house'. This is illustrated in Table 1 below, where the paradigmatic dimension is represented as if on the vertical axis of the network (Körtvélyessy et al. 2020).

The syntagmatic dimension, on the other hand, represents a linear axis in Table 1. It forms a line or a series of derivatives, all derived from a derivative before them, leading all the way back to the original word-formation base. Drawing from Table 1, one such line could be *dom* 'house' → *dom-ov* 'home' → *dom-ov-ina* 'homeland' → *dom-ov-in-ový* 'related to a homeland'. Each derivative may have the power to motivate its own derivatives, several lines thus can be recorded in one network, for example *dom* 'house' → *dom-ček* 'little house' → *dom-ček-ový* 'related to a little house'.

Each derivational step represents one *order of derivation* (or '*OD'*). As shown in Table 1, lexeme *domov*, as well as the above-mentioned *domček*, *domík*, and *domisko* are all part of the 1st OD, as they are all derived directly from the base of the network. In this fashion, lexemes *domovina*, *domčekový*, *domíkový*, and *domiskový* are situated at the 2nd OD, as they are derived from the lexemes of the 1st OD. Lastly, the lexeme *domovinový*, being derived from *domovina*, is part of the 3rd OD (Körtvélyessy et al. 2020).

Finally, *semantic dimension* represents a particular semantic category for each derivational step. As illustrated in Table 1, lexemes of the 1st OD are assigned semantic categories LOCATION for *domov*, DIMINUTIVE for *domček* and *domík* and AUGMENTATIVE for *domisko*. The semantic categories are always assigned based on the last derivational step, thus, the adjectives of 2nd OD, despite still having DIMINUTIVE or AUGMENTATIVE meanings, are assigned a category RELATIONAL, since the last step was the attachment of adjectival suffix *-ový*. The list of semantic categories was compiled specifically for the research conducted in Körtvélyessy, Bagasheva, and Štekauer (2020) comprising of 49 "theory-neutral, cross-linguistically applicable, comparative semantic concepts" (Körtvélyessy et al. 2020, p. 18).

Table 1 Sample from the derivational network dom ‘house’ (Körtvélyessy et al. 2020)

Base	1st OD			2nd OD		3rd OD
	LOCATION	DIMINUTIVE	AUGMENTATIVE	LOCATION	RELATIONAL	RELATIONAL
dom ‘house’	*domov* ‘home’			*domovina* ‘homeland’		*domovinový* ‘related to a homeland’
		domček ‘little house’			*domčekový* ‘related to a little house’	
		domík ‘little house’			*domíkový* ‘related to a little house’	
			domisko ‘large house’		*domiskový* ‘related to a large house’	

2.3 Analysis of derivational networks

To effectively characterize the complexity of derivational networks, two main parameters were introduced by Körtvélyessy et al. (2020), namely *Maximum Derivational Network* (MDN), and *Saturation Value* (SV).

MDN represents the largest possible number of *potential derivatives* (p.d.) for a particular category of a base. It shows the potential that could be reached in an ideal situation. To determine the MDN value, several different networks built around the base of the same category need to be compared. For example, by cross-examining the derivational networks of Slovak nouns, the researchers could discover the maximum potential number of derivatives a simple Slovak nominal lexeme could motivate. Subsequently, for each network the number of derivatives in each semantic category in each order of derivation is counted, and the maximum number is determined.

However, the MDN value is an ideal that is rarely, if ever, reached. The *saturation value* thus represents the ratio of actualisation of the potential represented by MDN. It is calculated using formula $SV = \frac{D}{MDN} * 100$ (%), where D is number of *actual derivatives* and MDN is maximum derivational network of the category in question, with the resulting values expressed as the percentage (Körtvélyessy et al. 2020).

The research into derivational networks thus shows the derivational potential of lexemes and how well this potential is realised. By comparing the networks, it is possible to discover, for example, that verbal lexemes can often create nouns of the semantic category agent, and to identify verbs that are missing this category. It is also possible to identify semantic categories that are frequently combined in the networks, that tend to motivate new lexemes every time they appear, or instead, that block all further derivation.

3 Theoretical framework

The following chapter outlines the theoretical framework used in reconstructing the derivational networks for English and Slovak. It details the selection of sources, the criteria for including derivatives, and the procedures followed to ensure theoretical and empirical

consistency with the previous research, as well as providing a reliable and replicable framework for potential subsequent research in different languages.

The primary authoritative source for addressing theoretical problems was Körtvélyessy, Bagasheva and Štekauer (2020), a book that introduced the model of derivational networks in the first place. With the exception of the deliberate reinclusion of non-affixal processes (along with the issues arising from that decision) all core principles and structural features of the original model were retained and systematically replicated in the present research.

The attestation of derivatives was conducted using authoritative dictionaries and corpora. For each language, the most authoritative and comprehensive dictionaries were chosen, namely *Oxford English Dictionary* (OED) for English, and *Slovník súčasného slovenského jazyka A-Pn* (SSSJ)[3], accompanied by *Ortograficko-gramatický slovník slovenčiny* (OGSS)[4] for Slovak.[5] The dictionaries were supplemented by relevant corpora, namely *British National Corpus* (BNC) and *Corpus of Contemporary American English* (COCA) for English, and *Slovenský národný korpus* (SNK)[6] for Slovak. All derivatives were attested in these sources before being included in the networks. Consistent with the approach adopted in the original research, derivatives tagged as archaic or obsolete were systematically excluded, as the aim was to represent the synchronic state of each language's word-formation system.

Finally, the specific order of the derivatives was decided through careful examination of the lexemes and affixes in the word-formation reference books of each language. For English, it was Bauer (1983), Bauer et al. (2013), and Plag (2018), for Slovak it was Ološtiak (2015) and the morphemic dictionary Sokolová, Ološtiak, Ivanová (2012). By adhering to these authoritative sources and methodically verifying the derivatives, it was ensured that the derivational networks were as accurately represented as possible.

3.1 Non-affixal processes

Non-affixal word-formation processes play a significant role in the lexicons of many languages. In English, conversion is widely recognized as one of the most productive mechanisms, allowing virtually any word class to shift into another without overt morphological marking. As Bauer (1983, p. 226) notes, conversion is "an extremely productive way of producing new words." Non-affixal processes also occur in Slovak, although they may be less easily recognizable and are less productive.

However, the study by Körtvélyessy, Bagasheva, and Štekauer (2020), which introduced the model of derivational networks, deliberately excluded non-affixal processes from their analysis. Their model omitted not only lexemes formed through these processes, but also any subsequent derivatives motivated by them. As Körtvélyessy et al. (2020, p. 21) explicitly state, "the networks contain lexical items that are exclusively constructed by affixation processes."

As outlined in the Introduction, the present paper seeks to address this limitation by systematically reincluding non-affixal processes into derivational networks for the English and

[3] Dictionary of the Contemporary Slovak Language, A-Pn
[4] Dictionary of Slovak Orthography and Grammar
[5] Since the SSSJ dictionary is at the time of writing still in the process of compiling and covers only the lexical items from A to Pn, the OGSS dictionary has been employed as a substitute.
[6] Slovak National Corpus

Slovak languages. However, this inclusion raises several methodological and theoretical challenges that must first be resolved before undertaking the empirical analysis.

3.1.1 English conversion

The main challenge for English was determining the *directionality* of conversion, a complex and still unsatisfactorily resolved issue in the literature on English word-formation. As maintained by Marchand (1963, p. 176), "when there is no morphological mark, […] no immediate solution seems available" and Bauer and Valera (2005, p. 11) even claim "the question of directionality is currently unresolved and irresolvable" despite numerous approaches attempting to solve it. One possible solution seems to be the historical attestation, as listed in the OED. However, this represents the diachronic view, and as Marchand (1963, p. 179) asserts, "synchronic linguistics will not regard historical evidence as a solution." Therefore, another approach was necessary.

As a solution, Marchand (1963; 1964) proposes several synchronic criteria for determining the directionality of conversion. These criteria are based either on the content of the lexemes or their form. The former group includes semantic dependence, semantic range, semantic pattern, and range of use, while the latter group draws comparisons based on phonetic shape, stress, and morphological type of lexemes.

In Marchand's (1964, p. 10) view, the most important is the criterion of *semantic dependence*, as it is "as often as not sufficient in itself to solve the question". The criterion holds that if semantic features of one lexeme are necessary for content analysis of the other, the latter lexeme is the derivative of the former. Based on this feature, Marchand (1963) distinguishes between two groups of nouns: the *bridge/father* group, which includes "primary" nouns and the *look/cheat*[7] group, where the nouns are always derivatives of their respective verbs.

