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SYSTEMIC AND NON-SYSTEMIC VALENCY BEHAVIOR OF CZECH DEVERBAL ADJECTIVES

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Abstract: We present results of an automatic comparison of valency frames of interlinked adjectival and verbal lexical units based on the valency lexicons NomVallex and VALLEX. We distinguish nine derivational types of deverbal adjectives and examine whether they tend to display systemic or non-systemic valency behavior. The non-systemic valency behavior includes changes in the number of valency complementations and, more dominantly, non-systemic forms of actants, especially a prepositional group.

Keywords: deverbal adjective, derivational type, non-systemic valency, passive valency

1 INTRODUCTION

Similarly to valency of verbs and deverbal nouns, valency of deverbal adjectives (DAs) plays an important role in the syntactic structure of a sentence ([1], [2], [3], [4]). It is typical of the surface syntactic structure of deverbal adjectives that one valency slot of their base verb occupies a position of a noun being modified by the given adjective ([5]; Sect. 2.2). Which particular valency slot turns into the governing noun depends on the derivational type of the DA (Sect. 2.1 and 2.2). For example, both *podezírající* 'suspecting' (2) and *podezíraný* 'suspected' (3) are derived from the verb *podezírat* 'to suspect' (1), but the governing noun of the former corresponds to the verbal Actor (ACT; i.e., who is suspecting), and of the latter to the verbal Addressee (ADDR; i.e., who is suspected). The valency complementations that remain in the valency frame (VF) of a DA are expected to inherit morphemic forms from the corresponding valency complementations of their base verb (([6], [7]); cf. the same forms of Patient (PAT) in (1–3) and the same form of ADDR in (1–2)), or to change in a regular way, cf. the predictable change Nom > Ins / *od* 'from'+Gen in (1) and (3).

(1) *podezírat* 'to suspect': ACT(Nom) ADDR(Acc) PAT(*z*+Gen,že)
policie.ACT ***podezírá*** *politika*.ADDR *z podvodu*.PAT / *že podvádí*.PAT
'the police suspects a politician of a fraud / that he is swindling'

(2) *podezírající* ‘suspecting’: ADDR(Acc) PAT(*z*+Gen,že)
policie ***podezírající*** *politika*.ADDR *z podvodu*.PAT */ že podvádí*.PAT
‘police suspecting a politician of a fraud / that he is swindling’

(3) *podezíraný* ‘suspected’: ACT(Ins,*od*+Gen) PAT(*z*+Gen,že)
politik ***podezíraný*** *policií*.ACT *z podvodu*.PAT */ že podvádí*.PAT
‘a politician suspected by the police of a fraud / that he is swindling’

However, various irregularities (described in the literature only cursorily ([6], [8])) are rather common, including changes in the number of valency complementations, cf. the only valency slot in the VF of the DA *podezřelý-1* ‘suspect(ed)’ (4a), as well as non-predictable changes in morphemic forms of some valency complementations, cf. the forms of ACT and PAT of the adjective *podezřelý-2* ‘suspect’ (4b) and the forms of ADDR and PAT of the adjective *podezíravý* ‘suspectful’ (5) with those in (1).

(4) a. *podezřelý-1* ‘suspect(ed)’: PAT(*z*+Gen,že)
politik ***podezřelý*** *z podvodu*.PAT */ že podvádí*.PAT
‘a politician suspect(ed) of a fraud / that he is swindling’

b. *podezřelý-2* ‘suspect’: ACT(Dat) PAT(Ins)
politik ***podezřelý*** *policii*.ACT *potenciálně podvodným jednáním*.PAT
‘a politician suspect to the police due to [lit. by] a potentially fraudulent act’

(5) *podezíravý* ‘suspectful’: ADDR(*k*+Dat) PAT(že)
policie ***podezíravá*** *k politikovi*.ADDR, *že podvádí*.PAT / **z podvodu*.PAT
‘police suspicious towards a politician, that he is swindling / *of a fraud’

In this paper, we exploit manually annotated valency properties of Czech deverbal adjectives and verbs captured in valency lexicons NomVallex [9] and VALLEX [10] (Sect. 2). Drawing on an automatic comparison between VFs of DAs and their base verbs enables us to specify regular (systemic) and irregular (non-systemic) valency behavior of deverbal adjectives (Sect. 3). We provide the first statistical data and show what kinds of non-systemic valency behavior of DAs are the most frequent and what derivational adjectival types are subject to non-systemic changes to the largest extent (Sect. 4).

