Representing scales: Degree result clauses and emphatic negative polarity items in Romanian

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Abstract

The paper proposes a representational re-encoding of the scalar, pragmatic accounts of NPI licensing within the framework of *Lexical Resource Semantics* (LRS). The analysis focuses on a less researched distribution pattern: emphatic NPIs occurring in result clause constructions that receive an intensification reading. We will provide a scalar extension of a standard semantic account of result clauses to capture the high degree interpretations. Our investigation will also offer new insights on NPI licensing in embedded clauses. We will primarily consider Romanian data.

1 Introduction

While scalar analyzes play an important role in recent research in formal semantics and pragmatics, there has been no attempt to integrate them into a representational framework. In this paper, we will propose an implementation of the scalar theories within *Lexical Resource Semantics* (LRS, Richter & Sailer 2004) – a constraint-based underspecified semantic combinatorics for HPSG. In particular, we will discuss two phenomena for which a scalar approach is very natural: high degree readings of finite *result clause constructions* (RCX) and *emphatic negative polarity items* (E-NPI). We base our analysis on the patterns identified in Romanian.

The paper will proceed as follows: Section 2 describes the distributional properties of the E-NPIs occurring in the Romanian finite RCXs that receive a high degree interpretation. Section 3 defines some important characteristics of the LRS framework. We then propose an LRS-rendering of a scalar approach on NPI licensing, starting from the theory of Krifka (1995) (Section 4). In Section 5, we focus on the analysis of result clauses and on the interaction between emphatic NPIs and degree RCXs, while pointing out some important differences between Romanian and English; we also adapt the standard semantic analysis of degree result clauses from Meier (2003) and provide an LRS description. In Section 6, we develop an analysis of the fixed, idiomatic degree result clauses, which contribute a plain intensification reading, as *mixed expressives* with non-at-issue literal meaning (Gutzmann, 2011). Section 7 concludes the paper.

2 Data

In this paper, we focus on finite *result clause constructions* (RCXs), which express a primary predication in the main clause and a secondary predication in the result clause (RCl) – see example (1). We restrict ourselves to RCls modifying adjectives, where the RCl can be used to make a high degree statement for the

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matrix predicate. In (1), the RCX *(atât de) deasă de nu se vede om cu om*, just as its English correspondent *so thick (that) you can't see your hand in front of your face*, can receive the high degree interpretation of 'extremely thick'.

(1) Dimineața e o ceață [**RCX: atât de deasă**, [RCl: **de nu se**
Morning.DEF is a fog so thick.ADJ that not REFL
vede om cu om]].
see.3SG person with person

Intended: 'In the morning, the fog is [**RCX: so thick [RCl: you can't see your hand in front of your face**]].'

In (1), and in (2) below, the content of the RCl corresponds to an extreme outcome of the primary predicate (i.e., it makes an emphatic statement), which triggers the intensification reading of the modified predicate. A similar observation is made in Hoeksema & Napoli (2019), for Dutch and English. Note that in Romanian, unlike in English, high degree RCXs do not require a degree marker, *atât de/așa de* 'so'. We will discuss this in detail in Section 5.

(2) Ion e [**RCX: așa de prost [RCl: de nu știe cum îl cheamă (cu buletinul în mână)**].

lit.: Ion is so stupid that he does not know his own name (with the ID in hand).

Intended: 'Ion is [**RCX: so stupid [RCl: he can't see a hole in a ladder**]].'

We have analyzed a special type of degree RCXs, where the secondary predication in the RCl is an *emphatic negative polarity item* (E-NPI). E-NPIs, which are a prominently-studied case of emphatic statements (see Krifka 1995, Eckardt 2005, Chierchia 2006, and others), represent expressions that are excluded from positive environments. As shown below, a positive statement would make the expressions highly infelicitous:

(3) Dimineața e o ceață [atât de deasă, de #**(nu)** se vede om cu om].