To exemplify, the semantic features of the verb *look* are necessary for the content analysis of the noun *look* – the noun in question is defined as 'an act or way of looking'. But this dependence on the verb does not hold for the noun *bridge*; on the contrary, it is the verb *bridge* that is dependent on content features of the noun. As noted by Marchand (1963, p. 184), "we think of a bridge without thinking of the action of bridging. We cannot, however, conceive of the action of bridging without stating that what we build is a bridge".

The same applies to nouns denoting persons: the semantics of the noun *father* are rarely explained by the verb *father*, while the semantics of the noun *cheat* is naturally explainable via the semantic features of the verb *cheat*. Marchand (1963, p. 187) thus claims that "all nouns which are not naturally analysed through the verb must be regarded as primary nouns".

To make matters more objective, Marchand (1963, p. 185) provides four *sense groups* which are, according to him, typical for deverbal nouns, but impossible for primary nouns. These sense groups are:

a) a single act or instance of active process: act or instance of *-ing* (e.g., *look, knock, ring,* or *surprise*),
b) an object affected by the action: one who/that which is *-ed* (e.g., *award, cut,* or *chop*),
c) an agent that performs the action; one who/that which *-s* (e.g., *cheat, switch,* or *bait*),
d) a place or instrument connected with the action (e.g., *dump, sink, clip,* or *whistle*).

[7] Marchand distinguishes between the nouns denoting something material or immaterial (*bridge* or *look*) and the nouns denoting persons (*father* or *cheat*). Though in both oppositions the analysis remains the same.

As Marchand (1963, pp. 186–187) claims, "none of the nouns of the *father* and *bridge* group displays this semantic peculiarity", and therefore "a noun matched by a verb which falls under one of the above sense groups is a derivative from the verb".

While not without limitations, Marchand's framework offers the most coherent criteria currently available for determining the directionality of conversion. His emphasis on semantic dependence, supported by clearly defined sense groups, allows for a synchronic way of determining direction of conversion without relying on uncertain historical evidence. Given the lack of any other universally accepted solution to the problem, it was decided to adopt this framework for the construction of networks. Consequently, each instance of conversion was carefully examined based on these criteria, and inserted in the networks in the determined order.

3.1.2 Slovak transflexion

In the Slovak morphological tradition, the term conversion is no longer recognized as a word-formation process; instead, an analogous non-affixal process is identified, referred to as *transflexion*. Due to the highly inflectional nature of Slovak, this process is realized in ways that differ from English conversion, which may lead to some ambiguities. Therefore, a brief overview of relevant aspects of Slovak morphology is necessary before proceeding further.

Firstly, from a morphological perspective, Slovak grammar recognises two types of word-classes: inflected and non-inflected. Lexemes from inflected word-classes form inflectional paradigms, e.g., declension in the case of nouns, adjectives, numerals and pronouns, and conjugation in the case of verbs. Non-inflected word-classes (adverbs, prepositions, conjunctions, particles, and interjections) do not form such paradigms. Therefore, each lexeme has either its own inflectional paradigm or does not inflect at all.

The process of *transflexion* changes these inflectional paradigms by adding inflectional affixes. By Slovak definition (Ološtiak, Gianitsová-Ološtiaková 2015, p. 234), *transflexion* is a word-formation process, in which a new unit is formed by the *transfer* from one type of inflectional paradigm to another without the use of any derivational affix. But unlike in English, the transferred lexemes are not formally identical due to the change in *transflex*, or a "set of grammatical morphemes" attached to the right-hand part of the base (Ološtiak, Gianitsová-Ološtiaková 2015, p. 233).

A clear example of this process can be seen in the pair *suchý* (adj., 'dry') → *sucho* (n., 'drought'). Here, the adjective *suchý* is transferred into the noun *sucho* without the addition of a derivational suffix. The final morpheme *-o* is not a derivational suffix, but a grammatical morpheme that signals the nominative singular form of neuter nouns following the inflectional paradigm of MESTO. The resulting noun thus belongs to a different inflectional paradigm but is not morphologically derived via a derivational affix.

Similarly, the noun *slza* (n., 'teardrop') motivates the verb *slziť* (v., 'to shed tears'). The verb form *slziť* incorporates the transflex *-iť*, which corresponds to the infinitive form of verbs within the paradigm ROBIŤ. Again, although *-iť* appears at first glance like a proper derivational affix, it is in fact simply a part of verbal inflectional morphology.

Another illustrative case is the transformation of *vedomie* (n., 'consciousness') into *vedomý* (adj., 'conscious'). Here, the nominal form ends in *-ie*, indicating its membership in a neuter noun paradigm VYSVEDČENIE, while the adjectival form ends in *-ý*, which marks the nominative singular form of adjectives in the PEKNÝ paradigm. Again, this change is interpreted not as derivation via suffixation but rather as a paradigmatic shift. This is supported by the fact that derivational suffixes remain part of every word-form once the lexeme is inflected, whereas

the morphemes involved in transflexion do not persist across forms (Ološtiak, Gianitsová-Ološtiaková 2015, pp. 233–239).

In all of these examples, the formal differences between the base and derivatives are attributed to a change in transflex, rather than the presence of a derivational morpheme. As such, transflexion occupies a unique space in Slovak word-formation, functioning analogously to conversion in English, though realized through morphological means specific to a highly inflectional language (Ološtiak, Gianitsová-Ološtiaková 2015).

Additionally, Dokulil (1962, p. 62) claims that transflexion[8] is broader in scope than conversion in English because it is possible to transfer lexemes within the same word-class, as opposed to English, which is allowed by the "paradigmatic wealth" of Slavic languages. As per the definition, during the process of transflexion a lexeme is transferred from one type of inflectional paradigm to another, and since Slavic languages can have several inflectional paradigms for each word-class, transflexion within the word-class itself is possible (Ološtiak, Gianitsová-Ološtiaková 2015; Dokulil 1962).

To exemplify, the lexeme *fyzika* 'physics', which belongs to the inflectional paradigm of feminine nouns of the category ŽENA, can motivate via transflexion the lexeme *fyzik* 'physicist', belonging to the inflectional paradigm of masculine nouns of the category CHLAP. The transflex *-a*, signifying its affiliation with the feminine ŽENA nouns is replaced by the transflex *-ø* of the masculine CHLAP nouns, while the word-class of nouns is retained (Ološtiak, Gianitsová-Ološtiaková 2015, pp. 233–239).

Apart from the above-discussed transflexion *proper*, two other subtypes are recognised in Slovak: *deflexion,* a process where the new lexeme is formed by losing its flection, (i.e., it is transferred from an inflected word-class to a non-inflected one), and *aflexion,* a process where the previously non-inflected lexeme gains flection.

3.1.3 Slovak morphological motivation

Transflexion is in Slovak morphology accompanied by another non-affixal process analogous to English conversion termed *morphological motivation* (Ološtiak 2015). But unlike transflexed lexemes, the *morphologically motivated* lexemes are transferred from one word-class to another without any formal changes.

Bases of such motivation are often specific word-forms of a lexeme (instead of the whole lexeme), such as verbal participles, gerunds, or inflected adjective forms. For example, a noun *kupujúci* 'buyer' is morphologically motivated by an active present participle *kupujúci* of a verb *kúpiť* 'to buy', and an adjective *zničený* 'destroyed' is similarly motivated by a passive participle *zničený* of a verb *zničiť* 'to destroy'. Additionally, the verb *písať* 'to write' yields the gerund *písanie*, which functions as a noun meaning 'writing', and the adjective *starý* 'old' can appear in the nominative singular feminine form *stará* 'old', which can also function as a noun, with the meaning 'wife' in informal expressions. (Ološtiak 2017; 2015).

In this way, passive participles of Slovak verbs motivate adjectives and nouns, and active present participles motivate adjectives, nouns, and adverbs. According to research conducted by Ivanová, Kyseľová, and Perovská (2015), out of all Slovak lexemes motivated by a verbal base, 15.4% (2,753) are adjectives, and out of that sample 29.6% (817) are motivated morphologically by participles. Producing nearly 30% of deverbal adjectives, the participial morphological motivation represents a significant process of creating new lexemes

[8] Dokulil (1962) at that time still worked with the term *konverze* 'conversion' to describe, what was later termed *transflexion*.

in Slovak. Passive participles are especially productive, as they motivate 720 adjectives (88.1% of morphologically motivated adjectives), and the remaining 97 adjectives (11.9%) are motivated by active present participle. Nevertheless, all such lexemes were excluded from the original networks compiled by Ivanová (2020), as they do not represent a case of affix-based derivation.

