Action nouns *vs.* nouns as bases for denominal verbs in Czech: A case study on directionality in derivation[1]

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Abstract

Suffixless action nouns are mostly analysed as deverbal derivatives (e.g., *výběr* 'choice' < *vybírat* 'to choose.IPFV'), but dictionaries ascribe the reverse direction to some noun–verb pairs (*útok* 'attack' > *útočit* 'to attack.IPFV') despite being both formally and semantically close to the former type. The question is addressed in the present study of whether any linguistic features can be identified in pairs of suffixless nouns and directly corresponding verbs that would speak in favour of one or the other direction. The analysis of 250 Czech suffixless nouns reveals a correlation between the number of directly related verbs derived by suffixes and the direction as recorded in the dictionaries: While deverbal nouns correspond mostly to a pair of verbs with different (aspect-changing) suffixes (cf. *výběr* 'choice' : *vybrat*/*vybírat* 'to choose.PFV/IPFV'), nouns that are bases for verbs tend to share the root with a single (imperfective) verb (*útok* 'attack' : *útočit* 'to attack.IPFV'). This correlation is elaborated into two different paradigms, one being based on verbal roots and the other on nominal roots, which might be applicable in hypothesizing the direction also with nouns that are not covered by the dictionaries.

Keywords: derivation, directionality, action noun, conversion, denominal verb

1 Introduction

Action nouns are defined as formations that have nominal inflection and/or occur in syntactic positions typical of nouns, but have an action meaning (Koptjevskaja-Tamm 2015: 1196; Comrie & Thompson 1985). Action nouns are viewed as derived from verbs since the action meaning is primarily expressed by verbs (Koptjevskaja-Tamm 2003; Daneš et al. 1967: 562). As confirmed by typological research, action nouns belong to the most frequent categories attested cross-linguistically, demonstrating a variety of affixes in individual languages (Bauer 2002: 40; Štekauer et al. 2012: 293–297).

   The present paper deals with a particular type of Czech action noun, namely with nouns that consist of a root (and optionally a prefix), but do not contain a suffix or inflectional mark in their citation form; see the nouns *běh* 'run' and *výběr* 'choice' in (1). As verbs are obligatorily marked by overt suffixes in Czech, namely by a thematic suffix and an ending, action nouns without a suffix (hereafter, SUFFIXLESS ACTION NOUNS)[2] have a simpler morphemic structure than the corresponding verbs and thus contradict the general principle that the derivative "is distinguished from the base because of its greater semantic specificity and more complex morphological structure, which usually reveal themselves in the addition of a morphological element (typically an affix), which increases the phonic body of the derivative and therefore its length with respect to that of the base" (Iacobini 2000: 866; see also Marchand 1963 and 1964).

(1)   a.   *běh*   <   *běž-e-t*
            run   run–IPFV–INF[3]
            'run'   'to run'
      b.   *vý-běr*   <   *vy-br-a-t*
            PREF–take   PREF–take–PFV–INF
            'choice'   'to choose'

Suffixless action nouns are contrasted with nouns with an analogous morphemic structure (i.e. a missing suffix part) that serve as bases for denominal verbs. In the literature, this word-formation type subsumes nouns displaying a wide semantic spectrum, from nouns referring to things (2) to nouns referring to events (3); cf. Dokulil et al. (1986: 410–411) or Štícha et al. (2018: 958). The pairs in (3) are thus both formally

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[2] Suffixless action nouns, which are assumed to be derived from verbs, are seen here as a subgroup of suffixless nouns. The term SUFFIXLESS NOUNS refers solely to the lack of the suffix part in the morphemic structure of these nouns rather than to the way they were formed or whether they are unmotivated.

[3] Abbreviations in the glosses (alphabetically): GEN=genitive, IMP=imperative, INF=infinitive, IPFV=imperfective, LOC=locative, NOM=nominative, PFV=perfective, PL=plural, PREF=prefix, SG=singular. From (4) onwards, glosses are omitted and the morphemic structure is not marked in the examples. The relevant categories of Czech words are then provided with their English translations.

and semantically close to the pairs of a suffixless action noun and its base verb in (1), differing only in the hypothesized direction of derivation.

(2) a. *cukr*   > *cukr–ova–t*
         sugar   sugar–IPFV–INF
         'sugar'   'to sugar'
     b. *stín*   > *stín–i–t*
         shadow   shadow–IPFV–INF
         'shadow'   'to shade'
(3) a. *cval*   > *cvál–a–t*
         gallop   gallop–IPFV–INF
         'gallop'   'to gallop'
     b. *zá–vod*   > *zá–vod–i–t*
         PREF–lead   PREF–lead–IPFV–INF
         'race'   'to race'

In the present study, the formal and semantic similarity between the noun–verb pairs in (1) and (3) is taken as a point of departure for a case study on the directionality in word-formation in Czech. First of all, accounts of formation of suffixless action nouns *vs.* denominal verbs in the descriptive tradition of Dokulil's word-formation theory, in generative approaches, and in general dictionaries of Czech are summarized in Section 2, pointing out that semantic dependency in the noun–verb pairs is taken as the main criterion. As this feature, though, does not appear to be sufficiently distinctive in some pairs, the objective of the paper is to examine whether some features that were previously discussed in the literature as potential directionality indicators can support the decision on a particular direction in these pairs.

For the sake of the analysis, a list of 250 suffixless nouns is extracted from a large corpus of Czech, taking neither the meaning of the nouns nor the semantic relation between the noun and verb into account (Section 3). For each noun, verbs that share the root morpheme (and the prefix, if present) and are distinguished just by the thematic suffix and the infinitive marker in the citation form are searched for in the corpus. The nouns are annotated for semantic dependency, phonological features, and valency. The analysis in Section 4 points out that there is a correlation between whether a particular noun corresponds to a single verb or to a pair of verbs and the direction of derivation (as interpreted from the semantic dependency annotation). While a pair of verbs is available with most nouns annotated as deverbatives, a single verb is available for nouns that are considered bases for verbs.

In Section 5, the relationships observed in the data are discussed and modelled as two distinct derivational paradigms. Using the paradigms to capture specific patterns repeatedly occurring across the word-formation system of Czech, the study follows the recent discussion on the applicability of paradigms to description of derivation. In spite of being established particularly in inflectional morphology (Blevins 2006), the term PARADIGM was introduced into word-formation already by Dokulil (1962: 14) and since then elaborated in different, often not related accounts

(see Štekauer 2014 for a summary). The present study adheres to the integrating approach by Bonami & Strnadová (2019), in which paradigmatic structures are dealt with as specific constellations of semantically defined slots repeated across morphological families, without special regard to the inflection/derivation boundary.

2 Czech action nouns and denominal verbs in the literature and in dictionaries

2.1 Suffixless action nouns as conversion, zero-derivation, transflexion

In Dokulil's onomasiological account, which has become a widely respected and, in fact, the only common ground of word-formation descriptions in Czech since then (Daneš et al. 1967; Dokulil et al. 1986; Štícha et al. 2013; Štícha et al. 2018, and others), the formation of a suffixless noun from a verb has been referred to by several terms, each of them emphasizing another aspect of the process but all of them sharing the directional perspective. In analogy to verb-to-noun conversion in English, suffixless action nouns were used as examples of CONVERSION by Dokulil (1962: 62–65, 1968a, 1968b, referring to Marchand 1960, etc.) as well as by authors of several more or less recent grammars and textbooks (e.g., Dokulil et al. 1986: 292–294; Bednaříková 2009) including the representative summary of Czech word-formation (Bozděchová 2016: 2888).[4] The fact that, in contrast to English, there is no formal identity between the base verb and the converted noun in Czech was explained by the different morphological structures of the languages. In compliance with the definition of conversion as a paradigm change (Dokulil 1962: 62, 1968a: 226), the base and the converted word differ in inflectional markers, i.e., the thematic suffix and the ending as overt markers of verbal inflection are deleted and substituted for nominal inflection in the action noun in Czech (namely, for the zero ending in the citation form), and no derivational affixes operate here.

Conversion as derivation by means of inflectional markers but without derivational affixes was reinterpreted as an affixation of a zero suffix (ZERO-DERIVATION, NULLABLEITUNG). The applicability of the concept of zero-derivation was discussed against the background of the affinity between the formation without affixes and suffixal derivation, the latter being the basic word-formation process in Czech and other Slavic languages (Dokulil 1968b). This approach, however, has not been accepted by Czech linguists. Similarly rare is the view that suffixless action nouns are results of DESUFFIXATION (Dokulil 1962: 24; Stašková 2008; Rusínová 2016), i.e., a type of backformation (cf. Štekauer 2015 for a discussion of the uses of this term in word-formation studies of European languages).