2 DEVERBAL ADJECTIVES IN THE NomVallex LEXICON

NomVallex is a valency lexicon of Czech deverbal nouns [9], adjectives and deadjectival nouns; it is based on the theoretical framework of the Functional

Generative Description (FGD) and on corpus data (Czech National Corpus, subcorpus SYNv8 [11], and Araneum Bohemicum Maximum [12]). Each lexical meaning of an adjective is treated as one lexical unit (LU) of a lexeme. Applying the valency theory of the FGD [13], valency properties of a LU are captured in a valency frame, which is modeled as a sequence of valency slots, supplemented with their morphemic forms. The following types of complementations may fill in the individual slots of VFs of most deverbal adjectives: obligatory or optional actants, i.e., Actor (ACT), Patient (PAT), Addressee (ADDR), Effect (EFF), and Origin (ORIG), e.g., *chtivý peněz*.PAT 'avid for money', *prodejný mládeži*.ADDR 'marketable to the youth', *odvolatelný z funkce*.ORIG 'dismissible from the post', and obligatory free modifications, especially those with the meaning of direction, e.g., *stěna přilehlá ke kostelu*.DIR3 'a wall adjoining to the church'.

NomVallex currently contains 258 adjectival LUs in 160 lexemes, out of which 195 LUs in 128 lexemes are considered to be deverbal. Deverbal adjectives are classified into nine types (Sect. 2.1, Table 1), and where possible, valency frames of particular LUs are linked to valency frames of their base verbal LUs in the VALLEX lexicon (164 adjectival LUs, 6 of which are linked to more than one verb, Sect. 4).

In NomVallex, all Czech deverbal derivates with adjectival inflection are regarded to be deverbal adjectives, no matter whether they denote an action (e.g., *porota rozhodující o cenách* 'jury deciding the awards'), a property (e.g., *rozhodující okamžik* 'decisive moment') or an object (*můj známý* 'an acquaintance of mine').

2.1 Types of deverbal adjectives

We distinguish nine derivational types of deverbal adjectives, exemplified here by DAs derived from verbs *podezřívat* 'suspect' and *rozpadat se – rozpadnout se* 'disintegrate' (Table 1). The classification is somewhat heterogenous: types (i)–(iv) are characterized by mostly regular derivation from transgressive and participial verbal forms, types (v)–(vii) reflect what the adjectives mostly denote, and types (iv') and (viii) are singled out from the preceding groups because of their specific valency properties.[1]

Because types (i)–(ii) are expected to display systemic valency behavior [7] and types (vii)–(viii) usually have no valency complementations (cf. the adjective-noun *podezřelý* 'the suspect' with an empty VF and *zařízení čtoucí dopravní značky* 'a device reading traffic signs' vs. *čtecí zařízení // *zařízení čtecí dopravní značky* 'reading device // device intended for reading *traffic signs'), these DAs are only rarely covered in NomVallex. Instead, types (iii)–(vi) are focused on (Sect. 4).

[1] We take types (i)–(iv) and (v)–(vii) from [14]. However, the relationship between the derivational suffix and DA's meaning is not always straightforward (e.g.. the adjective *rozpadací* 'disintegrating easily' is not an adjective of purpose).