The case of Slovak gerunds is, however, more complex. Furdík (2004) claims that these items are a result of word-formation derivation. He considers the process to be the most productive word-formation process with attested instances for 97% of all Slovak verbs. In contrast, Dvonč et al. (1966) treat these items as verbal word-forms that are occasionally *shifted* to nouns as a result of semantic shift. Sokolová (2013) argues against Furdík's approach and suggests differentiating between verbal nouns as part of verbal paradigm, and verbal nouns *lexicalised as independent lexemes*, indicating the process of morphological motivation. Finally, Ološtiak (2015) treats the verbal nouns as lexemes formed by suffixation, but only a selected number of cases are treated as new lexemes, unlike Furdík's (2004) universal approach. Yet, no such nominalisations were included in the original networks by Ivanová (2020) either, as they again do not represent clear instances of derivational affixation.

Given that the aim of the present paper is to incorporate lexemes formed through non-affixal processes, departicipial and degerundial lexemes (and other minor cases of morphological motivation) were reintegrated into the new derivational networks, as a result of *morphological motivation.* Naturally, special attention was paid to distinguishing between lexical units that represent mere verbal word-forms and those that constitute genuine new lexemes motivated by these verbal word-forms, as is detailed in the section 3.2.

3.2 Derivation vs. inflection

The second issue requiring detailed consideration concerns the "fuzzy boundary" between derivation and inflection, which continues to prevent theoretical morphologists from reaching consensus on a number of cases (Körtvélyessy et al., 2020). Among the most prominent of these is the status of departicipial and degerundial lexemes. As noted in Section 3.1.3, such items were deliberately excluded from the original Slovak networks. While the original English networks likewise omitted departicipial adjectives, they did, by contrast, include gerundial nouns.

Incorporating non-affixal processes into derivational networks offers a means of reducing these disparities, as lexemes formed from participles and gerunds can be reintroduced into the networks under the categories of *conversion* and *morphological motivation*. The following sections therefore examine these contentious areas in both English and Slovak, drawing on the respective word-formation traditions in each language. For English, the primary sources are Bauer et al. (2013), Plag (2018), and Huddleston and Pullum (2002), while for Slovak, reference is made chiefly to the word-formation monographs of Dvonč et al. (1966) and Ološtiak (2015).

3.2.1 English gerund

The first case to discuss is the status of English gerund. As defined by Huddleston and Pullum (2002, p. 81), a gerund is a "word derived from a verb base which functions as or like a noun". The crucial part of the definition is the 'as or like' formulation, which leaves the issue of whether it is verb or noun open.

As noted above, the status of verbal nominalisations with suffix *-ing* was treated as the case of proper derivation in the original networks by Popova (2020), drawing from both Bauer et al. (2013) and Plag (2018), who classify the *-ing* suffix as derivational suffix of deverbal nominalisation. As Bauer et al. (2013, p. 202) observe, "all non-auxiliary verbs in English, regardless of their origin or other means of nominalisation, have nominal forms in *-ing*." As a result, such nominalisations were attested for "all words in the 1st order of derivation" in the original networks (Popova 2020, p. 153). This approach was retained in the current networks as well, and such forms are thus counted as a part of affix-based derivation.

This approach aligns with the description offered by Huddleston and Pullum (2002). In their framework, however, the nominalisations are not inherent but rather made explicit through a set of formal criteria that separate verbal gerunds from gerundial nouns. These criteria are A) complementation, B) modification by adjective or adverb, C) determiners, and D) plural inflection.

According to criterion A), transitive verbs can take a noun phrase as their object, as in example (1a). Nouns, by contrast, cannot take such direct objects; instead, they require a prepositional phrase headed by *of*, as in example (1b). Thus, the word *killing* in (1b) is identified as a noun rather than as part of the verb's inflectional paradigm (Huddleston, Pullum 2002, p. 81).

(1)	a.	*He was expelled for killing the birds.*	[form of verb]
	b.	*She had witnessed the killing of the birds.*	[gerundial noun]
	c.	*These unjustified killings must stop.*	[gerundial noun]

Criterion B) concerns the type of modifiers the form can take. If it can be modified by an adjective, as in example (1c), it is classified as a noun, since verbs in English only permit modification by adverbs. Similarly, criterion C) notes that verb forms cannot be preceded by determiners such as the, a construction allowed with nouns, as seen in (1b). Finally, criterion D) states that verbs cannot take plural inflection, as in (1c); this again confirms the noun status of killings (Huddleston, Pullum 2002, p. 82).

These criteria were used to distinguish between the cases of standard inflectional formation of gerunds and derivational formations of nouns. Thus, only such *-ing* forms were included in the networks, that complied with the criteria.

3.2.2 English participles

The second issue concerns the *-ing* and *-ed* adjectives, identical in form to present and past participles, respectively. Huddleston and Pullum (2002) provide criteria based on which the participial adjectives and their respective verb-forms can be differentiated in a manner similar to the distinction between gerund verb forms and gerundial nouns.

The criterion A) is again complementation. As mentioned above, verbs can take a noun phrase as an object, whereas adjectives cannot. This is illustrated in examples (2a) and (2b) below, where the former takes the object *me*, and is therefore a part of the inflectional paradigm of verb, a present participle. However, it is impossible (or ungrammatical) to do the same for the latter, making it a proper adjective.

The same criterion applies to past participles. As seen in example (3a), *given* is in this context a verb-form, as it takes an indirect object in the form of him. Example (3b), on the other hand, contains adjective. The semantic distinction between the two is also important, as the former denotes event, while the latter denotes state.

(2) a. *You're frightening me.* [form of verb]
b. *Such a prospect is frightening indeed.* [participial adjective]
(3) a. *He quickly spent the money given him by his uncle.* [form of verb]
b. *It didn't look broken to me.* [participial adjective]

The criterion B) is based on the ability of adjectives to be modified by adverbs *very* and *too*, as is exemplified in examples (4a) and (4b). Such modification, however, is not possible for verbs, as seen in example (4c).

(4) a. *The show was very entertaining.* [participial adjective]
b. *He was too frightened to move.* [participial adjective]
c. *The plants were *very/*too watered by the gardener.* [form of verb]

Therefore, only the first two sentences contain adjectives, whereas in the third example, watered is a proper past participle.

Finally, according to the criterion C), if adjectives are introduced by a verb *to be* in the sentence, the verb can be substituted with a verb *seem*, as is the case in examples (5a) and (5b). Such substitution, however, is not possible with verbs introduced by *to be*, as seen in examples (5c) and (5d):

(5) a. *The show was/seemed entertaining.* [participial adjective]
b. *The picture was/seemed distorted.* [participial adjective]
(6) a. *They are/*seem entertaining the prime minister.* [form of verb]
b. *The boss is/*seemed considered guilty of bias.* [form of verb]

Again, the examples in (5) include adjectives, whereas examples in (6) include a present and past participle, respectively.

However, as mentioned above, the original English networks do not include such adjectives, as they are treated simply as "verb forms that can function as adjectives" (Popova, Rosenberg 2020, p. 127). This approach is based on both Bauer et al. (2013, p. 290) and Plag (2018, p. 96), who list the *-ing* suffix as one of the suffixes that form adjectives from verbal bases, even though they both give it a special status as *not a proper* derivational suffix. The *-ed* suffix, on the other hand, is not recognised as a deverbal derivational suffix by either source. Both Bauer et al. (2013, p. 304) and Plag (2018, p. 95) list it only as a denominal suffix attaching to nouns and noun-phrases, e.g. *wooded*, or *empty-headed*. In the case of verbs, Bauer et al. (2013, p. 306) suggest that deverbal *-ed* adjectives are instead of direct suffixal derivation formed by conversion from the relevant past participles. Similarly, Plag (2018, p. 96) maintains that the *-ing* suffix is an inflectional suffix that "primarily forms present participles, which can in general also be used as adjectives". Unable to recognise this process as a proper affix-based derivation, the original authors decided to exclude them.