Yet another term, TRANSFLEXION, was proposed by Dokulil in 1982 (but also Dokulil 1968a: 235) to refer to class-changing processes that are overtly marked by a difference between the citation forms of the input and output words, as is the case with the suffixless action nouns in Czech. With the introduction of this term, the scope of

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[4] The concept of conversion in description of Slavic languages in general (with a focus on Russian, Serbo-Croatian and Bulgarian) is summarized by Manova (2011: 5–8).

conversion has been narrowed to changes of inflectional paradigm without overt marking, so that the input word is formally identical with the output (cf. nominalization of the gerundive adjective *cestující* 'travelling' into the noun *cestující* 'passenger'). Formation of suffixless action nouns is called transflexion by Filipec & Čermák (1985: 104); cf. also the description of analogous formations in Slovak by Furdík (2004: 68f.) and Ivanová & Ološtiak (2016: 2902).

In the context of the state-of-the-art research into word-formation across languages, formation of suffixless actions nouns in Czech does not comply with the canonical type of conversion, defined by a word-class change and formal identity (Valera 2014; Štekauer 1996). Nevertheless, when the phenomenon of conversion is approached (more) broadly, covering also word-class change accompanied by formal variation between the base and the derivative (Valera 2015; Bauer & Valera 2005), the action noun formation in Czech does fall within the scope of conversion and is interpreted in this way (cf. Manova 2011: 60; Cetnarowska 1996).

2.2 Suffixless action nouns in the generative perspective

Going back to Chomsky's (1970) classification, Czech suffixless action nouns could be classified as DERIVED NOMINALS (En. *refusal, criticism*, Cz. *výběr* 'choice', *běh* 'run'), while Czech nominalizations in *-ní/-tí* (*vybírání* 'choosing', *běhání* 'running') can be compared to English GERUNDIVE NOMINALS (e.g., *refusing, criticizing*; Karlík 2000). Following the more detailed approach by Grimshaw (1990), the categories of EVENT NOMINALS and RESULT NOMINALS (but not complex event nominals) are discussed in relation to suffixless action nouns in Czech, focusing on the particular reading and selected syntactic and semantic features (e.g., argument structure/ valency, pluralization) that underlie this classification; Karlík (2007), Dvořáková Procházková (2007).

The description of Czech suffixless action nouns as event or result nominals is not uncontroversial due to their morphemic structure. The lack of the thematic suffix classifies them as ROOT NOMINALS or ZERO-DERIVED NOMINALS (Grimshaw 1990; Alexiadou & Grimshaw 2008; Borer 2013). Since these approaches associate verbal characteristics with the thematic suffix and the roots are considered underspecified for word class, root nominals are claimed not to have an argument structure, which is untenable for Czech suffixless action nouns (Karlík 2019). As a tentative proposal to resolve this controversy, Karlík (2019: 106) suggests that the argument structure is "licenced by an event feature of the root in the lexicon as encyclopaedic information". Karlík's conclusion converges remarkably with the findings I am going to present in the analysis that follows, although Karlík's approach is based on a different theoretical background and looks for answers to different questions.

2.3 Denominal verbs mostly as derivation

Denominal verbs, which are formed by both affixal and suffixless processes across languages, have been treated in a variety of ways depending on the

morphological structure of particular languages and the particular framework used (McIntyre 2015: 1413–1414). In the specific case of Czech verbs based on suffixless nouns, which I examine in relation to suffixless action nouns, a thematic suffix and an infinitival ending are attached to the base noun. Even if the denominal formation is a process reversed to the process of formation of suffixless action nouns (see (3) *vs.* (1) above), formation of denominal verbs has not been discussed as conversion or transflexion by Czech linguists, except for a minor remark by Dokulil (1968a: 225), but was described as suffixation (e.g., Dokulil et al. 1986: 406–416; Štícha et al. 2013: 226–236).

Whatever term is used, derivation of denominal verbs is strictly separated from the formation of action nouns in the literature on Czech and the two processes are considered as processes with opposite directionality. Although they evidently appear to be close or even overlapping in nouns with action meaning, the issue how to distinguish both types remains open (Dokulil et al. 1986: 416), or it is not even touched upon in most grammars.

2.4 Dictionaries

In the general dictionaries of Czech (Havránek et al. 1960–71; Filipec et al. 1998),[5] suffixless action nouns and related verbs are listed under separate entries, as are suffixless nouns and denominal verbs. The direction of derivation is not recorded explicitly in the dictionaries, but it is encoded in the meaning definition. Suffixless action nouns (4a, 5a) are explained by using nominalizations in *-ní/-tí* of the particular base verbs (in 4b and 5b), whereas the other way round, the meaning of denominal verbs (6a, 7a) is described by a light-verb construction that contains the motivating noun (6b, 7b).

(4)   a.   *běh* 'run' = *běžení* 'running'
       b.   *běžet* 'to run.IPFV' = *rychle jít* 'to go quickly'
(5)   a.   *sběr* 'collecting' = *sbírání* 'collecting'
       b.   *sbírat* 'to collect.IPFV' = *snášet dohromady* 'to bring together'
(6)   a.   *souhlasit* 'to agree.IPFV' = *dávat souhlas* 'to give consent'
       b.   *souhlas* 'agreement' = *shoda v názoru* 'consensus on opinion'
(7)   a.   *útočit* 'to attack.IPFV' = *provádět útok* 'to carry out an attack'
       b.   *útok* 'attack' = *napadení někoho* 'assaulting somebody'

In some pairs, though rarely, a circular definition is encountered (8). One can also find pairs with which the dictionaries provide opposite analyses. For instance, the noun *lov* 'hunt' is interpreted as motivating the verb by Havránek et al.'s dictionary (9), while

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[5] The dictionaries differ in coverage but are uniform in evaluating semantic dependency in most noun–verb pairs (see (4) to (8)). As there are still a few cases whose assessment differs (such as (9) *vs.* (10)), the annotation in Section 3.3.1 is based on one of them, that of Havránek et al.

Filipec et al. assess this noun as a deverbal formation; the latter interpretation is preferred also by Daneš et al. (1967: 594), Dokulil (1968a: 223), and Dokulil et al. (1986: 292), see (10). Relying on native speaker intuition, both interpretations seem equally acceptable.

(8) a. *končit* 'to end.IPFV' = činit konec 'to make an end'
     b. *konec* 'end' = místo, kde něco končí 'the place where something ends'
(9) a. *lovit* 'to hunt.IPFV' = provádět lov 'to make hunt'
     b. *lov* 'hunt' = stíhání a zmocňování se zvěře 'chasing and seizing of animals'
(10) a. *lov* 'hunt' = lovení zvěře a ryb 'hunting of animals and fish'
     b. *lovit* 'to hunt.IPFV' = zmocňovat se zvěře a ryb 'to seize animals and fish'

The present study uses Havránek et al.'s dictionary as the primary source of information on semantic dependency. The present study does not, though, aim to search for criteria that would classify nouns in line with the consulted dictionary, but to ask whether any difference can be observed in suffixless nouns that would entitle a linguist to associate them with different word-formation rules.

3 Extraction of nouns and verbs and annotation of the features to analyse

3.1 Extraction of suffixless nouns

For the present study, a list of 250 suffixless nouns was compiled in three steps. First of all, the nouns were extracted from a 100-million-word corpus of written Czech (SYN2015 corpus; Křen et al. 2015). The selection was based only on the formal shape of the nouns while the meaning of the nouns was not taken into consideration in order to avoid subjectivity in assessing the (non-)actionality. However, as the morphemic structure of words is not marked in the SYN2015 corpus (as in any other corpora of Czech), it was not possible to extract suffixless nouns directly. A basic formal feature of these nouns, namely that they never end in a vowel in Czech, was used to start the data compilation procedure. By using this feature, a frequency list of nearly 80 thousand different nouns with a final consonant was obtained.[6]

Second, proceeding from the top of the frequency list, those nouns were deleted that had a suffix and/or were masculine animate nouns (because animate masculines do not compete for the action noun interpretation; e.g., *král* 'king' – *kralovat* 'to reign.IPFV') and/or were loan nouns (because the suffix part may be delimited differently with respect to the source *vs.* target language) and/or did not have a directly related verb in the SYN2015 data. In the last step, the top 250 nouns from the

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[6] The corpus was searched by the Kontext query tool (https://kontext.korpus.cz) by using the following query: [tag="N.*" & lemma!=".*[aeiouyáéěíóůúý]"]. A total of 15,258,089 tokens was found, which belong to 79,969 different types.

reduced list, i.e., nouns that lack the suffix, are not animate masculines, are not loan nouns and have a corresponding verb counterpart, were included into the final list for analysis.