Adjectival type			*podezřívat*^{impf} – *podezírat*^{impf} – **podezřít*^{pf} ‘to suspect’	*rozpadat se*^{impf} – *rozpadnout se*^{pf} ‘to disintegrate’
Derived from	(i)	present transgressive	*podezřívající* – *podezírající* ‘suspecting’	*rozpadající se* ‘disintegrating’
	(ii)	past transgressive	-	*rozpadnuvší se* ‘having disintegrated’
	(iii)	active participle	*podezřelý* ‘suspect (adjective)’	*rozpadlý* ‘disintegrated’
	(iv)	passive participle (perfective or imperfective)	*podezíraný* – *podezřívaný* ‘suspected’	-
	(iv’)	passive participle of a (typically perfective) reflexive intransitive verb	-	*rozpadnutý* ‘disintegrated’
Expressing	(v)	potential to be affected by an action, with the most productive suffix *-telný*	*podezíratelný* – *podezřívatelný* ‘one who can be suspected’	*rozpadnutelný* ‘that which can be disintegrated’
	(vi)	property resulting from a tendency to repeat an action, formed with various suffixes	*podezíravý* – *podezřívavý* ‘suspectful’	*rozpadavý* ‘(prone to) disintegrating’
	(vii)	purpose, mostly using suffix *-cí*, e.g. *krycí* ‘aimed to cover’	-	*rozpadací* ‘disintegrating easily’
	(viii)	a concretum, usually a person (semantically a noun, formally an adjective)	*podezřelý* ‘suspect (noun)’	-

Tab. 1. Types of DAs

2.2 Adjectival passive valency

According to [15], adjectives usually have one valency slot which is filled with the noun they modify (so-called passive valency; e.g., *rozpadlý plot* ‘disintegrated fence’). In case of DAs, it corresponds to a valency slot of the base verb [5] (e.g., the ADDR in constructions *podezírat politika.*ADDR *z podvodu.*PAT ‘to suspect a politician of a fraud’ > *politik podezíraný z podvodu.*PAT ‘a politician suspected of a fraud’). In the VFs of DAs, we treat passive valency as a form of expression of a valency complementation and mark it by an upward arrow, see (6). The distribution

of passive valency across the annotated adjectival types in NomVallex is given in Table 2.

(6) *podezíraný* 'suspected': ACT(Ins,*od*+Gen) PAT(*z*+Gen,že) ADDR(↑)

Type	Number of LUs			
	Passive valency			Total
	ACT(↑)	ADDR(↑)	PAT(↑)	
(i)	9	-	-	9
(ii)	3	-	-	3
(iii)	25	2	1	28
(iv)	9	4	18	31
(iv')	11	-	-	11
(v)	3	-	17	20
(vi)	71	-	15	86
(vii)	-	-	1	1
(viii)	3	1	2	6
Total	134	7	54	195

Tab. 2. Passive valency of DAs in NomVallex

Only types (i) and (ii) systematically use ACT as their passive valency, the others, though preferring one complementation to be their passive valency, allow for exceptions, often caused by unusual valency behavior of their base verb or by uncertainty about their base verbal LU, especially in case of reflexive and non-reflexive verbal variants. Adjectives representing type (iii) logically strongly prefer ACT to be their passive valency (e.g., *problém vzniklý z čeho* 'a problem arising from sth.'), however, also PAT (*škoda vzniklá komu*.ACT 'harm inflicted upon sb.') or ADDR (*podezřelý z čeho* 'suspect(ed) of') are exceptionally possible. Types (iv) and (v) obviously prefer PAT (e.g., *povolaný* 'conscripted') or ADDR (*podezíratelný* 'one who can be suspected') to be their passive valency. However, there are several cases in which ACT stands in this position, e.g., with the adjective *poddajný* 'docile' derived from the reflexive verb *poddat se* 'yield', rather than from its non-reflexive variant *poddat* 'subdue'. Reflexivity of the base verbal lexical unit also leads to using ACT as passive valency with adjectives representing type (iv') (e.g., *odhodlaný* 'determined', *rozhádaný* 'quarreling (e.g., couple)', *zamilovaný* 'in love'). Type (vi) is a heterogenous group of DAs derived by various suffixes and expressing various properties; in our data, these DAs prefer ACT to be their passive valency (e.g., *vnímavý* 'sensitive'). Types (vii) and (viii), i.e., adjectives of purpose and adjectives denoting a person, are too rare in our data to be able to generalize their typical passive valency.

3 SYSTEMIC AND NON-SYSTEMIC VALENCY BEHAVIOR OF DEVERBAL ADJECTIVES

3.1 Systemic valency behavior

Systemic valency behavior of DAs concerns both deep and surface realization of adjectival valency and it differs depending on the adjectival type.