Since the current approach includes the process of conversion, the exclusion of such forms is unnecessary. The derivational networks specify only the *citation forms* of the lexemes, but each lexeme can be realised by several word-forms. Therefore, if a particular lexical item is derived from one of the word-forms instead of directly from the citation form, it should still be considered a derivative of that base. This issue is illustrated in example (7) below, with one of the verbs from the research sample:

(7) Base 2nd order
burn.V → (*burning*.V) → *burning*.Adj (CONVERSION)

The adjective *burning* is here treated as a converted form, the base of which is the present participle of the verb *burn*. The base of the network is represented by the citation form *burn*, but it also includes its whole inflectional paradigm, including its participle forms. The adjective *burning* is thus still in the 2nd order of derivation as converted from one of the inflected word-forms of the verb.

To summarise, the present research acknowledges the ambiguity of the deverbal adjectival *-ing* and *-ed* suffixes but maintains that participial adjectives constitute unambiguously distinct lexemes that can be reliably distinguished from their formally identical verbal forms. Accordingly, such adjectives are included in the current networks as instances of conversion, provided they meet the above-mentioned criteria and can be shown to function as separate lexemes.

3.2.3 Slovak participles

The case of participles in Slovak is very similar to that in English. The participles are in Slovak treated as inflection, and a part of conjugation of verbs. In many cases, however, these verb-forms are lexicalised as new adjectival or nominal lexemes. Horecký et al. (1989, p. 200) speak of adjectivisation and nominalisation of participles, where the participle in question goes beyond its verbal properties and is therefore "detached from the verbal paradigm", the result of which is a new lexeme – an adjective or a noun (Horecký et al. 1989, p. 206). This issue was already addressed as a case of morphological motivation in section §3.1

Similar to their English counterparts, Slovak departicipial adjectives (as well as nouns) can be distinguished from their respective participles by several criteria. The most crucial criterion is the semantic shift. Such lexemes lose the dynamic component present in participles (or at least significantly diminish it) and instead take the component of quality as their primary characteristic. Such is the case, for example, in the departicipial adjective *obľúbený* 'favorite' motivated by passive participle of a verb *obľúbiť* 'come to like sb/sth', where the dynamic component representing the process of getting to like somebody is diminished and replaced by the quality of being liked.

Departicipial adjectives differ from the participles also by the ability to form comparatives and superlatives, a property considered a natural part of adjectival paradigm but impossible for verbal participles. Additionally, the verbal participles cannot motivate adverbs by suffixes *-o* and *-e*, and abstract nouns by suffix *-osť*, both of which are available to adjectives. Some examples of this are *prekvapený* 'surprised' → *prekvapene* 'in a surprised manner', or *vyčerpaný* 'exhausted, tired' → *vyčerpanosť* 'fatigue'.

Therefore, it was determined that the same approach applied to English participles (see example 7) is also adopted for Slovak. Departicipial adjectives and nouns are treated as separate lexemes once they can be shown to meet the criteria distinguishing them from verbal participles, and are accordingly included in the networks as instances of conversion from the relevant participial word-forms.

3.2.4 Slovak gerund

Finally, the last peculiar problem is presented by gerunds, or, in Slovak terminology, verbal nouns. These are lexical items formed from verbs by the suffix *-nie/-tie*, as in *behať* 'to run' → *beha-nie* 'running N'.

The detailed criteria for distinguishing between verbal nouns as the word-forms on one hand and as the independent lexemes on the other are listed in both Sokolová (2013) and Ivanová (2020a). The verbal noun functions as a word-form and a part of verbal paradigm if it: A) is possible to negate it with the prefix *ne-*, as in *pochopenie/nepochopenie* '(not) understanding'; B) has preserved the reflexive element *sa/si*, as in *smiať sa* 'to smile' → *smiatie sa* 'smiling'; or c) if it serves as an object it is possible to replace it by an infinitive as in example (8), or restructure the object to subordinate clause with the respective finite verb, as in example (9) below.

(8)	*Bojím sa stretnutia s ním.*	→	*Bojím sa stretnúť sa s ním*
	'I am afraid of meeting him'	→	'I am afraid to meet him.'
(9)	*Bojím sa sklamania.*	→	*Bojím sa že ma to sklame.*
	'I am afraid of disappointment.'	→	'I am afraid it will disappoint me.'

Except for some exceptions, none of these uses are possible with lexicalised verbal nouns. Therefore, they are treated purely as word-forms of verbs (Sokolová 2013; Ivanová 2020a).

In contrast, the verbal noun is an independent lexeme if : A) it has the full nominal paradigm, including the plural form, as in *riešiť* 'to solve' → *riešenie/riešenia* 'solution/solutions'; B) there is inconsistency between the aspect of the verb and the aspect indicated by the morphemic structure of the verbal noun, as in *pokúšať* 'to tempt' → *pokušenie* 'temptation'[9]; and most importantly C) if there is a semantic shift between the verbal noun and its respective verb, as in *oceniť* 'to award' → *ocenenie* 'award, prize', where the verbal noun lost the dynamics of the action of awarding somebody with a prize, and instead signifies only the prize itself, the result of the action. Again, these criteria are not absolute, and some exceptions can be found (Sokolová 2013; Ivanová 2020a).

Nevertheless, verbal nouns were also completely excluded from all Slavic derivational networks constructed for Körtvélyessy, Bagasheva, and Štekauer (2020). In the new networks, however, they were reincluded as cases of morphological motivation, but only when they qualify as independent lexemes. Each case was examined individually using the criteria above, with further verification against dictionaries, where only lexicalised verbal nouns are granted separate entries.

4 Analysis

Derivational networks from the previous research, originally compiled by Popova (2020) for English and Ivanová (2020) for Slovak, were reworked according to the new rules of compilation, as outlined in the previous chapter. The following chapter discusses, for each word class, how the inclusion of non-affixal processes (conversion for English; transflexion and morphological motivation for Slovak) reshapes: a) the overall size of the networks as measured by the Maximum Derivational Network (MDN); b) the distribution of growth across orders of derivation; c) the internal changes captured by average capacity and average

[9] In this case the morphemic structure of the verbal noun *pokušenie* suggests it is motivated by the perfective verb, but the verb *pokúšať* is imperfective, and it has no perfective form in Slovak. To illustrate, the verbal noun with imperfective morphemic structure would be *pokúšanie*. This is the verbal word-form, whereas *pokušenie* is an independent lexeme.

saturation; and d) the distribution of semantic categories associated with the newly included conversion-based derivatives.

4.1 The original sample

The original networks were constructed on the basis of a sample of 30 simple underived lexemes, evenly distributed across nouns, adjectives, and verbs. The complete sample, comprising both English and Slovak counterparts, is presented in Table 2. For the purposes of the present paper, the same set of lexemes was employed.

Table 2 The sample of bases for derivational networks in English and Slovak

Nouns	Adjectives	Verbs
bone / kosť	*narrow / úzky*	*cut / rezať*
eye / oko	*old / starý*	*dig / kopať*
tooth / zub	*straight / priamy*	*pull / ťahať*
day / deň	*new / nový*	*throw / hodiť*
dog / pes	*long / dlhý*	*give / dať*
louse / voš	*warm / teplý*	*hold / držať*
fire / oheň	*thick / hustý*	*sew / šiť*
stone / kameň	*bad / zlý*	*burn / horieť*
water / voda	*thin / chudý*	*drink / piť*
name / meno	*black / čierny*	*know / vedieť*

The lexemes were originally collected from the Swadesh's core vocabulary counting 200 words, in an attempt to find "simple underived equivalents for core vocabulary words" across all 40 languages of the original sample (Körtvélyessy et al. 2020, p. 12).

However, the original networks reflected a pronounced typological contrast: English networks were relatively shallow, with limited output from each base, while Slovak networks were considerably more complex, reflecting the language's predominantly affixal word-formation system. This difference is particularly evident in the comparison of maximum derivational network (MDN), as illustrated in Table 3, below.

Table 3 Original MDN values

MDN	English	Slovak
Nouns	33 p. d.	122 p. d.
Adjectives	31 p. d.	128 p. d.
Verbs	37 p. d.	273 p. d.

While English motivated 33 potential derivatives for nouns, 31 for adjectives, and 37 for verbs, the Slovak networks were considerably more complex, with the corresponding figures of 122, 128, and 273 potential derivatives, respectively.

The following analysis examines how the inclusion of non-affixal processes modifies these patterns and affects the overall structure and depth of the recompiled networks. The central aim of this comparison was to determine whether the inclusion of such processes could reduce the significant differences originally observed between English and Slovak. Furthermore, the analysis examines which semantic categories were most frequently represented among the newly added lexemes, as these distributions provide insight into how non-affixal processes reshape the overall structure of the networks.