The restriction of the present study to high-frequency nouns was motivated by the fact that I wanted to deal with items that are covered by the dictionaries and other sources so that annotation can be extracted from them in order to avoid subjective assessment and to make the analysis as objective and replicable as possible. High frequency items, though, behave specifically in some respects; in particular, they are prone to polysemy.[7] Polysemy is handled in the next step of the data compilation procedure when assigning corresponding verbs to the nouns. In that step, polysemous nouns are disambiguated and linked by particular senses to individual verbs (Section 3.2). The particular sense is then focused on in the annotation of semantic dependence and valency (Sections 3.3.1 and 3.3.3) but not with morphographemic alternations (Section 3.3.2) as they are not sense-related. The sense addressed is reflected also in the English translation provided with each noun and verb.

3.2 Assigning corresponding verbs to the nouns

For each noun in the sample, the data of the SYN2015 corpus were searched for a directly related verb that shares the root (and, alternatively, the prefix) morpheme with the noun and differs just in the presence of the suffix part,[8] allowing for vowel alternations both in the prefix and the root and for alternations of the final root consonant. Only verbs attested in this corpus were listed. Nouns that were related to a matching verb only formally without showing a semantic relation perceived in synchrony (11) were excluded from the sample and replaced by another one from the source list.

(11)   *příběh* 'story' – *přiběhnout / přibíhat* 'to come.PFV/IPFV running'[9]

Some of the nouns shared the root with two or even more verbs with different suffixes. If these verbs had the same lexical meaning and differed just in the category of grammatical aspect, they were listed as a verb pair with the particular noun in a single entry (12) because there are mostly neither formal features (due to the common root allomorphy) nor semantic features (e.g., clearly un/perfective meaning) of the

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[7] Cf. the long-standing debate over the relation between token frequency and polysemy, initiated by Zipf (1935, 1949) and continued in different settings, including most recent accounts using state-of-the-art data (Pawley 2006; Bybee 2007; Levelt 2013; Hernández-Fernández et al. 2016; Kuiper et al. 2017).

[8] A handful of nouns in the sample correspond to reflexiva tantum, which differ in the suffix and in the reflexive *se* from the particular noun (*smích* 'laughter' – *smát se* 'to laugh.IPFV').

[9] Verb pairs that share the lexical meaning and differ in the aspect are separated by a slash (the perfective followed by the imperfective) and provided with a single English counterpart with both aspect values (PFV/IPFV).

nouns that would justify preferring one of the verbs as the (more) direct verbal counterpart of the noun; cf. the consonant alternation *k:č* between *skok* 'jump' and *skočit* 'to jump.PFV' and the vowel root alternation *o:á* between *skok* 'jump' and *skákat* 'to jump.IPFV' in (12).[10]

(12) *skok* 'jump' – *skočit / skákat* 'to jump.PFV/IPFV'

On the other hand, multiple verbs with the same root but different meanings (regardless the aspect category) were separated and listed as different entries with the same noun. For instance, the noun *hlas* 'voice/vote' is listed in three entries. Two of the verbs are based on the meaning 'the sound produced by a person' (13a, 13b), while *hlasovat* 'to vote.IPFV' in (13c) refers to the noun's meaning of 'a formal indication of one's opinion'. In (14), the noun *sklad* meaning 'fold' is related to the verb pair in (14a), which is based on suppletive roots,[11] while the verb *skladovat* in (14b), which has no suffixed aspectual counterpart, corresponds to the meaning 'depot'.[12]

As a result, the 250 nouns in the sample are listed in 263 entries, out of which 131 are pairs of a noun and a verb and 132 triplets consisting of a noun and a pair of verbs. While each verb occurs in a single entry, some nouns are listed in several entries (13, 14).

(13) a. *hlas* 'voice' – *hlásit* 'to report.IPFV'
      b. *hlas* 'voice' – *hlásat* 'to proclaim.IPFV'
      c. *hlas* 'vote' – *hlasovat* 'to vote.IPFV'
(14) a. *sklad* 'fold' – *složit / skládat* 'to fold.PFV/IPFV'
      b. *sklad* 'depot' – *skladovat* 'to store.IPFV'

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[10] The verb pairs included in the list consist of a perfective and an imperfective verb with the exception of four pairs of imperfective verbs, one of which is a determinate and the other one an indeterminate verb (e.g., *běžet / běhat* 'to run.IPFV/IPFV'). The relation of these pairs to the particular suffixless noun is very similar to the relations between the noun and the perfective and imperfective verb (cf. the account of Czech or, more generally, Slavic aspect as a category that has evolved from the category of determinacy; Němec 1958).

[11] The decision to include verbs with suppletive roots as a verb pair into the data was based on the lexicographic description documenting that the suffixless noun is related to both of the verbs (cf. *sklad* meaning 'fold' defined as "skládání, složení' 'folding.PFV/IPFV' by Havránek et al. 1960–71). The pair of verbal roots *lož / klád* can be found with another six nouns in the data sample (*doklad* 'document', *náklad* 'load', *podklad* 'base', *překlad* 'translation', *výklad* 'explanation', *základ* 'foundation'). Another pair of suppletive verbs is related to the noun *chod* 'running' – *chodit / jít* 'to go.IPFV/IPFV'; the same roots are attested also in verbs listed with the nouns *odchod* 'leaving', *přechod* 'transition', *příchod* 'arrival', *vchod* 'entry', and *východ* 'exit'.

[12] Yet a different case are orthographical and stylistically marked variants; they are subsumed under the standard item (e.g., the colloquial variant *prohlídnout* under *prohlédnout* 'to inspect.PFV').

3.3 Selection and annotation of features to be analysed

Marchand in his 1964 paper, which has become a classic reference, lists seven criteria that help to determine the direction of derivation 'between words unmarked by derivational morphemes' in English:

(i)   the derivative is 'semantically dependent' on the base (as evidenced by the meaning definition of the verb *to saw* that necessarily refers to the noun *saw*, but not *vice versa*),

(ii) the derivative is 'restricted in usage' as compared to the base; it may have a limited set of forms (cf. the denominal verb *neighbour* attested only in *-ing* forms) or a limited set of contexts. These limitations may be manifested in frequency of the items in that the derivative is less frequent than the base,

(iii) the derivative has a narrower 'semantic range', i.e., is semantically more specific than the semantically broader base,

(iv) the derivative may show a 'semantic pattern' typical of the particular word class (e.g., the verb *to father* corresponds to a denominal pattern 'to act like someone'),

(v)   some affixes or other strings in the 'phonetic shape' of a word can reveal the word class of the base (e.g., *-ation* or *-ment* in the denominal verbs *probation* and *document*),

(vi) the word class of constituents in compounds (their 'morphological type') may help to determine the base (e.g., the verb *blacklist* is based on an A+N compound and is thus likely to be a denominal derivative),

(vii) characteristic shifts of stress may also support decisions on the direction of derivation in English conversion.

Semantic dependency, discussed as the most important criterion for determining the direction of derivation by Marchand ((i) but also (iii) and (iv) above) as well as by other approaches (see Iacobini 2000, Koptjevskaja-Tamm 2015, or McIntyre 2015 for overviews), is assigned to the nouns and verbs in the sample by using the general dictionary in order to avoid the risk that native speakers' intuition fails in the transition zone between deverbal and denominal derivation under focus;[13] see Section 3.3.1 for annotation and 4.1 for the analysis of this feature.

The exploration of morphographemic alternations (Sections 3.3.2 and 4.2) is inspired by Marchand's paper, too. Nevertheless, as stress shifts (under (vii) above) do not

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[13] See Umbreit (2010), Sanders (1988), who exploits analogy between zero derivations and overtly marked derivations, or Bergenholtz & Mugdan's study (1979: 350–354) pointing out a notable amount of disagreement among native speakers about the direction of motivation and putting forward a proposal of a bidirectional account which is, however, not supported by the results of the present study. In future work, classification of noun–verb pairs according to Bagasheva's (2017) comparative semantic concepts, or according to semantic patterns expressed through noun-to-verb conversion summarized by Plag (1999: 219–220) might be employed.

apply in Czech derivation (because stress is fixed to the initial syllable in Czech), alternations are chosen as an alternative phonological manifestation of the direction of derivation; cf. the role of umlauts in German (McIntyre 2015: 1414).

The other features discussed by Marchand are not examined for different reasons. The observation of a derivative having a lower frequency in a pair of derivationally related lexemes (under (ii) above, but also Dokulil 1962: 109) cannot be applied to the data sample because the SYN2015 corpus used in the study is not disambiguated for word senses and the frequency scores extracted would necessarily relate to all senses of polysemous items, which would make an adequate analysis impossible.[14] Neither the criterion of word-class-specific affixes (under (v) above, cf. also McIntyre 2015), nor the criterion concerning the word class of the constituent parts (vi) are applicable to my material due to the specific morphemic structure of the analysed noun–verb pairs.