When determining the deep syntactic structure of DAs, i.e., especially members of their valency frames, the adjectives are expected to inherit all actants that are present in the valency frame of their base verbal lexical unit, though one of them is only expressed as passive valency (Sect. 2.2).

As for the surface expression of actants, all morphemic forms which do not change are regarded to be systemic. These include prepositionless cases Gen, Dat, Acc and Ins, an infinitive (Inf), prepositional groups (PGs), conjunctions and content clauses (CONT), expression *jako* 'as'+Nom (e.g., *proslulý jako* 'famous as'), and expressions containing preposition *za* 'as/for' plus an adjective in Acc (*za*+adj-Acc, e.g., *považované za méněcenné* 'considered to be inferior').

There are two verbal morphemic forms that we consider to be subject to systemic changes, namely Nom (7) and prepositionless Acc (8). Changes Nom > Ins / *od* 'from'+Gen are typical of ACT of adjectives belonging to types (iv) [5] and (v), though the change Nom > *od* 'from'+Gen is rather rare.

(7) *hacker*.Nom ***vydírá*** *podnikatele*.Acc
'a hacker is blackmailing an entrepreneur'

(a) Nom > Ins
podnikatel ***vydíraný*** / ***vydíratelný*** *hackerem*.Ins
'an entrepreneur blackmailed / susceptible to blackmailing by a hacker'

(b) Nom > *od* 'from'+Gen
podnikatel ***vydíraný*** / ***vydíratelný*** *od hackera*
'an entrepreneur blackmailed / susceptible to blackmailing from a hacker'

(8) Acc > Gen
znát *poměry*.Acc > ***znalý*** *poměrů*.Gen
'to know the conditions > knowledgeable about the conditions'

While no adjectival complementation can be expressed by Nom, Acc can be subject to the systemic change Acc > Gen but can also remain unchanged, esp. with DAs of types (i), e.g., *znající něco* 'knowing sth.', and (ii), e.g., *poznavší něco* 'having learnt sth.'. Actants of other adjectival types only exceptionally allow expression by an Acc, e.g., *dlužný někomu vysvětlení*.Acc 'owing sb. an explanation'

and *dvě děti naučené jednu roli*.Acc ‘two children who-have-learnt the same role’. Instead, the other adjectival types prefer the systemic change Acc > Gen, e.g., *znalý poměrů*.Gen ‘knowledgeable about the conditions’ and *chtivý peněz*.Gen ‘avid for money’.

3.2 Non-systemic valency behavior

Non-systemic valency behavior of DAs involves three phenomena:

i. a change in the number of slots in the valency frame of an adjective (e.g., the VF of the adjective *chtivý* ‘avid’, which is derived from *chtít* ‘to want’, only contains PAT, e.g., *chtivý peněz*.PAT ‘avid for money’, losing the original verbal ORIG, cf. **chtivý od někoho*.ORIG ‘*avid from sb.’; Sect. 4.1);

ii. non-systemic forms of actants (e.g., Acc > Dat, *vláda poslouchá prezidenta*. Acc > *vláda poslušná prezidentovi*.Dat ‘the government obeys the president > government obedient to the president’; Sect. 4.2 and 4.3);

iii. a change in the nature of a valency complementation to exclusively nominal in the case of adjectives of type (viii); for example, the adjective-noun *známý* ‘acquaintance, friend’ denotes a person and its VF only contains the nominal complementation Appurtenance (e.g., *můj*.APP *starý známý* ‘an old acquaintance of mine’). However, this is extremely rare in the NomVallex data and is not dealt with in the paper.

4 AN AUTOMATIC COMPARISON OF VERBAL AND ADJECTIVAL VALENCY FRAMES

Our automatic comparison of VFs of adjectives in NomVallex and VFs of their base verbs in VALLEX covers 164 verb–adjective pairs. The automatic procedure captures systemic valency behavior (when the number and type of valency slots, including passive valency, is the same in the adjectival VF as in the corresponding verbal VF and their forms are either the same or correspond to a systemic change, see Sect. 3.1) as well as non-systemic valency behavior; its output is captured in the `valdiff` attribute of the DA.