Intended: 'In the morning, the fog is [so thick you can #**(not)** see your hand in front of your face].'.

(4) Ion e [așa de prost de #**(nu)** știe cum îl cheamă (cu buletinul în mână)].

Intended: 'Ion is [so stupid he can #**(not)** see a hole in a ladder].'.

Many E-NPIs are also *minimizers*, which typically denote minimal elements on a contextually-salient scale. In the examples above, *se vede om cu om* (lit. *see the person in one's immediate range of sight*), corresponding to the English *see one's hand in front of one's face*, emphatically expresses what for the speaker counts as a minimal range of visibility; *știe cum îl cheamă* (lit. *he knows his own* *name*) stands for a minimal manifestation of one's knowledge, while the English correspondent, *see a hole in a ladder*, suggests a minimal manifestation of one's sensitivity to details. The observation is that negating some minimum pragmatic threshold on a contextual scale can lead to strong emphatic utterances (Krifka 1995, Eckardt 2005); this further proves that, when embedded in RCls, negated minimizers can be very naturally employed for triggering a high degree reading of the matrix predicates. For example, in *ceață atât de deasă de nu* ***se vede om cu om*** 'fog so thick that you can't **see your hand in front of your face**', the minimizer could be interpreted as emphatically indicating an extremely low degree of visibility, and, when negated, it triggers an inference related to the (extreme) intensity of the fog.

In what concerns the complementizers, in Romanian, RCls can be introduced with *încât* (which is the default case), *că*, or *de* (see GBLR, Pană Dindelegan 2010, 583). When it occurs in RCls, *de* seems to be restricted to emphatic sentences. In (5), a strongly favorable consequence of the quality of being elegant (i.e., being *admired*) is contrasted with a neutral consequence, where Ion is no more than *noticed*:

(5) Ion se îmbracă atât de elegant [**încât/de** lumea îl *admiră*]/
Ion REFL dresses so elegantly that people him *admire*/
[**încât/#de** lumea îl *observă*].
that people him *notice*
'Ion dresses so elegantly that people *admire* him/that people (no more than) *notice* him.'

Conventionalized finite RCls, many originating from RCls hosting regular word combinations associated with an extreme outcome, seem to represent a productive pattern for expressions that have been lexicalized into high-degree modifiers in Romanian – cases when the RCl expresses a high degree of intensity of the primary predicate, and the result interpretation is entirely replaced by an intensification reading (see (6)). Moreover, the most conventionalized expressions that have evolved into high-degree modifiers normally collocate with *de* and reject interchangeability with *încât*, the regular connector for the non-conventionalized RCls; this further proves that *de* is strongly associated with an intensification interpretation:

(6) a. *(frumoasă)* [*de/# încât nu se poate*]
(lit.: (so beautiful) that it cannot be) 'very beautiful'
b. *(frumoasă)* [*de/# încât mori*]
(lit.: (so beautiful) that one dies) 'very beautiful'.

Up to this point, we have made the following observations: RCXs can have a high degree interpretation (**OBS1**); *de*-RCXs require an emphatic statement inside the RCl (**OBS2**); there are lexicalized RCls that *only* have an intensification reading (**OBS3**).

In the rest of the chapter, we will present four tests (**T1–T4**) that we have designed in order to classify E-NPIs embedded in high-degree RCls. For Romanian, we have identified three main types of E-NPIs; each type will be illustrated with one example:

(7) a. E-NPI1: *a (nu) vedea la un pas* 'not see within a step'
(lit.: not to see a step ahead)
(referential, result reading: 'there is no visibility at all')

b. E-NPI2: *a (nu) se vedea om cu om* 'not REFL see person with person'
(lit.: not to see the person in one's immediate range of sight)
(referential, result reading: 'there is no visibility at all')

c. E-NPI3: *a (nu) [te/vă] vedea* 'not CL.ACC.2SG/PL I.see'
(lit.: not to see you)

Our tests will show that E-NPI1s and E-NPI2s convey a result state of the primary predicate since they have a referential reading – in our examples, related to the *lack of visibility*, i.e., *there is no visibility at all*; E-NPI3s contribute a purely intensifier reading in relation to the matrix predicate, and do not assert a result meaning.