The third feature, examined in addition to semantic dependency and alternations in the present study, is valency, which has been recognized as a defining feature of nominalizations across languages (Comrie 1976; Comrie & Thompson 1985; Koptjevskaja-Tamm 1993, 2003, 2013). When modelling how verbal categories get lost in nominalizations (e.g., Mackenzie 1987 or Lehmann 1988), valency is considered one of the most internal, or even the most internal feature that is preserved even when other verbal categories such as tense or aspect are no longer available (Malchukov 2006). The data are annotated for valency to see whether this feature can distinguish deverbal nouns from non-deverbatives (Sections 3.3.3 and 4.3).

3.3.1 *Determining semantic dependency between nouns and verbs*

The annotation of semantic dependency between nouns and verbs is based on Havránek et al.'s dictionary (1960–71), in which nouns are defined as semantically depending on verbs by using the *–ní/-tí* nominalizations, while a light-verb construction in the definition of the meaning of the verb indicates that the verb is semantically dependent on the noun, i.e., that it is a denominal derivative (cf. Section 2.4).

With polysemous items, the annotation was carried out with respect to the particular sense. If the noun is listed in more pairs/triplets, the information on semantic dependency was extracted separately for each of them. For instance, the same direction (noun-to-verb) was listed with all the three pairs in (13) (i.e., *hlas* 'voice' > *hlásit* 'report. IPFV', *hlas* 'voice' > *hlásat* 'to proclaim.IPFV', and *hlas* 'vote' > *hlasovat* 'to vote.IPFV'), but different directions were captured with the verbs in (14) (namely, *sklad* 'fold' < *složit / skládat* 'to fold.PFV/IPFV' and *sklad* 'depot' > *skladovat* 'to store.IPFV'). The data conforms to the observation that individual senses of a polysemous lexeme, rather than the lexeme as a whole, undergo derivation as pointed out by Plank (2010).

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[14] Corpus frequency is involved in the analysis of English noun–verb conversion by Bram (2011: esp. 231–263) and contrasted with other features (including semantic dependency).

3.3.2 Annotation of morphographemic alternations in inflection and derivation

Annotation of morphographemic alternations was based on data stored in the large inflectional dictionary of Czech, which is used in morphological analysis within Natural Language Processing tasks (Straka & Straková 2014); the annotation was subsequently checked manually. For each noun in the sample, it was noted whether it undergoes alternations in inflection by comparing its citation form with each of its inflected forms. In addition, citation form of the noun was compared to the citation form of the respective verb (or verbs) to identify alternations related to derivation.

3.3.3 Annotation of noun valency

In contrast to the rich literature on the syntactic behaviour of nominalizations (Spevak 2014, Alexiadou & Rathert 2010 and others),[15] there are not many lexicographic resources that capture syntactic features of nominalizations in an explicit way for a larger amount of data (e.g., Herbst et al. 2004, Baker et al. 1998, Macleod et al. 1998, or Meyers et al. 2004 for English, or Balvet et al. 2010 for French). For Czech, two valency dictionaries are available that cover also valency of nouns, namely Svozilová et al. (2005) and PDT-Vallex, which is a part of the release of Prague Dependency Treebank 3.5 (Hajič et al. 2018). The latter resource is used for the valency annotation of my data sample, although its scope is limited to the Prague Dependency Treebank data (it only covers nouns and their senses that were encountered during the annotation of the treebank data).

The PDT-Vallex dictionary is theoretically rooted in the valency account elaborated within the framework of the Functional Generative Description (Panevová 1974, 1975; Sgall et al. 1986), which has been formulated primarily for verbs and applied to nouns by Kolářová (2010, 2014). Under this account, valency is understood as a combinatorial potential of a lexical unit, i.e., a verb or a noun, but also an adjective or an adverb. The configuration of valency slots that are either required or specifically permitted by the lexical unit is captured in the dictionary as its valency frame; cf. the valency frame of the noun *výběr* 'choice' in the PDT-Vallex in (15). The frame contains two valency slots (Actor and Patient); each of them may be expressed either by a bare genitive (Gen) or by a possessive adjective or by a pronoun as specified in the parentheses. As evidenced in the examples, each of the slots may be omitted in the surface structure of the sentence.

(15) *výběr* 'choice' Actor (Gen, possessive) Patient (Gen, possessive)
  examples: *jeho*.Actor *výběr vhodných kandidátů*.Patient 'his.Actor choice of relevant candidates.Patient', *výběr profese*.Patient 'choice of profession.Patient', *ministrův*.Actor *výběr* 'minister's.Actor choice'

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[15] The phenomenon is referred to by different names. The term 'valency', used in the present study, appears, for instance, in Mackenzie (1985), Spevak (2014) or Bloch-Trojnar & Malicka-Kleparska (2017).

For each noun in the sample, its valency frame was extracted from the PDT–Vallex dictionary. With polysemous nouns, a valency frame for the respective sense was searched for in the dictionary. The analysis is rather coarse, focusing on the presence/absence of valency with particular nouns; the annotation is limited to so-called obligatory valency slots (which are required by the noun) while potential slots (permitted by the noun) are not included; neither morphemic forms are considered in the annotation. If the noun was not found in the dictionary, it was marked as not having valency in the annotation.

4 Analysis of the noun–verb pairs for the features assigned

4.1 Semantic dependency

According to the semantic dependency annotation, the data sample of a total of 263 noun–verb entries splits into two groups: nouns in 126 entries were specified as semantically dependent on the verb (which is interpreted as the verb-to-noun direction of derivation) whereas the reverse dependency (and thus the noun-to-verb direction) was ascribed to nouns in the remaining 137 entries.

There is a remarkable correlation between the semantic dependency annotation and the annotation of corresponding verbs. 107 out of 126 nouns described as deverbatives have a corresponding pair of verbs in the corpus and 112 out of 137 nouns assigned the noun-to-verb direction correspond to a single verb (Table 1).

The subsets obtained by combing the two annotations differ in the morphemic structure of the nouns and verbs and in the grammatical aspect of verbs. Among 107 nouns that are described as deverbal derivations and correspond to a pair of verbs, there are 95 prefixed nouns, clearly dominating over those without prefixes (12 nouns); cf. (16) *vs.* (17). The verbs in the pairs share the lexical meaning and are distinguished by the grammatical aspect (perfective *vs.* imperfective) or, in a few prefixless verb pairs, by the determinate *vs.* indeterminate feature (18).

(16) a. *projev* 'manifestation' – *projevit / projevovat* 'to manifest.PFV/IPFV'
      b. *zvyk* 'habit' – *zvyknout / zvykat* 'to get used.PFV/IPFV'
(17) a. *hod* 'throw' – *hodit / házet* 'to throw.PFV/IPFV'
      b. *křik* 'shouting' – *křiknout / křičet* 'to shout.PFV/IPFV'
(18) a. *běh* 'run' – *běžet / běhat* 'to run.IPFV/IPFV'
      b. *let* 'flight' – *letět / létat* 'to fly.IPFV/IPFV'

In the subset of 112 denominal entries containing nouns corresponding to single verbs, prefixless formations (87 pairs) outweigh those with a prefix (25 pairs); cf. (19) *vs.* (20). Regardless of the morphemic structure, all verbs in these noun–verb pairs are imperfectives, except for the single prefixed perfective in (21), for which the imperfective counterpart (*porozovat* 'to give.IPFV birth') can be found in Havránek et al.'s dictionary.

Table 1: Four subsets identified in the sample by correlating the semantic dependency annotation with the number of corresponding verbs

semantic dependency in the dictionary:	noun based on verb (verb-to-noun derivation)	verb based on noun (noun-to-verb derivation)	
corresponding verbs in the corpus: a pair of corresponding verbs	107 - prefixless: 12 - prefixed: 95	25 (see Table 5) - prefixless: 3 - prefixed: 22	132
a single corresponding verb	19 (see Table 4) - prefixless: 13 - prefixed: 6	112 - prefixless: 87 - prefixed: 25	131
	126	137	263

(19) a. *noc* 'night' – *nocovat* 'to stay.IPFV overnight'
      b. *sůl* 'salt' – *solit* 'to salt.IPFV'
(20) a. *odpor* 'protest' – *odporovat* 'to protest.IPFV'
      b. *závod* 'race' – *závodit* 'to race.IPFV'
(21) *porod* 'childbirth' – *porodit* 'to give.PFV birth'

In the remaining two subsets, the semantic dependency annotation does not match up with the number of corresponding verbs in the above described way. The subset of 19 nouns that are captured as semantically dependent on the verb in the dictionary and have a single verb attested in the corpus contains 13 prefixless and six prefixed nouns; see Table 2. Five of the prefixed nouns as well as the prefixless *tok* 'flow' have, however, a second corresponding verb (i.e., an aspectual counterpart of the first one) listed in Havránek et al.'s dictionary; see the third column in Table 2. Moreover, *nápis* 'inscription' and *výzkum* 'research' exhibit a vowel alternation in the prefix when compared to the verb, which is considered typical of deverbal derivatives (see Section 4.2).