4.2 Nominal networks

The analysis of nouns demonstrates that the inclusion of conversion has a significant effect on the structure of English derivational networks, while its impact on Slovak is comparatively modest. In English, the maximum derivational network (MDN) expands from 33 to 69 potential derivatives, representing an increase by 109%. The Slovak networks, on the other hand, increased only slightly, from 122 to 133 potential derivatives (+9%).

The most notable growth in both languages occurs beyond the 1st OD: while the original English network contained 22 derivatives in the 1st OD, the revised network has 23, expanding only by 1 potential derivative, and the same applies to Slovak as well, increasing from 44 to 45 potential derivatives, as is illustrated in Table 4.

Table 4 Maximum derivational network of nouns [potential derivatives]

		English			**Slovak**		
		Original	*With Conversion*		*Original*	*With Conversion*	
Orders of Derivation	1st	22	23	+ 5%	44	45	+ 2%
	2nd	11	25	+ 127%	46	48	+ 4%
	3rd	---	15	*NEW*	26	30	+ 15%
	4th	---	6	*NEW*	5	9	+ 80%
	5th	---	---	0	1	1	0
FULL MDN		**33**	**69**	**+ 109%**	**122**	**133**	**+ 9%**

However, the English 2nd OD more than doubles, from 11 to 25 (+127%), and entirely new 3rd and 4th ODs emerge (with 15 and 6 potential derivatives, respectively). Nevertheless, the Slovak networks continue with modest gains at each order of derivation: 2nd OD increases from 46 to 48 (+4%), 3rd OD from 26 to 30 (+15%), and 4th OD from 5 to 9 (+80%), while the 5th OD remains unchanged at 1 potential derivative.

This expansion is also evident in the average capacity, i.e. the number of actual derivatives of each base (see Table 5). In English, the average capacity increases from 9.1 to 17.4 actual derivatives (+91%), while the average saturation declines slightly from 27.57% to 25.22% (–9%). This indicates that as the networks grow more complex, their overall systematicity diminishes. In Slovak, by contrast, the average capacity shows only a modest increase, from 32.6 to 36.4 derivatives (+12%), accompanied by a negligible rise in average saturation, from 26.72% to 27.37% (+2%).

Interestingly, in both languages the greatest increase in capacity is observed for the same lexeme: fire in English, which expanded from 5 to 22 derivatives (+340%), and its Slovak counterpart oheň, with the increase from 16 to 20 derivatives (+25%).

Table 5 Capacity [actual derivatives], average capacity, and average saturation of nominal networks

	English			Slovak		
	Original	*With Conversion*		*Original*	*With Conversion*	
bone / kosť	11	14	+ 27%	52	57	+ 10%
eye / oko	11	18	+ 64%	35	39	+ 11%
tooth / zub	13	15	+ 15%	41	43	+ 5%
day / deň	6	7	+ 17%	24	25	+ 4%
dog / pes	22	35	+ 59%	19	20	+ 5%
louse / voš	6	11	+ 83%	24	28	+ 17%
fire / oheň	**5**	**22**	**+ 340%**	**16**	**20**	**+ 25%**
stone / kameň	4	8	+ 100%	33	38	+ 15%
water / voda	6	22	+ 267%	53	60	+ 13%
name / meno	7	22	+ 214%	29	34	+ 17%
Average Capacity	9.1	17.4	**+ 91%**	32.6	36.4	**+ 12%**
Average Saturation	27.57	25.22	**- 9%**	26.72	27.37	**+ 2%**

The final insight is provided by the semantic distribution of non-affixal derivatives. As shown in Table 6, the most frequent semantic category in the English nominal networks is CAUSATIVE (e.g. *fire*, N → *fire*, V), which appears at the 1st OD in 9 out of 10 networks. In fact, it is the only semantic category represented at the 1st OD. At the subsequent ODs, however, it is joined by systematic distribution of QUALITY (e.g. *fire*, V → *fired*, Adj.), along with a few less common categories such as ENTITY (e.g. *daily*, Adv. → *daily*, N), or PATIENT (e.g. *named*, Adj. → *named*, N).

In the Slovak nominal networks, the 1st OD also features an instance of CAUSATIVE (e.g., *oko*, N → *očiť*, V 'to eye sb.'), although in contrast to English, only a single case is attested. The 1st OD also includes one instance of a RELATIONAL adjective (e.g., *pes*, N → *psí*, Adj. 'related to dog'). The most systematic category, however, emerges at the 2nd OD, where QUALITY (e.g., *vykostiť*, V → *vykostený*, Adj. 'deboned') is recorded 4 times, taking as their base the verbal derivatives from the 1st OD.

In sum, the non-affixal processes substantially enlarge English nominal networks, more than doubling their size and even extending them into new 3rd and 4th orders of derivation, while Slovak networks show only small growth. Notably, the 1st OD in both languages records minimal increases and is almost exclusively associated with the CAUSATIVE category, suggesting that nouns are limited in producing direct non-affixal derivatives. The real expansion occurs at the 2nd and 3rd ODs, largely motivated by the verbs derived from the 1st OD. Additionally, average saturation remains stable in both languages at around 30%, though it declines slightly in English.

Table 6 Overview of distribution of semantic categories in nominal networks

	English		**Slovak**		
OD	*Semantic Category*	*Fr.*	*Semantic Category*	*Fr.*	*Translation*
1st	CAUSATIVE *fire,* N → *fire,* V	**9/10**	CAUSATIVE *oko,* N → *očiť,* V	**1/10**	[eye] → [to eye]
			RELATIONAL *pes,* V → *psí, Adj.*	**1/10**	[dog] → [rel. to dog]
2nd	QUALITY *fire,* V. → *fired,* Adj.	**4/10**	QUALITY *vykostiť,* V. → *vykostený,* Adj.	**4/10**	[to debone] → [deboned]
	ENTITY *daily,* Adv. → *daily,* N	**1/10**	ENTITY *vodné,* Adj. → *vodné,* N	**2/10**	[water Adj.] → [water rate]
3rd	PATIENT *named,* Adj. → *named,* N	**1/10**	PATIENT *očkovaný,* Adj. → *očkovaný,* N	**2/10**	[vaccinated] → [vaccinated N]
			COLLECTIVE *zúbkovať,* V. → *zúbkovanie,* N	**1/10**	[to serrate] → [serration]
4th			FEMININE *očkovaný,* N. → *očkovaná,* N	**2/10**	[vaccinated N] → [vaccinated N]

4.3 Adjectival networks

The impact of conversion is also evident in the adjectival networks. The English networks again expand noticeably, though not to the same extent as with nouns, whereas Slovak this time shows more significant increases. This has the effect of slightly reducing the disparity between the two languages in this category.

Table 7 Maximum derivational network of adjectives [potential derivatives]

		English			**Slovak**		
		Original	*With Conversion*		*Original*	*With Conversion*	
Orders of Derivation	1st	20	23	+ 15%	51	54	+ 6%
	2nd	10	16	+ 60%	51	64	+ 25%
	3rd	1	7	+ 600%	19	28	+ 47%
	4th	---	---	0	7	9	+ 29%
	5th	---	---	0	---	---	0
FULL MDN		**31**	**46**	**+ 48%**	**128**	**155**	**+ 21%**

As shown in Table 7, the English Maximum Derivational Network expands from 31 to 46 potential derivatives, an increase of nearly a half (+48%), while the Slovak networks grow at a slower pace, from 128 to 155 potential derivatives (+21%).

In English, most of the expansion occurs at the upper orders of derivation: the 1st OD grows only slightly, from 20 to 23 potential derivatives (+15%), while the 2nd OD increases from 10 to 16 (+60%), and the 3rd OD rises from just 1 to 7. In Slovak, the growth is more gradual and evenly distributed: the 1st OD expands from 51 to 54 potential derivatives (+6%), the 2nd from 51 to 64 (+25%), the 3rd from 19 to 28 (+47%), and even the 4th OD records a small increase, from 7 to 9 derivatives (+29%).

A comparable contrast is visible in the capacity measures. As shown in Table 8, English shows a sharp rise in average capacity, from 8.6 to 14.4 actual derivatives per base (+67%), accompanied by a notable increase in average saturation (from 27.74% to 31.31%, +13%). This suggests that, unlike nouns, adjectival networks in English become not only larger but also more internally consistent once conversion is taken into account. Slovak again shows more moderate development: average capacity grows from 33.3 to 42.2 actual derivatives (+27%), while saturation rises only insignificantly, from 26.02% to 27.23% (+5%).