T1: Can we change the RCX into a coordination without changing the meaning of the expression?

(8) E-NPI1 & E-NPI2

a. E o aglomerație pe străzi în timpul grevei [**de** nu *se vede la un pas*]/ [**de** nu *se vede om cu om*].
'There is a huge crowd in the streets during the strike.' (lit.:There is a crowd in the streets during the strike **that** one cannot see a step ahead/ **that** one cannot see the person in their immediate range of sight.)

b. = E o aglomerație pe străzi în timpul grevei [**și** nu *se vede la un pas*]/ [**și** nu *se vede om cu om*]. (lit.: There is a crowd in the streets during the strike **and** one cannot see a step ahead/ **and** one cannot see the person in their immediate range of sight.)

(9) E-NPI3

a. Emoțiile astea mi-au făcut foame [**de** nu *te văd*]. (CoRoLa)
'These emotions made me extremely hungry.'
(lit.: These emotions made me hungry **that** I cannot see you.)

b. ≠ Emoțiile astea mi-au făcut foame [**și** nu *te văd*].
(lit.: These emotions made me hungry **and** I cannot see you.)

In **T1**, we have started from an RCX and changed it into a coordination, where a result relation can still be inferred. Both E-NPI1 and E-NPI2 pass the test – (8b); however, if the sentence hosting E-NPI3 is considered in isolation, the expression suffers a change in meaning since only the *literal* reading is available in coordination – see (9b) – i.e., **T1** distinguishes between the third type and the first two types of E-NPIs. E-NPI1 and E-NPI2 are felicitous according to **T1**, since their meaning, based on a scalar inference (i.e., *there is no visibility at all*), remains unchanged when used outside an RCX. In other words, E-NPIs such as *a se vedea la un pas* and *a se vedea om cu om* clearly have distinct *literal* meanings – one expressing visibility within the distance of a step, the other visibility to the nearest person in someone's immediate range of sight. Used as E-NPIs, however, both assert a minimal degree of visibility. By contrast, an E-NPI3 undergoes a change in meaning when used in a coordination structure – see the infelicity of (9b). Thus, the meaning that the expression would have in isolation does not contribute to the high degree reading of the entire RCX.

In **T1**, the RCX is changed into a coordination, and a result relation can be inferred in all the examples. In **T2**, we will look at cases in which no such relation can be inferred. Since E-NPI3 is already excluded by **T1**, we will only apply **T2** to E-NPI1 and E-NPI2:

> **T2**: Can the expression be used felicitously if the context does not permit the inference of a result relation?

(10) E-NPI1 & E-NPI2
Mergeam pe stradă [**și** nu *se vedea la un pas*]/
[#**și** nu *se vedea om cu om*].
(lit.: I was walking down the street **and** one could not see a step ahead/ **and** one could not see the person in their immediate range of sight.)

As shown in (10), E-NPI1 passes **T2**, whereas E-NPI2 cannot be used felicitously in the absence of a salient result relation in discourse. This shows that an E-NPI2 is collocationally restricted to a result relation.

The following test looks at the distribution of the possible complementizers of the RCls that occur in high degree result constructions:

> **T3:** Is variation possible with respect to the RCl complementizer without a change in the meaning of the expression in the RCl?

(11) E-NPI1 & E-NPI2
E așa de întuneric afară [**de/încât** nu *se vede la un pas*]/ [**de/încât** nu *se vede om cu om*].
(lit.: It's so dark outside that one cannot see a step ahead/
that one could not see the person in their immediate range of sight.)
'It is very dark outside.'

(12) E-NPI3

Emoțiile astea mi-au făcut foame [**de**/# **încât** nu *te văd*].