The last subset of 25 nouns that are described as semantically primary and correspond to pairs of verbs in the corpus is listed in Table 3. Nouns in grey show a vowel alternation in the prefix, which is considered typical of deverbal nouns. All the nouns refer to an action or to a result and fall within the transition zone between deverbal and denominal derivation in which the noun-based definition of the verb seems as acceptable as the verb-based definition of the noun (as illustrated by (9) and (10) in Section 2.4). As for the morphemic structure, there are three prefixless and 22 prefixed nouns in this subset. Eleven of the prefixed nouns exhibit, moreover, an alternation of the vowel in the prefix with respect to the particular verb pair. All in all, the morphemic structure of these nouns seems to speak in favour of deverbal derivation, i.e., the same as signalled by the attestedness of a corresponding verb pair. In this light, the number of corpus-attested verbs seems a more reliable signal of the direction of derivation than the semantic dependency as provided by the dictionary.

Table 2: Nouns that are described as semantically dependent on the verbs in the dictionary and have a single corresponding verb in the corpus

noun	verb	second verb attested in the dictionary only
boj 'fight'	*bojovat* 'to fight.IPFV'	
čin 'act'	*činit* 'to do, make.IPFV'	
děj 'action'	*dít (se)* 'to happen.IPFV'	
dík 'thanks'	*děkovat* 'to thank.IPFV'	
chov 'breeding'	*chovat* 'to breed.IPFV'	
jev 'phenomenon'	*jevit (se)* 'to seem.IPFV'	
květ 'bloom'	*kvést* 'to bloom.IPFV'	
nápis 'inscription'	*napsat* 'to write.PFV'	*napisovat* 'to write.IPFV'
pláč 'crying'	*plakat* 'to cry.IPFV'	
plat 'pay'	*platit* 'to pay.IPFV'	
pout' 'pilgrimage'	*putovat* 'to wander.IPFV'	
provoz 'operation'	*provozovat* 'to operate.IPFV'	*provodit* 'to accompany.PFV'
předpoklad 'assumption'	*předpokládat* 'to assume.IPFV'	*předpoložit* 'to assume.PFV'
ruch 'bustle'	*rušit* 'to disturb.IPFV'	
růst 'growth'	*růst* 'to grow.IPFV'	
svah 'slope'	*svažovat (se)* 'to slope.IPFV'	*svážit (se)* 'to slope.PFV'
tok 'flow'	*téct* 'to flow.IPFV'	*tékat* 'to flow.IPFV'
výzkum 'research'	*vyzkoumat* 'to research.PFV'	*vyzkoumávat* 'to research.IPFV'
zpěv 'singing'	*zpívat* 'to sing.IPFV'	

4.2 Vowel alternations in inflection and derivation

Vowel and consonant alternations are frequently attested in both deverbal and denominal derivation in Czech (22) as well as in inflection of the base words and derivatives (23; Dokulil 1962:159–178, Ziková 2015).

(22)   a.   *sníh* 'snow' : *sněžit* 'to snow.IPFV'
       b.   *výběr* 'choice' : *vybrat / vybírat* 'to choose.PFV/IPFV'
(23)   a.   *sníh* 'snow.NOM-SG': *sněhu* 'snow.GEN-SG': *snězích* 'snow.LOC-PL'
       b.   *vybrat* 'to choose.PFV-INF' : *vyber* 'choose.PFV-IMP'

The present analysis of phonological features is inspired by Millet's (1958) assumption that the word class of the base affects the phonemic/graphemic stability of the root morpheme in that deverbal nouns (NOMS POSTVERBAUX) do not undergo root vowel changes during inflection, as evidenced in (24), while unmotivated nouns containing nominal roots (NOMS RADICAUX) are sensitive to alternations when inflected, cf. the *í:ě* alternation in the inflection of the noun *sníh* 'snow' which is supposed to be the base for the verb *sněžit* 'to snow.IPFV' (25); cf. also Pognan (2017).

Table 3: Nouns that are classified as semantically primary with respect to verbs in the dictionary and correspond to a pair of verbs in the corpus

noun	verb pair (PFV/IPFV)
křik 'shouting'	*křiknout/křičet* 'to shout'
nápad 'idea'	*napadnout/napadat* 'to get an idea'
návrh 'proposal'	*navrhnout/navrhovat* 'to propose'
název 'name'	*nazvat/nazývat* 'to name'
obal 'wrapper'	*obalit/obalovat* 'to wrap'
obsah 'content'	*obsáhnout/obsahovat* 'to contain'
odpověď 'answer'	*odpovědět/odpovídat* 'to answer'
podnět 'stimulus'	*podnítit/podněcovat* 'to stimulate'
pokus 'attempt'	*pokusit* se/*pokoušet se* 'to attempt'
pomoc 'help'	*pomoct/pomáhat* 'to help'
pozdrav 'greeting'	*pozdravit/pozdravovat* 'to greet'
příkaz 'order'	*přikázat/přikazovat* 'to order'
rozkaz 'order'	*rozkázat/rozkazovat* 'to order'
řeč 'speech'	*říct/říkat* 'to say'
skok 'jump'	*skočit/skákat* 'to jump'
slib 'promise'	*slíbit/slibovat* 'to promise'
úder 'hit'	*udeřit/udeřovat* 'to hit'
úsměv 'smile'	*usmát* se/*usmívat se* 'to smile'
výnos 'yield'	*vynést/vynášet* 'to yield'
výslech 'interrogation'	*vyslechnout/vyslýchat* 'to interrogate'
vzkaz 'message'	*vzkázat/vzkazovat* 'to send a message'
zákaz 'prohibition'	*zakázat/zakazovat* 'to forbid'
základ 'foundation'	*založit/zakládat* 'to found'
zámek 'lock'	*zamknout/zamykat* 'to lock'
zvyk 'habit'	*zvyknout/zvykat* 'to get used'

(24)   *výběr* 'choice.NOM-SG' : *výběru* 'choice.GEN-SG'
(25)   *sníh* 'snow.NOM-SG' : *sněhu* 'snow.GEN-SG'

In the data sample, an alternation of the root vowel was found in inflection of eight nouns. When linking the alternation annotation with the annotations discussed so far, all the eight nouns have a single corresponding verb and are captured as semantically primary to the corresponding verb in the semantic dependency annotation (Table 4), which is in line with Millet's hypothesis. Nevertheless, there are further 15 nouns in the sample which contain a long vowel in the root but do not undergo an alternation in inflection, despite being assigned the same direction of derivation and having a single verbal counterpart; cf. the examples in the last column of Table 4.

The same long root vowels without alternations are further attested in three nouns that are assumed to be deverbal derivatives and have two corresponding verbs (26).

Table 4: Root vowel alternations in inflection of nouns that are assumed bases for verbs (left column) and nouns with the same direction but without root alternations (right)

root vowel alternation	example nouns NOM–SG : GEN–SG	counterexamples with no alternation NOM–SG : GEN–SG
á:a	*mráz* : *mrazu* 'frost' *kámen* : *kamene* 'stone'	*báseň* : *básně* 'poem' *pláč* : *pláče* 'cry'
í:ě	*vítr* : *větru* 'wind' *sníh* : *sněhu* 'snow'	*cíl* : *cíle* 'target' *hřích* : *hříchu* 'sin'
ů:o	*stůl* : *stolu* 'table' *sůl* : *soli* 'salt'	*růst* : *růstu* 'growth'

(26) a. *pád* 'fall.NOM-SG' : *pádu* 'fall.GEN-SG'
     b. *oddíl* 'section.NOM-SG' : *oddílu* 'section.GEN-SG'
     c. *nárůst* 'increase.NOM-SG' : *nárůstu* 'increase.GEN-SG'

In addition to the alternations in inflection, there are 58 noun–verb pairs/triplets in the sample that show alternations in the prefix vowel between the citation form of the noun and of the verb(s); see Table 5. The nouns with prefix alternations correlate strongly with the annotation of noun–verb pairs *vs.* triplets: 55 out of the 58 alternating nouns have a pair of verbs assigned. The remaining three nouns (*zájem* 'interest', *nápis* 'inscription', *výzkum* 'research') have a single verbal counterpart in the corpus but *nápis* 'inscription' and *výzkum* 'research' have a second verbal counterpart attested in Havránek et al.'s dictionary. When compared to the semantic dependency annotation, there is a weaker correlation of 46 nouns with a prefix alternation captured as deverbal derivation with the remaining 12 in the opposite direction.