Table 8 Capacity [actual derivatives], average capacity, and average saturation of adjectival networks

	English			**Slovak**		
	Original	*With Conversion*		*Original*	*With Conversion*	
narrow / úzky	5	10	+ 100%	19	25	+ 32%
old / starý	10	12	+ 20%	55	72	+ 31%
straight / **priamy**	6	13	+ 117%	**13**	**21**	**+ 62%**
new / nový	11	18	+ 64%	53	60	+ 13%
long / dlhý	14	18	+ 29%	44	49	+ 11%
warm / teplý	**8**	**18**	**+ 125%**	43	55	+ 28%
thick / hustý	10	15	+ 50%	23	34	+ 48%
bad / zlý	5	7	+ 40%	20	38	+ 15%
thin / chudý	5	11	+ 120%	18	22	+ 22%
black / čierny	12	22	+ 83%	45	54	+ 20%
Average Capacity	8.6	14.4	**+ 67%**	33.3	42.2	**+ 27%**
Average Saturation	27.74	31.31	**+ 13%**	26.02	27.23	**+ 5%**

Among the individual lexemes, the English adjective *warm* expands the most dramatically (8 → 18 derivatives, +125%), while *old* records the smallest gain (10 → 12, +20%). The situation is this time different in Slovak, the greatest increase is seen in the adjective *straight*, which rises from 13 to 21 derivatives (+62%), while other items show only minor changes.

Moving on to the semantic distribution of adjectival derivatives, it can be seen that in English, the 1st OD is dominated by ENTITY (e.g., *bad*, Adj. → *bad*, N), present in 9 out of 10 networks, while MANNER (e.g., *long*, Adj. → *long*, Adv.) and CAUSATIVE (e.g., *warm*, Adj. → *warm*, V) appear in 5 networks each. In the 2nd OD, QUALITY becomes the most systematic category (e.g., *warm*, V → *warmed*, Adj.), with 8 instances, and persists into the 3rd OD with 1 additional case.

Slovak presents a very similar list of categories, though in less systematic manner. The 1st OD contains again ENTITY (e.g., *hustý*, Adj. → *húštie*, N 'thicket'), but unlike in English, only in 4 networks, and CAUSATIVE (e.g., *čierny*, Adj. → *černiť*, V 'to blacken') in 3 networks. These are accompanied by STATE (e.g., *teplý*, Adj. → *teplo*, N 'warmth') with 2 instances. The 2nd OD is, similarly to English, dominated by QUALITY (e.g., *obnoviť*, V → *obnovený*, Adj. 'renewed'), which appears 9 times, followed by ACTION (e.g., *obnoviť*, V → *obnova*, N 'renewal') in 7 networks, and a single CAUSATIVE example (e.g., *zlosť*, N → *zlostiť*, V 'to annoy'). In the 3rd OD, QUALITY continues with 2 further cases (e.g., *vychudnúť*, V → *vychudnutý*, Adj. 'gaunt').

Table 9 Overview of distribution of semantic categories in adjectival networks

	English		Slovak		
OD	*Semantic Category*	*Fr.*	*Semantic Category*	*Fr.*	*Translation*
1st	ENTITY *bad,* Adj. → *bad,* N	**9/10**	ENTITY *hustý,* Adj. → *húštie,* N	**4/10**	[thick] → [thicket]
	CAUSATIVE *warm,* Adj. → *warm,* V.	**5/10**	CAUSATIVE *čierny,* Adj. → *černiť,* V.	**3/10**	[black] → [to blacken]
	MANNER *long,* Adj. → *long,* Adv.	**5/10**	STATE *teplý,* Adj. → *teplo,* N.	**2/10**	[warm] → [warmth]
2nd	QUALITY *warm,* V. → *warmed,* Adj.	**8/10**	QUALITY *obnoviť,* V. → *obnovený,* Adj.	**9/10**	[renew] → [renewed]
			ACTION *obnoviť,* V. → *obnova,* N.	**7/10**	[renew] → [renewal]
			CAUSATIVE *zlosť,* N. → *zlostiť,* V	**1/10**	[annoyance] → [to annoy]
3rd	QUALITY *lengthen,* V. → *lengthened,* Adj.	**1/10**	QUALITY *vychudnúť,* V. → *vychudnutý,* Adj.	**2/10**	[to become gaunt] [gaunt]

Overall, the effect of conversion on the adjectival networks is again stronger in English, where the networks expand by nearly half, than in Slovak, where growth is more moderate. Unlike nouns, however, adjectives show stronger capacity to motivate direct derivatives of the 1st OD. In both English and Slovak was the 1st OD dominated by ENTITY, CAUSATIVE and MANNER. Nevertheless, the real expansion is again carried forward mostly by verbs introduced at the 1st OD. Slight increases in saturation put the values at around 30%, in a similar manner to nouns, yet with an important difference: English adjectival networks show a 13% increase, in contrast to the decline observed in nouns, suggesting that conversion in adjectives operates in a more systematic way.

4.4 Verbal networks

Finally, the verbal networks once again demonstrate how conversion reshapes derivational structure in English, while its role in Slovak remains supportive rather than transformative. Once conversion is taken into account, the English networks again expand markedly, from 37 to 63 possible derivatives (an increase by 70%). Slovak, already characterized by large and intricate verbal networks, grows more moderately, from 273 to 321 derivatives (an increase by 19%). The more detailed results are shown in Table 10 below.

As is evident, the English 1st OD rises from 17 to 22 potential derivatives (+29%). This represents the largest first-order increase across the three word-classes (compared to +5% for nouns and +15% for adjectives), indicating that verbal bases are the most productive in forming direct derivatives through non-affixal processes. The 2nd OD more than doubles its scope (14 → 32; +129%), while the 3rd OD also expands (6 → 9; +50%). No derivatives, however, were attested at the 4th OD.

Table 10 Maximum derivational network of verbs [potential derivatives]

		English			Slovak		
		Original	*With Conversion*		*Original*	*With Conversion*	
Orders of Derivation	1st	17	22	+ 29%	68	72	+ 6%
	2nd	14	32	+ 129%	130	149	+ 15%
	3rd	6	9	+ 50%	42	57	+ 36%
	4th	---	---	0	20	30	+ 50%
	5th	---	---	0	4	7	+ 75%
	6th				6	6	0
FULL MDN		**37**	**63**	**+ 70%**	**270**	**321**	**+ 19%**

In Slovak, growth appears at nearly every level of derivation, though it is steadier rather than abrupt, as in English. The 1st OD increases from 68 to 72 derivatives (+6%), the 2nd OD from 130 to 149 (+15%), the 3rd OD from 42 to 57 (+36%), and the 4th OD from 20 to 30 (+50%). Even the 5th OD registers additional forms (4 → 7; +75%), though the 6th OD remains unchanged at the maximum of 6 potential derivatives. Notably, the +6% increase in the 1st OD matches that of adjectives, with both categories outperforming nouns by four percentage points.

The contrast between English and Slovak is further highlighted by the average capacity figures. As shown in Table 11, the average number of actual derivatives in English rises from 10.2 to 17.8 (+75%), a substantial increase compared to the more moderate growth observed in Slovak, where capacity expands from 73.9 to 94.9 (+28%). Despite these gains, average saturation changes only slightly: +2% in English and +8% in Slovak.

Table 11 Capacity [actual derivatives], average capacity, and average saturation of verbal networks

	English			Slovak		
	Original	*With Conversion*		*Original*	*With Conversion*	
cut / rezať	12	22	+ 83%	66	89	+ 35%
dig / kopať	12	16	+ 33%	76	96	+ 26%
pull /ťahať	7	10	+ 43%	142	184	+ 30%
throw / hodiť	7	10	+ 43%	80	94	+ 18%
give / dať	**4**	**12**	**+ 200%**	116	146	+ 26%
hold / držať	22	29	+ 32%	79	89	+ 13%
sew / šiť	10	15	+ 50%	82	99	+ 21%
burn / horieť	6	11	+ 83%	26	32	+ 23%
drink / piť	13	31	+ 138%	56	70	+ 25%
know / **vedieť**	9	22	+ 144%	**16**	**50**	**+ 213%**
Average Capacity	10.2	17.8	**+ 75%**	73.9	94.9	**+ 28%**
Average Saturation	27.57	28.25	**+ 2%**	27.37	29.57	**+ 8%**

Examining individual lexemes reveals several noteworthy patterns. In English, the lexeme *give* shows the largest increase, expanding from 4 to 12 actual derivatives (+200%). At the opposite end of the spectrum, the lexeme *hold* records the smallest gain. Already the largest network in the original sample with 22 derivatives, it rises only modestly to 29 (+32%). In

Slovak, the most dramatic expansion occurs with the lexeme *vedieť* 'to know,' which jumps from 16 to 50 derivatives (+213%). By contrast, the lexeme *držať* 'to hold' exhibits the smallest increase, growing from 79 to 89 derivatives (+13%).