(lit.: These emotions made me hungry **that** I cannot see you.)

'These emotions made me extremely hungry.'

In (11), E-NPI1 and E-NPI2 allow for both *de* and *încât*, while the meaning of the RCl remains unchanged (i.e, *there is no visibility at all*); by contrast, E-NPI3 requires the presence of *de*, see (12). The use of *încât* in (12) triggers a change in meaning: the expression in the RCl can only be interpreted *literally*, which leads to infelicity.

T4 is intended to clarify what is the meaning contributed by RCl hosting the E-NPI to the overall RCX:

T4: Does the RCX entail the proposition in the result clause?

(13) E-NPI1 & E-NPI2

Ninge **a.** [de nu *se vede la un pas*]/**b.** [de nu *se vede om cu om*].

(lit.: It is snowing **a.** [that one cannot see a step ahead]/ **b.**[that one can't see the person in one's immediate range of sight].)

'It is snowing very hard.'

Entails: **a.** Nu *se vede la un pas*./**b.** Nu *se vede om cu om*.
(result reading: both **a.** and **b.** trigger the scalar inference *there is no visibility at all*)

(14) E-NPI3

Emoțiile astea mi-au făcut o foame [de nu *te văd*].

(lit.: These emotions made me hungry [that I cannot see you].)

'These emotions made me extremely hungry.'

Does not entail: Nu *te văd*. (no result reading)

Both expressions in (13) have a high-degree reading, and they entail the proposition in the RCl. In both cases, there is also a result reading since the expressions trigger a scalar inference: If it is snowing so hard that *one cannot see a step ahead*/that one *cannot see the person in their range of sight*, then *there might be no visibility whatsoever*. By contrast, the RCX with the interpretation of 'extremely hungry' in (14) does not entail the meaning of the sentence in the RCl. This shows that the sole meaning contribution of the expression to the RCX is *intensification* i.e., the RCl asserts high degree rather than its result reading.

The results of our tests are summarized in Table 1. They allow us to identify three types of E-NPIs that can occur in RCXs with high degree readings:

(15) a. E-NPI1s are only occasionally used in result clauses and act as intensifiers; there is also a result interpretation.

	T1	T2	T3	T4
E-NPI1: (de) nu se vede la un pas	✓	✓	✓	✓
E-NPI2: *de nu se vede om cu om*	✓	✗	✓	✓
E-NPI3: *de nu [te/vă] văd*	✗	n/a	✗	✗

Table 1: Results of the tests

b. E-NPI2s require a result relation, being bound to the RCXs; they encode a high degree reading, while also keeping the notion of result.

c. E-NPI3s express nothing but intensification, being lexicalized into high-degree modifiers.

Having presented the core data, in the following chapter we will describe the general framework used in the analysis.

3 Framework: Lexical Resource Semantics (LRS)

Lexical Resource Semantics (LRS, Richter & Sailer 2004) is a constraint-based underspecified semantic combinatorics for HPSG – similar in some respects to *Minimal Recursion Semantics* (Copestake et al., 2005) or *Constraint Language on Lambda Structures* (Egg et al., 2001). The major difference is that LRS uses expressions of some standard semantic representation language for the semantic representation of a linguistic expressions – in the present paper, a version of higher order predicate logic. LRS has been successfully applied to a number of challenging phenomena at the syntax-semantics interface, including scope ambiguity (Richter & Sailer, 2004), negative concord (Iordăchioaia & Richter, 2015), gapping (Park et al., 2018), projective meaning (Hasegawa & Koenig, 2011; Sailer & Am-David, 2016), and others. We will use a version of the compact LRS notation introduced in Penn & Richter (2005), which can be transformed into the more explicit AVM-notation used in Richter & Sailer (2004) without loss of information.[1]

In LRS, linguistic signs contribute constraints on the semantic representation of the structure containing them. There are *contribution* constraints, which determine the constants, variables, and operators, and *embedding* constraints, which determine subexpression relationships within the larger semantic representation. LRS is *lexical* in the sense that only lexical items (signs licensed by lexical entries and lexical rules) may make contribution constraints. We use a semantic metalanguage to express LRS-constraints which enriches our representation language with metavariables ($\alpha, \beta, \ldots$).