In this Section, we only focus on differences in the number or forms of actants, leaving out free modifications. Going from the deep to the surface valency structure, we first focus on the difference in the number of actants (Sect. 4.1), then we provide the general statistics on the number of systemic and non-systemic morphemic forms in adjectival VFs (Sect. 4.2), and finally we present the distribution of non-systemic adjectival forms (Sect. 4.3).

4.1 Differences in the number of actants

Any change in the number of actants (i.e., in the deep syntactic structure) between a verb and a DA indicates a change in meaning. Table 3 exemplifies DAs with different number of actants and shows that such changes are rather rare, especially when it comes to adding a new actant (e.g., *zuřivý vůči podvodníkům*. ADDR 'furious at the swindlers') or deleting one but not all actants (e.g., *podezřelý z podvodu*.PAT **policií*.ACT 'suspect(ed) of a fraud *by the police'). Deleting actants may affect all types of DAs, even particular LUs of type (i), e.g., *rozhodující okamžik* 'decisive moment'.

Actant	Passive valency	„Standard" valency				
		Shared	Added	Deleted		Total
				EMPTY VF	Non-EMPTY VF	
ACT	107	41	-	11 *dotčený* 'in question'	6 *podezřelý-1* 'suspect(ed)'	58
ADDR	7	11	1 *zuřivý k*+Dat 'furious at sb.'	4 *prodejný* 'corruptible'	4 *způsobilý* 'eligible'	20
EFF	-	8	1 *příjemný čím* 'pleasant by/ due to'	2 *oprávněný* 'justified'	-	11
ORIG	-	5	2 *zkušený z*+Gen 'experienced [lit. from]'	1 *vědomý* 'willful'	5 *chtivý* 'avid'	13
PAT	50	87	-	21 *rozhodující* 'decisive'	1 *přejícný* 'ungrudging'	109
Total	164	152 72%	4 2%	39 18,5%	16 7,5%	211 100%

Tab. 3. A difference in the number of adjectival actants

4.2 Systemic vs. non-systemic morphemic forms

A general statistics on the number of morphemic forms in verbal and corresponding adjectival VFs is given in Table 4. Looking at the average numbers of all systemic and non-systemic forms, we can see that non-systemic forms account for 30% of the total number of adjectival forms in our data; the highest percentage of non-systemic forms is detected with types (vi), 51% (e.g., *podezíravý k politikovi* 'suspectful towards a politician'), and (iv'), 32% (e.g., *dojatý z vyprávění* 'touched by

[lit. from] the story'). However, even DAs of type (vi) may display systemic valency behavior (e.g., *nápomocný* 'helpful', *pamětlivý* 'mindful'). In line with our expectations, types (i) and (ii) only use systemic morphemic forms. In case of types (vii) and (viii) (with 1 and 6 verb-adjective pairs, respectively), only slots corresponding to passive valency are shared between the base verbs and the derived adjectives.

Adjectival type	Verb -adjective pairs	Base verb's forms	Adjectival forms				
			Systemic		Non-systemic		Total (100%)
				%		%	
(i)	9	23	23	100%	0	0%	23
(ii)	3	5	5	100%	0	0%	5
(iii)	14	31	22	75%	7	25%	29
(iv)	30	84	70	86%	11	14%	81
(iv')	9	21	17	68%	8	32%	25
(v)	18	19	19	76%	6	24%	25
(vi)	74	139	57	49%	58	51%	115
Total	157	322	213	70%	90	30%	303

Tab. 4. The number of systemic and non-systemic adjectival morphemic forms of actants shared between the base verb and a derived DA, excluding the passive valency

4.3 Distribution of non-systemic forms of adjectival actants

Our data shows that a prepositional group is the most frequent non-systemic form, documented esp. with PAT (43 instances, e.g., PG *k* 'to'+Dat in (9)), or ACT (11 instances, e.g., PG *pro* 'for'+Acc in (10)). As for a non-systemic PG as an expression of PAT or ADDR, it often occurs in valency frames of adjectives expressing a property which relates to sb./sth., e.g., *vnímavý* 'sensitive', *podezíravý* 'suspectful', *snášenlivý* 'tolerant', see (9) and (11).