The distribution of semantic categories is also noteworthy. In English, all verbs in the sample yielded a QUALITY derivative at the 1st OD (e.g., *cut*, V → *cut*, Adj.). The category ACTION was also well represented, occurring in 7 out of 10 networks (e.g., *pull*, V → *pull*, N). The only other well-distributed category at this order was ENTITY, which appeared in 4 out of 10 networks (e.g., *drink*, V → *drink*, N). At higher orders, however, ENTITY was the sole category attested, with examples such as *drinkable*, Adj. → *drinkables*, N at the 2nd OD or *unknowable*, Adj. → *unknowable*, N at the 3rd OD. The results are shown in Table 12.

Table 12 Overview of distribution of semantic categories in adjectival networks

	English		**Slovak**		
OD	*Semantic Category*	*Fr.*	*Semantic Category*	*Fr.*	*Translation*
1st	QUALITY *cut,* V. → *cut,* Adj.	**10/10**	ACTION *rezať,* V. → *rezanie,* N *rezať,* V. → *rez,* N	**7/10**	[to cut] → [cutting, N] / [cut, N]
	ACTION *pull,* V. → *pull,* N.	**7/10**	QUALITY *rezať,* V. → *rezaný,* Adj.	**5/10**	[to cut] → [sliced]
	ENTITY *drink,* V. → *drink,* N.	**4/10**	ENTITY *vedieť,* V. → *veda,* N.	**2/10**	[to know] → [science]
2nd	ENTITY *drinkable,* Adj. → *drinkables,* N. *undercut,* V. → *undercut,* N.	**3/10**	QUALITY *prerezať,* V. → *prerezaný,* Adj.	**10/10**	[to cut through] → [cut-through]
			ACTION *preťahovať,* V. → *prieťah,* N.	**9/10**	[to pull / prolong] → [holdup]
			ENTITY *poťahať,* V. → *poťah,* N.	**4/10**	[to pull over] → [cover / overlay]
3rd	ENTITY *unknowable,* Adj. → *unknowable,* N.	**1/10**	QUALITY *pozošívať,* V. → *pozošívaný,* Adj.	**4/10**	[to stitch up] → [stitched up]
4th			ACTION *uvedomiť,* V. → *uvedomienie,* N.	**1/10**	[to realise] → [realisation]

The Slovak data show a similar pattern to English. At the 1st OD, the most common categories were likewise ACTION, QUALITY, and ENTITY. ACTION appeared in 7 out of 10 networks, as in *rezať*, V, which motivated both *rezanie*, N 'cutting' and *rez*, N 'cut'. The same verb also produced one of the 5 QUALITY derivatives, the adjective *rezaný* 'sliced'. ENTITY was attested in 2 cases, such as *veda*, N 'science', derived from *vedieť*, V 'to know'. These three categories continued to dominate at the upper orders as well: for instance, *prerezaný* 'cut through' (QUALITY) and *poťah* 'cover, overlay' (ENTITY) appear both at the 2nd OD, while *pozošívaný* 'stitched up' (QUALITY) and *uvedomenie* 'realisation' (ACTION) occur at the 3rd and 4th ODs, respectively.

In conclusion, verbs prove to be the most responsive category to conversion in English, with networks expanding sharply at the 1st and even more in the 2nd OD, where QUALITY, ACTION, and ENTITY derivatives dominate. This growth results in substantial increases in both size and capacity, though the networks remain still relatively shallow compared to Slovak. With already highly complex affixal networks, Slovak increases its MDN values only by 19%, smaller than in the case of adjectives, yet it reinforces it and increases its saturation values the

most of the three word-classes. Conversion thus emerges as a transformative force in English verb formation, but as a supplementary process in Slovak.

4.5 Concluding remarks

The reanalysis of derivational networks shows that the inclusion of non-affixal processes can substantially alter the picture of derivational productivity and systematicity. However, the full impact of such inclusion depends strongly on the language type.

Figure 2 illustrates this phenomenon by showing the proportional relationship between the original and the newly recalculated networks. In the figure, the cross-hatched [▧] segment represents the MDN values of the original networks, while the solidly coloured section on top of it indicates the additions resulting from the inclusion of non-affixal processes and their subsequent derivatives.

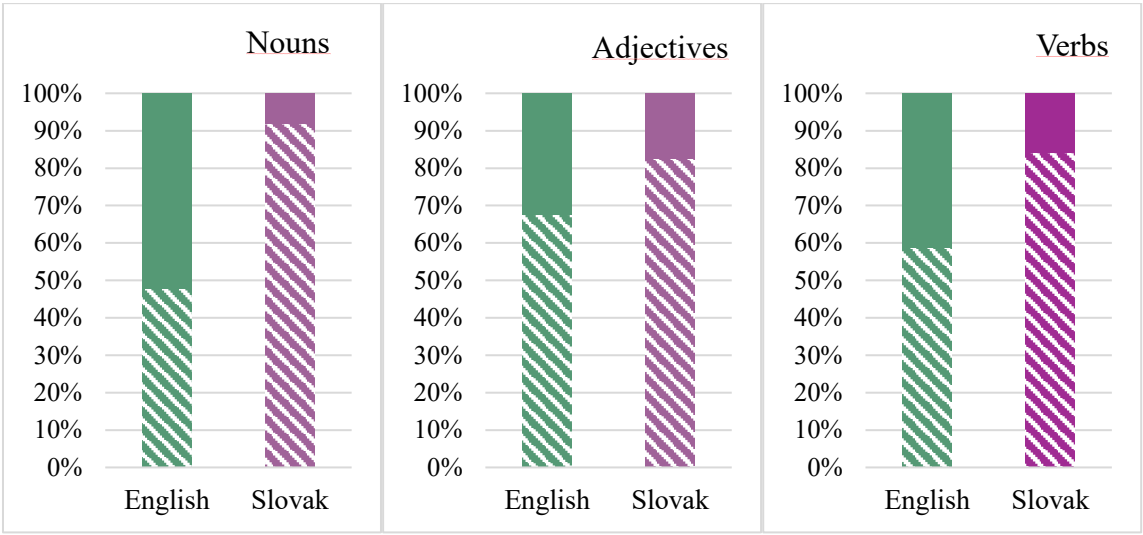

Figure 2 Proportion between the original networks [▧] and the networks with conversion [■]

As the figure illustrates, the proportion of newly added potential derivatives is considerably higher in English than in Slovak. For nouns, the original English MDN values account for less than 50% of the recalculated MDN, whereas in Slovak the original values exceed 90%. A similar pattern was observed in verbs, where the English share is 59% compared to 84% in Slovak. The contrast is somewhat less pronounced in adjectives, where the original English networks represent 67% of their recalculated values, while in Slovak the corresponding figure is 83%.

Nevertheless, despite these differences in proportionality, the inclusion of non-affixal processes did not substantially reduce the overall disparity between English and Slovak networks, as illustrated in Figures 3 and 4 below. Figure 3 presents the MDN values without conversion, while Figure 4 displays the recalculated MDNs with conversion included. The figure indicate that the English networks expanded considerably, as was already evident from Figure 2 as well. However, Figures 3 and 4 show that English networks still failed to reach the values recorded in Slovak, even when compared with the original Slovak networks. Moreover, the marginal increase observed in the Slovak networks made the contrast between the two languages even more pronounced.