Another seven nouns with a long vowel in the prefix do not exhibit alternations with respect to the corresponding verb (Table 6). All of them have one corresponding verb and are considered bases for denominal verbs in the annotation.

The prefix vowel alternations thus seem, with reservation due to the size of the analysed sample, to disclose the following pattern: when deriving a noun from a verb with a short vowel in the prefix, the vowel is lengthened (e.g., *výběr* 'choice' < *vybrat* / *vybírat* 'to choose.PFV/IPFV'; cf. Daneš et al. 1967: 599), whereas when deriving a verb from a noun with a long prefix, the prefix remains unchanged (cf. *útok* 'attack' > *útočit* 'to attack.IPFV'). This pattern seems to be exploitable when determining the direction of derivation in real data analysis.

4.3 Valency

The valency, as another feature typical of nominalizations, is analysed with the nouns in the sample to answer the question whether it can help to distinguish deverbal derivatives

Table 5: Prefix vowel alternations in the citation form of the verbs *vs.* nouns

prefix vowel alternation	number of verb–noun pairs/triplets	examples
a:á	25	*nakoupit / nakupovat* 'to purchase.PFV/IPFV' : *nákup* 'purchase' *zapsat / zapisovat* 'to record.PFV/IPFV' : *zápis* 'record'
y:ý	17	*vybrat / vybírat* 'to choose.PFV/IPFV' : *výběr* 'choice' *vykonat / vykonávat* 'to perform.PFV/IPFV' : *výkon* 'performance'
i:í	6	*přijmout / přijímat* 'to receive.PFV/IPFV' : *příjem* 'receipt' *přinést / přinášet* 'to bring.PFV/IPFV' : *přínos* 'contribution'
u:ú	6	*utéct / utíkat* 'to escape.PFV/IPFV' : *útěk* 'escape' *uvést / uvádět* 'to introduce.PFV/IPFV' : *úvod* 'introduction'
o:ů	4	*dokázat / dokazovat* 'to prove.PFV/IPFV' : *důkaz* 'proof' *proběhnout / probíhat* 'to take.PFV/IPFV place' : *průběh* 'progress'

Table 6: Non-alternating long vowels in the prefix of nouns and corresponding verbs

prefix vowel (without alternation)	number of noun–verb pairs	example
á : á	3	*závod* 'race' : *závodit* 'to race.IPFV'
ú : ú	4	*útok* 'attack' : *útočit* 'to attack.IPFV'

from nouns that are bases for verbs.[16] In the annotation, a valency frame is listed with 154 nouns, which might be (naïvely) interpreted as that the noun is a deverbal derivative, whereas the lack of valency with the remaining 109 nouns might signal that the reverse direction of derivation is more likely. Manual inspection reveals, expectedly, that this division is not intuitively acceptable with many of the nouns. The reasons for this are connected with shifts in the meaning of the nouns, with the choice of the particular theory, with the limited coverage of the valency dictionary, or with a combination of these factors.

Even if the valency annotation matches neither the annotation of corresponding verbs nor the semantic dependency annotation (see Table 7), merging these three annotations seems to be useful in that two largest groups delimited in this way contain intuitively

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[16] The analysis is limited to the nouns. Noun valency is neither compared to the valency of the corresponding verbs nor to other types of nominalizations (e.g., to nominalizations in *-ní/-tí*).

Table 7: Valency annotation with respect to the number of corresponding verbs and to the semantic dependency annotation

valency potential according to the valency dictionary	corresponding verbs in the corpus	direction in the general dictionary
with valency slot(s): 154 nouns	– a single verb: 56 – a pair of verbs: 98	– noun-to-verb: 64 – verb-to-noun: 90
without valency: 109 nouns	– a single verb: 75 – a pair of verbs: 34	– noun-to-verb: 73 – verb-to-noun: 36

Table 8: Valency potential of the nouns within the four data subsets delimited in Table 1

semantic dependency:	verb-to-noun	noun-to-verb	
corresponding verbs in the corpus: a single corresponding verb	19 – with valency slot(s): 12 – without valency: 7	112 – with valency slot(s): 44 – without valency: 68 (group B)	131
a pair of corresponding verbs	107 – with valency slot(s): 78 (group A) – without valency: 29	25 – with valency slot(s): 20 – without valency: 5	132
	126	137	263

clear examples of deverbal nouns (group A in Table 8 and below) and of nouns motivating corresponding verbs (group B).

(A) The majority of the nouns with valency potential and, simultaneously, with a corresponding verb pair and the verb–to–noun direction have the action meaning as the only or the first meaning in the dictionary, usually followed with the resultative meaning at the second place (27), or the other way round with nouns in (28).

(27) *běh* 'run', *dopad* 'landing', *hod* 'throw', *nákup* 'purchase', *nástup* 'boarding', *návrat* 'return', *názor* 'opinion', *objev* 'discovery', *obrat* 'turnover', *odhad* 'estimate', *odchod* 'leaving', *pobyt* 'stay', *pokles* 'decrease', *postup* 'progress', *projev* 'manifestation', *průzkum* 'exploration', *přechod* 'transition', *překlad* 'translation', *příchod* 'arrival', *příjem* 'receipt', *příjezd* 'arrival', *přínos* 'contribution', *rozvod* 'divorce', *střet* 'conflict', *únik* 'leakage', *útěk* 'escape', *vstup* 'entry', *výklad* 'explanation', *výskyt* 'occurrence', *výstup* 'output', *vývoj* 'development', *vztah* 'relationship', *zákrok* 'intervention', *zápis* 'record', *zásah* 'intervention'

(28) *dohled* 'supervision', *dojem* 'impression', *důkaz* 'proof', *pocit* 'feeling', *podpis* 'signature', *popis* 'description', *přehled* 'overview', *sklon* 'inclination', *výběr* 'choice', *zátěž* 'load', *zisk* 'profit'

 (B) Intuitively clear examples of denominal derivation are found among the nouns that lack valency in the annotation and, at the same time, have a single corresponding verb and are assigned the noun-to-verb direction. These nouns do not contain any action feature in their semantics, referring to objects of daily use (*láhev* 'bottle', *stůl* 'table'), body parts (*tvář* 'face', *kloub* 'joint'), plant parts (*větev* 'branch', *kořen* 'root'), materials (*kov* 'metal'), foods (*cukr* 'sugar', *pepř* 'pepper'), or weather (*sníh* 'snow',); see (29) for more examples. Valency potential of these nouns is not expected to be assessed differently in a different valency dictionary or within a different theoretical account.

(29) *báseň* 'poem', *díl* 'part', *drát* 'wire', *dvůr* 'courtyard', *kámen* 'stone', *kruh* 'circle', *kříž* 'cross', *led* 'ice', *list* 'leaf', *mrak* 'cloud', *noc* 'night', *olej* 'oil', *pach* 'smell', *papír* 'paper', *pár* 'pair', *písek* 'sand', *plod* 'fruit', *popel* 'ash', *pytel* 'bag', *rám* 'frame', *řetěz* 'chain', *stín* 'shadow', *sůl* 'salt', *šperk* 'jewel', *tábor* 'camp', *tvar* 'shape', *uzel* 'knot', *vítr* 'wind', *zeď* 'wall', *zub* 'tooth'

5 Discussion

5.1 Verbs corresponding to the suffixless nouns and their aspectual counterparts

The analysis so far pointed out a correlation between the number of verbs and semantic dependency annotation: While nouns with a single counterpart were mostly assumed to be semantically primary to the corresponding nouns, nouns with a corresponding verb pair were considered as semantically depending on the verbs in the dictionary. In cases of mismatch between the two types of annotation, other features, in particular, the morphemic structure and vowel alternations, indicated that the number of corresponding verbs might be an even more reliable indicator of the direction of derivation than the semantic dependency. Now, the number of corresponding verbs is put under a special scrutiny.