[1]A complete list of LRS-related publications and other material can be found at https://www.lexical-resource-semantics.de, accessed 14.10.2019.

We briefly illustrate the system with the example in (16a). We show the constraints contributed by the words in (16b). The word *call* requires that the expression $\mathbf{call}(x)$ occur in the semantic representation of the clause. The negated auxiliary constrains the semantic representation to contain a negation, but it does not commit to what is in the scope of the negation. This is expressed with the metavariable α. The quantified NP *everyone* requires a universal quantifier, the variable it binds, and information on the restrictor. The scope is largely underspecified, indicated with the metavariable β. There is an embedding constraint, $\beta[x]$ requiring that whatever expression β is, it must contain an occurrence of x.

(16) a. [S: Everyone [VP: didn't call]].

b. Lexical constraints:

call:	$\mathbf{call}(x)$	*didn't*:	$\neg\alpha$
everyone:	$\forall x(\mathbf{person}(x) \rightarrow \beta[x])$		

When the words combine, these constraints are collected and embedding constraints will be added, depending on the kind of syntactic combination. For the VP, it is required that a semantic contribution of the verb *call* be in the scope of negation, see (17a).[2] When the VP combines with the quantified NP, the expression $\mathbf{call}(x)$ needs to be in the scope of the universal quantifier, (17b).

(17) Phrasal constraints on scoping:

a. $\alpha[\mathbf{call}(x)]$ (*call* is in the scope of negation)

b. $\beta[\mathbf{call}(x)]$ (*call* is in the scope of the subject quantifier).

This leads to the overall constraint in (18). The metavariable γ is constrained to contain a universal quantifier and a negation, both of which will have $\mathbf{call}(x)$ in their scope. The relative scoping of the universal and the negation is, however, not constrained.

(18) $\gamma[\forall x(\mathbf{person}(x) \rightarrow \beta[\mathbf{call}(x)], \neg\alpha[\mathbf{call}(x)]]$

At the level of the overall utterance, there is a closure constraint. This means that the semantic representation of the sentence is any expression that satisfies all the constraints and does not contain any additional elements. We can see which readings there are by looking for *pluggings* (Bos, 1996), i.e., mappings from metavariables to subexpressions of the meta-expression in (18). For our example, there are exactly two possible pluggings, which accounts for the two readings of the sentence. We show these pluggings in (19).

[2] The expression $\mathbf{call}(x)$ is called the *internal content* of the verb, which will be inherited by the auxiliary. Phrase-level embedding constraints typically make reference to the internal content of one of the daughters. See Richter & Sailer (2004) and Penn & Richter (2005) for details.

(19) a. Plugging: $\alpha = \textbf{call}(x); \beta = \neg\alpha; \gamma = \forall x(\textbf{person}(x) \rightarrow \beta)$:
Reading: $\forall x(\textbf{person}(x) \rightarrow \neg\textbf{call}(x))$

b. Plugging: $\alpha = \forall x(\textbf{person}(x) \rightarrow \beta); \beta = \textbf{call}(x); \gamma = \neg\alpha$:
Reading: $\neg\forall x(\textbf{person}(x) \rightarrow \textbf{call}(x))$

We will say a few words on our treatment of presuppositions and conventional implicatures. We largely follow Sailer & Am-David (2016), changing some attributes. All combinatorial and projective semantics information is collected in the value of an attribute LRS. The semantic constraints of a sign are given as meta-expressions on a PARTS-list. A sign's at issue content corresponds to the value of an AT-ISSUE attribute. There are two additional list-valued attributes, PRESUP(POSITIONS) and CI. The PARTS list contains (at least) the meta-expression in the AT-ISSUE value and everything on the PRESUP and CI lists. The final semantic representation of an utterance, i.e. the value of the EX(TERNAL)-CONT(ENT) attribute, contains all meaning components, integrating all presuppositions and CIs. Projective content that appears as part of the EX-CONT value is removed from the PRESSUP and CI lists (Sailer & Am-David, 2016, 653).