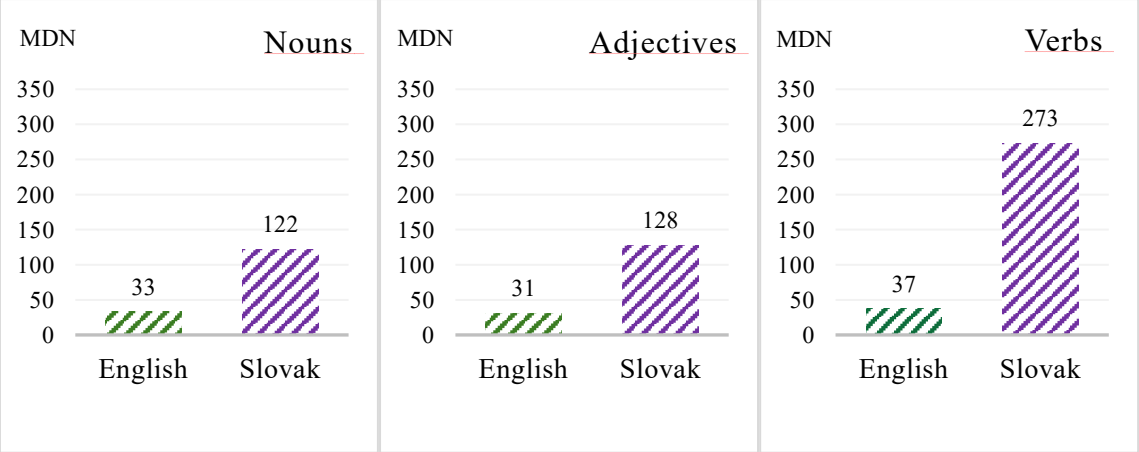

Figure 3 Original maximum derivational network values

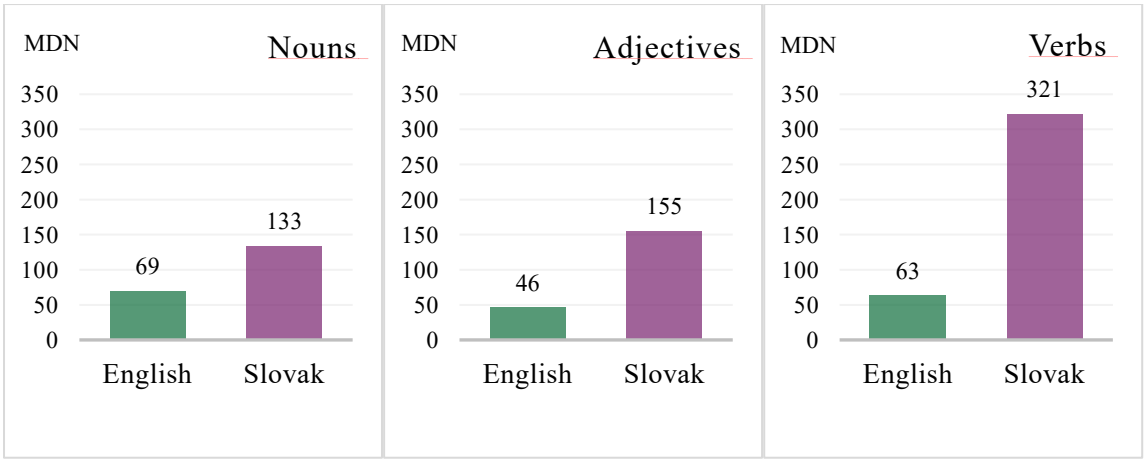

Figure 4 Maximum derivation network values after the inclusion of non-affixal processes

The only partial exception was found in the nominal networks, where the disparity was somewhat reduced and therefore less pronounced than in the other cases. Nevertheless, even here the MDN of the Slovak networks remained nearly twice as high as that of English.

The semantic distribution across the orders of derivation reveals that the dynamics of network expansion differ not only between English and Slovak but also across word classes. Nouns in both languages show minimal direct productivity at the 1st OD, where non-affixal derivation is almost exclusively limited to the CAUSATIVE category. The real expansion through non-affixal processes occurs at the 2nd and 3rd ODs, largely because the verbs derived at the 1st OD serve as new bases that motivate categories such as QUALITY, ACTION, and ENTITY.

Adjectival networks demonstrate a similar dependency. In both languages, verbs converted through the CAUSATIVE category at the 1st OD systematically motivate non-affixal derivatives of the QUALITY category at the 2nd OD, which in Slovak is further accompanied by productive ACTION derivatives. At the 3rd OD, QUALITY continues to extend the networks in both languages. Thus, both nominal and adjectival non-affixal expansion relies heavily on verbs formed at earlier orders.

Verbal networks, by contrast, are immediately productive at the 1st OD. In both English and Slovak, verbs motivate non-affixal derivatives not only of QUALITY but also of ACTION and ENTITY, ensuring significant early growth. At higher orders, however, the patterns diverge: English networks narrow rapidly, with ENTITY as the only systematic category, while Slovak

continues with categories ACTION and QUALITY alongside ENTITY well into the 3rd and 4th ODs, largely owing to the highly productive verb-to-verb affixal derivation active across all orders.

Thus, it appears that verbs not only dominate their own category at the 1st OD but also function as the principal outputs of conversion beyond the 1st OD for both nouns and adjectives. Moreover, English networks, while significantly expanded through conversion, remain typologically constrained, concentrating their productivity within a limited number of semantic domains. Slovak networks, by contrast, combine affixal and non-affixal strategies to sustain both larger sizes and a broader variety of semantic relations across successive orders of derivation.

5 Conclusion

This paper reassessed the structure of derivational networks by systematically incorporating non-affixal processes into previously compiled networks. The main question was whether such inclusion would significantly alter network size and internal organisation, and whether it would narrow the pronounced cross-linguistic contrasts observed in the original, affix-only model.

The empirical analysis was carried out on the same sample of 30 simple underived lexemes (10 nouns, 10 adjectives, 10 verbs) that was used in the original research by Popova (2020) for English and Ivanová (2020) for Slovak. The items were drawn from Swadesh's core vocabulary, ensuring comparability across both languages.

The scope of non-affixal processes was defined in line with the respective word-formation traditions of English and Slovak. For English, conversion was included as one of the most productive mechanisms of word-formation, with its directionality determined on the basis of Marchand's (1963, 1964) synchronic criteria of semantic dependence. In Slovak, two processes were reintegrated: *transflexion*, understood as the shift from one inflectional paradigm to another without the use of a derivational affix, and *morphological motivation*, which accounts for lexemes motivated by specific word-forms, most notably participials or gerunds. Together, these processes provided a framework for expanding the networks beyond affixation in a systematic, language-specific methodology.

The results of the analysis shown that English networks expanded substantially once conversion was included (most markedly in nouns and verbs), while Slovak, already characterized by large, complex affixal networks, grew only modestly. Yet the overall disparity remained: even the enlarged English MDNs were not able to match Slovak values, including Slovak's original data. The only partial softening appeared in the nominal networks, where the gap decreased but remained sizable.

The distribution of growth across orders of derivation reveals how non-affixal processes can restructure the networks. The non-affixal growth at the 1st OD was limited for both nouns and adjectives, as the major expansion arrived at the 2nd and 3rd ODs, motivated by verbs of the 1st OD. In both languages, verbs thus play an important structural role, as they dominate their own 1st OD and act as bases for the higher orders.

Saturation values remained stable at around 30% for all categories in both languages, shifting only marginally. In fact, most networks showed slight increases, which indicates that once non-affixal processes are included, the networks become not only larger but also somewhat more systematic. The only exception was English nouns, where a small decrease in saturation was recorded.

The findings also confirm that excluding non-affixal processes risks underrepresenting the true scope of derivational productivity, particularly in languages like English, where conversion is a central word-formation process. At the same time, inclusion does not erase typological differences: English appears limited in its derivational potential with a narrower set of semantic pathways and shallow number of orders of derivation. On the other hand, Slovak uses the non-affixal processes to further expand its already large, complex and semantically diverse networks across several orders of derivation.

To conclude, the inclusion of non-affixal processes provides a more complete and realistic picture of derivational structure. For the model of derivational networks to represent cross-linguistic productivity adequately, it must integrate both affixal and non-affixal processes. Only then can it fully capture the dynamics of how networks grow and how languages of different types balance their word-formation strategies.

At the same time, two limitations of the present study remain. Compounding and phrasal verbs, although highly productive in English, cannot be included in derivational networks, since the model is designed only for derivational processes. Their exclusion is therefore unavoidable, yet they likely account for further growth and introduce semantic categories comparable to those represented in the Slovak data. In addition, working with a controlled core-vocabulary sample may have hidden some patterns that only appear in specific lexical domains. Future research should therefore expand the sampling base and test the model on broader lexical data to explore how far these tendencies extend across the lexicon as a whole.

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