   Two verbs were listed for a suffixless noun if they shared the lexical meaning but differed in the category of grammatical aspect (or, rarely, of determinacy). The perfective and imperfective meanings are conveyed by different thematic suffixes in the individual verb pair. However, the suffixes on their own are not associated with a particular aspect; cf. the suffix *a* in both perfectives and imperfectives in Table 9. If a third verb with a different suffix is present in the corpus data, it is an iterative[17] based on the imperfective verb in the pair (30). Both the perfective and

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[17] In the literature on Czech, iterativeness is mostly subsumed under the category of AKTIONSART, which is used as an umbrella term for different 'manners of action' (resultative, terminative, semelfactive, etc.) expressed through derivation (e.g., Poldauf 1964 or Grepl et al. 2000: 209–213; cf. Filip's 2011 comprehensive summary on Aktionsart). The fact that iteratives are derived by suffixes while the other

Table 9: Five most frequent combinations of thematic suffixes in verb pairs that correspond to suffixless nouns

thematic suffix (PFV/IPFV)	example	number of pairs
i/ova	*pocítit / pocit'ovat* 'to feel'	24
nou/a	*říznout / řezat* 'to cut'	21
a/ova	*zapsat / zapisovat* 'to record'	13
∅/e	*vynést / vynášet* 'to yield'	12
nou/ova	*vztáhnout / vztahovat* 'to relate'	10

Table 10: Five most frequent thematic suffixes in verbs that correspond to a suffixless noun but do not have an aspectual counterpart with a different suffix

thematic suffix	example	number of verbs
i	*lovit* 'to hunt'	56
ova	*nocovat* 'to stay overnight'	47
a	*trestat* 'to penalize'	16
e	*kráčet* 'to step'	4
∅	*růst* 'to grow'	4

imperfective verbs usually combine with one or more prefixes resulting in perfectives in both cases (31), adding different semantic (Aktionsart) nuances.

(30) *říznout / řezat* 'to cut.PFV/IPFV' > *řezávat* 'to cut.IPFV repeatedly'
(31) a. *říznout* 'to cut.PFV' > *oříznout* 'to cut.PFV off' | *vyříznout* 'to cut.PFV out', etc.
      b. *řezat* 'to cut.IPFV' > *ořezat* 'to cut.PFV off' | *vyřezat* 'to cut.PFV out', etc.

When a single suffixed verb was listed with a particular noun in the annotation, it was mostly imperfective in aspect, referring to the action as a continuous process. The set of thematic suffixes attested in the verbs (Table 10) is not different from the suffixes in Table 9. The overlap in both tables documents that the suffixes are not related to one or the other direction and cannot be used in deciding on the direction of derivation in Czech (as applied by Manova 2011: 73 to Bulgarian examples). In these verbs, the suffix was changed only to form an iterative verb; cf. (32).

To form a perfective counterpart, i.e., to describe the particular action as completed, a prefix is added to the imperfective verb (33). While in (33a) *za-* is the single prefix combined with the verb *útočit* 'to attack' in the SYN2015 corpus, there are multiple different prefixes attested with other verbs (33b). It does not seem relevant for the analysis whether or not the prefixed verb (or which of the multiple prefixed verbs) can be

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Aktionsart types by prefixes, was one of Kopečný's (1962) arguments for including iteratives as the third value into the category of grammatical aspect (in addition to perfectives and imperfectives).

considered a pure aspectual counterpart of the imperfective and which of them convey Aktionsart; crucial is the mere non-existence of another suffixed verb.[18]

(32) *útok* 'attack' > *útočit* 'to attack.IPFV' > *útočívat* 'to attack.IPFV repeatedly'
(33) a. *útok* 'attack' > *útočit* 'to attack.IPFV' > *zaútočit* 'to attack.PFV'
      b. *sůl* 'salt' > *solit* 'to salt.IPFV' > *osolit* 'to salt.PFV' | *přisolit* 'to add.PFV more salt' | *přesolit* 'to add.PFV too much salt'

As confirmed with all nouns that were considered as intuitively clear examples of nouns motivating the verbs (cf. (29) in Section 4.3), a verb with an aspect-changing suffix is not expected to be found even if the amount of data used for searching is significantly increased (5-billion-word corpus, Křen et al. 2018). In contrast, the number of prefixed verbs for a particular base is usually growing when using a larger dataset, and an iterative is more likely to be found there as well. The fact whether a single verb or a pair of verbs with aspect-changing suffixes corresponds to a particular noun thus does not seem to be dependent on the size of the dataset, but is rather systemic in nature.

5.2 Directionality and the word class of the roots

The question has to be raised now what determines the way the aspectual counterpart is formed. The answer is sought in the inner structure of the verbs.

As thematic suffixes are not associated with a particular aspect and most of them are attested in verb pairs (i.e., verbs using an aspect-changing suffix) as well as in verbs that have no aspectual counterpart formed by a suffix (but use a prefix to change the aspect), the possibility or impossibility to form a suffixed counterpart apparently cannot be related to a specific set of thematic suffixes. The source of these differences has thus to be sought in the other constitutive part of the verbs, namely in their root morpheme.

The explanation which I would like to sketch here is that verbs which use a prefix to change the aspect contain roots with a non-actional, i.e., nominal meaning. The nominal root comes from the suffixless noun which is considered to be the base for such a verb; cf. the intuitively clear examples of nouns motivating the corresponding verbs in (29) above. On the contrary, verb pairs with aspect-changing suffixes seem to contain roots with an action meaning, i.e., verbal roots. The verbal root is then a part of the corresponding suffixless noun that is assumed to be derived from these verbs; cf. the verb pairs corresponding to the prototypical examples of deverbal derivatives in (27) and (28).

The hypothesis seems to be acceptable with the suffixless nouns and denominal verbs based on them, but may raise doubts in relation to the deverbal derivation because there

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[18] The debate over the category of aspect has a long history in Czech and, more generally, in Slavic linguistics, being centred around the grammatical *vs.* lexical status of the category and around the morphemic structure of the verbs (whether only suffixed counterparts and/or prefixed counterparts form a pure aspectual pair); e.g., Janda et al. (2013) for Russian, or a recent summary for Czech (Ševčíková & Panevová 2018).

the deverbal noun is proposed to be based on two verbs, which is certainly not a prototypical example of derivation, though not excluded in the literature on derivation;[19] cf. the discussion on DOUBLE or PARALLEL MOTIVATION (e.g., Daneš et al. 1967: 593 specifically for Czech suffixless nouns).

5.3 Verbal *vs.* nominal roots in two different derivational paradigms

Yet another possibility is to abandon the directional analysis. If the differences in the formation of aspectual counterparts are explained by the meaning of the root morpheme or, more generally, by its word class, I can reformulate it into two paradigms that still capture the observed differences but do not necessarily specify the direction of derivation. The first paradigm (left in Figure 1) is based on a verbal root and consists of a suffixless noun that corresponds to two verbs with different suffixes and different aspects, e.g. *říznout / řezat* 'to cut.PFV/IPFV' > *řez* 'cut'. In the paradigm on the right, which is supposed to be based on nominal roots, the suffixless noun is related to a single (imperfective) verb, e.g., *sůl* 'salt' > *solit* 'to salt.IPFV'. A prefix can be added to the verb to change the aspect (*solit* 'to salt.IPFV' > *osolit* 'to salt.PFV') but the prefixed verb is not directly related to the particular suffixless noun.

While the directional approach (at least implicitly) assumes that the supposed base word was available before the particular derivative, the non-directional analysis of Czech suffixless nouns is compatible with approaches that assume that words that seem to be derivationally related in the synchrony might have been created from a common root without a mutual relationship (Kastovsky 1994: 110). The Czech data analysed, however, contradict the hypothesis of the word-class neutrality of roots, which has been discussed across approaches with different theoretical backgrounds, cf. Grimshaw (1990), Alexiadou (2001), Farrell (2001), Kastovsky (2005), or Borer (2014). If the word class of the roots in the paradigm is not specified, the only distinction would be lost that explains the different shapes and relations in both paradigms. My explanation, working with the opposition of verbal *vs.* nominal roots, is strikingly close to Karlík's (2019) conclusion about the source of valency potential in Czech deverbal suffixless nouns (see Section 2.2).

Even if the difference between the deverbal and denominal derivation might be rooted in the historical development of Czech, the differences in the formation of aspectual counterparts are observable also in vocabulary that is too recent (being mostly based on loan bases) or has too low frequencies to be covered by the dictionaries. For instance, the

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[19] The issue of two verbs motivating the suffixless noun would be solved by considering the aspectual pair as a single verb lexeme (as suggested, e.g, Štícha et al. 2013: 440 or Nübler 1992). Such account is, nevertheless, far from being broadly accepted and many questions have not been clarified so far, in particular, which of the counterparts is the unmarked member of the aspectual opposition and thus the citation form of the joint verbal paradigm (the imperfective is considered as unmarked by Mathesius 1947, Isačenko 1960, Kopečný 1962, or Jakobson 1971, while the perfective is preferred by Wierzbicka 1967 or Bogusławski 2003).