(9) ***vnímat*** *potřeby*.PAT *jiných* > ***vnímavý*** *k potřebám*.PAT *jiných*
'to sense the needs of others > sensitive towards the needs of others'

(10) *nevidomí občané*.ACT *mohou* ***vnímat*** *výstražný pás*.PAT >
'blind people can perceive the safety strip' >
výstražný pás ***vnímatelný*** *nevidomými občany*.ACT / *pro nevidomé občany*.ACT
'a safety strip perceivable by the blind people / for the blind people'

(11) ***podezírat*** *politika*.ADDR > ***podezíravý*** *k politikovi*.ADDR
'to suspect a politician > suspectful towards a politician'

The second most frequent non-systemic form is a prepositionless case, surprisingly Dat for both ACT and PAT, cf. (12–14); Gen and Ins are also possible for PAT and EFF, see (12), (15) and (16).

(12) *policie*.ACT ***podezírá*** *politika*.ADDR, *že podvádí*.PAT >
'the police suspects a politician that he is swindling' >
politik ***podezřelý*** *policii*.ACT *potenciálně podvodným jednáním*.PAT
'a politician suspect to the police by a potentially fraudulent act'

(13) ***účastnit se*** *našeho jednání*.PAT > ***účastný*** *našemu jednání*.PAT
'to take part in our talks > taking part in [lit. to] our talks'

(14) *vláda* ***poslouchá*** *prezidenta*.PAT >
'the government is obeying the president' >
vláda ***poslušná*** *prezidentovi*.PAT
'a government obedient to the president'

(15) ***nemůže*** *promluvit*.PAT > *není* ***mocen*** *slova*.PAT
'he isn't able to speak > incapable of a word'

(16) *spisovatel*.ACT ***zná*** *o městě*.PAT *historku*.EFF >
'a writer knows a story about the town' >
město je spisovateli.ACT ***známé*** *historkou*.EFF
'a town known to the writer through a story'

Actants PAT and EFF may be expressed by a non-systemic infinitive or a content clause, cf. (17–18) for PAT.

(17) *osoba* ***odpovědná*** *jednat*.PAT
'sb. responsible to act'

(18) ***spokojený****, že vše dobře dopadlo*.PAT
'content that everything ended well'

Actant	Morphemic form	Adjectival type					Total
		(iii)	(iv)	(iv')	(v)	(vi)	
ACT	Dat	1	-	-	1	3	5
	PG	-	-	-	4	7	11
ADDR	PG	-	-	-	-	3	3
EFF	Ins	-	-	-	-	2	2
	PG	-	2	-	-	1	3
	Inf	-	1	-	-	-	1
	CONT	-	1	-	-	1	2

Actant	Morphemic form	Adjectival type					Total
		(iii)	(iv)	(iv')	(v)	(vi)	
ORIG	PG	-	-	-	1	-	1
PAT	Gen	-	-	-	-	1	1
	Dat	-	-	-	-	3	3
	Ins	1	-	-	-	-	1
	PG	2	7	2	-	32	43
	Inf	1	-	2	-	2	5
	CONT	2	-	4	-	3	9
Total		7	11	8	6	58	90

Tab. 5. A distribution of non-systemic adjectival forms

5 CONCLUSION

We have presented results of an automatic comparison of valency frames of interlinked adjectival and verbal lexical units based on the valency lexicons NomVallex and VALLEX. Differentiating nine types of Czech deverbal adjectives, we have observed that non-systemic valency behavior of deverbal adjectives is mostly manifested by either a difference in the number of actants or non-systemic forms of actants, out of which the non-systemic forms are more dominant, represented especially by a non-systemic prepositional group. While a difference in the number of actants may affect all types of deverbal adjectives, even those derived from present transgressives but not denoting an action (e.g., *rozhodující okamžik* 'decisive moment'), non-systemic forms of actants are only characteristic of selected adjectival types, most significantly of adjectives derived from verbs not strictly regularly and denoting various properties (e.g., *podezíravý* 'suspectful').

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