Figure 1: A suffixless noun in a derivational paradigm based on a verbal root *vs.* a nominal root

Table 11: Loan and low-frequency native examples fitting the deverbal (left) and denominal (right) derivational paradigm

a pair of verbs (PFV/IPFV) >	noun	noun >	verb (IPFV)
risknout / riskovat 'to risk'	*risk* 'risk'	*skejt* 'skate'	*skejtovat* 'to skate'
trumfnout / trumfovat 'to triumph'	*trumf* 'triumph'	*flirt* 'flirt'	*flirtovat* 'to flirt'
obsypat / obsypávat 'to backfill'	*obsyp* 'backfilling'	*kšír* 'belt'	*kšírovat* 'to belt'
orazit (si) / orážet (si) 'to take a rest'	*oraz* 'rest'	*kyt* 'putty'	*kytovat* 'to putty'

company name *Google* is used as an (undoubtedly) nominal root in the Czech imperfective verb (*googlovat* 'to google.IPFV') to which the perfective counterpart is formed by attaching a prefix (*vygooglovat* 'to google.PFV'). The same paradigm is used to recognize the pairs in the right part of Table 11 as containing nominal roots.

In contrast, two different aspect-changing suffixes with the root *klik* in the verbs *kliknout / klikat* 'to click.PFV/IPFV' may suggest that the root has been interpreted as a verbal root in Czech. The same paradigm is documented with the noun *přibal* 'something attached', which was coined from the verb pair *přibalit / přibalovat* 'to attach.PFV/IPFV' rather recently to refer to small presents attached to a product (for instance, a DVD or a makeup sample attached to a magazine); see the left part of Table 11 for some more loan examples and low-frequency native nouns not listed in the dictionaries.

5.4 The word class of the root and words that motivate the examined nouns and verbs and that are motivated by them

As the last point to discuss, I go back to two groups of derivatives mentioned above in order to add more details to the paradigms and to broaden the scope of the analysis. The first group includes nouns that motivate a single verb and fit thus in the denominal paradigm but, unlike the majority of these nouns, contain a prefix (cf. *odpor* 'protest' and *závod* 'race' in (20) in Section 4.1). Besides some opaque cases (e.g., *úkol* 'task') and those based on prepositional phrases (cf. *zápas* 'fight' if someone is holding somebody else by the waist *za* 'by' + *pás* 'waist'), there are a few nouns whose inner structure can be traced back to a pair of prefixed verbs which, in turn, are based on prefixless verbs. In (34) the noun *odpor* 'protest', which was analysed as motivating the verb *odporovat* 'to protest' in the sample, is motivated by the pair *odepřít / odpírat* 'to deny.PFV/IPFV', the perfective of

which is based on *přít (se)* 'to argue'. The chain in (34) and analogously in (35) to (37)[20] documents that a noun which is an output of the deverbal paradigm (e.g., *obejít / obcházet* 'to go.PFV/IPFV round' > *obchod* 'trade' in (37)) can enter the denominal paradigm resulting in a verb (*obchod* 'trade' > *obchodovat* 'to trade') whose characteristics are close to verbs with truly nominal roots (cf. (43) below).

(34) *přít (se)* 'to argue.IPFV' > *odepřít / odpírat* 'to deny.PFV/IPFV' > *odpor* 'protest' > *odporovat* 'to protest.IPFV'

(35) *vést* 'to lead' > *zavést / zavádět* 'to lead.PFV/IPFV' > *závod* 'race' > *závodit* 'to race.IPFV'

(36) *téct* 'to run.IPFV' > *utéct / utíkat* 'to run.PFV/IPFV away' > *útok* 'attack' > *útočit* 'to attack.IPFV'

(37) *jít* 'to go.IPFV' > *obejít / obcházet* 'to go.PFV/IPFV round' > *obchod* 'trade' > *obchodovat* 'to trade.IPFV'

With the second group, namely with the prefixed verbs mentioned in Section 5.1, I do not 'look back' to their motivating items but point to derivation that they enter. The prefixed verbs, motivated by verbs with both verbal roots (31) and nominal roots (33), are all perfectives in aspect and most of them can be turned into imperfectives again (secondary imperfectives) by replacing the thematic suffix; cf. *oříznout* 'to cut.PFV off' into *ořezávat* 'to cut.IPFV off' in (38) and *přisolit* 'to add.PFV more salt' into *přisolovat* 'to add.IPFV more salt' (39). The resulting pairs of a prefixed perfective and a prefixed imperfective differ just in suffixes, which was identified above as the basic configuration for coining a suffixless action noun; cf. the left paradigm in Figure 1. Such a noun is actually attested for the pair *ořezat / ořezávat* 'to cut.IPFV off' (*ořez* 'cutting off' in (38)) and parallel verb pairs with the *řez* root but different prefixes (cf. *výřez* 'cut-out', *zářez* 'notch', *prořez* 'cutting through'). On the contrary, it cannot be coined from *přisolit / přisolovat* 'to add.PFV/IPFV more salt' (39).

The possibility of deriving a suffixless noun once a suffixed verb pair is available is documented also for other verbs with verbal roots (cf. (40) and also *nadhoz* 'throwing up', *odhoz* 'tossing away' and other), whereas with verbs containing nominal roots (41, 42) the derivation of a suffixless prefixed noun is blocked, so this difference, too, seems to be related to the word class of the root. The impossibility to derive a suffixless noun from the verb pair in (43) might be seen as evidence of the denominal behaviour of these verbs.

(38) *říznout* 'to cut.PFV' > *oříznout / ořezávat* 'to cut.PFV/IPFV off' > *ořez* 'cutting off'

(39) *sůl* 'salt' > *solit* 'to salt.IPFV' > *přisolit / přisolovat* 'to add.PFV/IPFV more salt' > **přísol*

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[20] In all these cases, the bond between the noun and the denominal verb (*odpor* 'protest' > *odporovat* 'to protest.IPFV') is synchronically more transparent than between the verb pair and the noun (*odepřít / odpírat* 'to deny.PFV/IPFV' > *odpor* 'protest'), which was the reason why the nouns were analysed with regard to the single (deverbal) verbs in the sample.

(40) *hodit* 'to throw.PFV' > *vyhodit / vyhazovat* 'to toss.PFV/IPFV up' > *výhoz*
      'tossing up'

(41) *list* 'leaf' > *listovat* 'to leaf.IPFV' > *prolistovat / prolistovávat* 'to leaf.PFV/IPFV
      through' > **prolist*

(42) *prach* 'dust' > *prášit* 'to dust.IPFV' > *oprášit / oprašovat* 'to dust.PFV/IPFV off' >
      *opraš

(43) *obchod* 'trade' > *obchodovat* 'to trade.IPFV' > *zobchodovat / zobchodovávat* 'to
      complete.PFV/IPFV a trade' > **zobchod*

6 Conclusions

Suffixless nouns in Czech have been described in the literature either as derivatives of the corresponding verbs, or as bases for these verbs, essentially on the basis of semantics. When dealing with authentic language material, available dictionaries may not provide sufficient coverage, and semantic evidence (as the most important of the long-debated criteria for determining the direction of derivation) is often not distinctive enough to classify a pair of a noun and a verb as either verb-to-noun or noun-to-verb derivation. Dealing with 250 nouns and corresponding verbs extracted from a corpus, the main question of this study was whether the nouns themselves or the related verbs exhibit any features in their form or usage in synchrony that would support the assumption that they take part in two distinct underlying processes or, more precisely, in analogous processes with the opposite direction, and if so, whether any of the features can be exploited in determining the direction of derivation. An essential requirement was that the features analysed can be extracted from existing linguistic resources.

   Although the analysis was limited to a relatively small data sample, I believe that it has revealed a relationship between the direction of derivation (as interpreted from the meaning definition in the dictionary) and the way the verb forms its aspectual counterpart. The correlations observed can be summarized as follows:

– Suffixless nouns with verbal (action) semantics usually correspond to two verbs that
   have different suffixes expressing different grammatical aspects. In this case, the verbs
   are seen as motivating the noun or, in a non-directional approach, both the noun and
   the pair of verbs are based on a verbal root.
– Suffixless nouns with nominal (non-actional) semantics correspond to verbs that are
   typically imperfective and form their perfective counterpart by prefixation. In this
   case, the suffixless noun can be considered to be the base word for the imperfective
   verb or, alternatively, both the noun and the verb are based on a nominal root.

   The observed relationship between the direction of derivation and the formation of aspectual counterparts has not been, to the best of my knowledge, discussed in the literature on Czech so far. The very next step in the investigation will be to examine whether it provides an intuitively acceptable analysis for larger samples of suffixless

nouns, including borrowings, neologisms, and low-frequency items, and if so, whether it is applicable also to other formations.

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