Our feature geometry is illustrated in (20), which is an adaptation the analysis of the definite article from Sailer & Am-David (2016). The EXC-CONT is underspecified. The PARTS list contains all meta-expressions of the remaining semantic features. The AT-ISSUE value is just a variable. The existence requirement of definites is encoded as a presupposition in the PRESUP list, and uniqueness is assumed to be a CI and, consequently, included in the CI value.

(20) Semantic constraints of the definite article:

$$\left[\text{LRS}\ \begin{bmatrix}\text{EX-CONT} & \delta \\ \text{PARTS} & \langle x \rangle \oplus \boxed{1} \oplus \boxed{2} \\ \text{AT-ISSUE} & x \\ \text{PRESUP} & \boxed{1}\langle \exists x(\alpha[x] \wedge \beta[x]) \rangle \\ \text{CI} & \boxed{2}\langle \gamma \wedge (\exists x\alpha) \rightarrow (\exists! x(\alpha[x])) \rangle\end{bmatrix}\right]$$

The distinction between presuppositions and CIs is useful as these meaning components have distinct projective properties (see Karttunen & Peters 1979; Bach 1999; Potts 2005; Tonhauser et al. 2013, among others). Presuppositions can be integrated into the at issue content in the scope of operators, CIs need to project until the level of a speech act operator.[3]

4 Analysis 1: NPIs

Having established our framework, we can now propose an LRS-rendering of a scalar theory of emphatic NPIs in the spirit of Krifka (1995). Example (21), which we use for illustration, contains the minimizer NPI *a thing*. We include the at issue content of the sentence.

[3]As we do not use speech act operators here, CIs will be integrated into the highest EX-CONT.

(21) Alex didn't see a thing. $\neg\exists x(\textbf{minimal-thing}(x) \wedge \textbf{see}(\textbf{alex}, x))$

The NPI *a thing* refers to a minimal thing one could perceive visually, for which we use the constant **min(imal)-thing**. Krifka (1995) builds his analysis on a background-focus structure. The focus is determined by the descriptive content of the NPI, here the predicate **min-thing**. Minimizer NPIs trigger larger, scalar alternatives, i.e. alternatives that contain the meaning of the NPI. For our example the set of alternatives is $\{P|\textbf{min-thing} \subseteq P\}$. These alternatives are context dependent. Being on an African safari and trying to spot some animals, for example, the alternatives would include an antelope, a lion, a herd of elephants, etc. – but not trees, photographic equipment or others.

According to Krifka, a minimizer NPI has to be used in an emphatic statement. He expresses this by requiring that what is asserted in a sentence with an NPI must entail what would have been asserted had any of the alternatives been used instead. Example (21) is well formed because it entails all alternatives, i.e., not seeing an antilope, a lion, etc. Without a negation (or another scale-reversing operator), the entailment would not hold, i.e., seeing a minimal thing does not entail seeing an antelope, etc. Krifka (1995) expresses this requirement with a speech-act operator, **ScalarAssert**, that takes a background-focus-alternatives structure as its argument. An NPI triggers a set of alternatives and must be used in an utterance that makes a scalar assertion.

This theory has been widely adapted. Eckardt (2005) refines the semantics of the NPIs, and Chierchia (2004, 2006) shows how this theory can be integrated into Mainstream Generative Grammar. To name just two examples.

While very attractive, the original approach faces some serious problems. First, as NPI licensing is connected to the speech act operator **ScalarAssert**, it is unclear how NPI licensing works in embedded clauses. Our data on NPIs in RCl are a case in point. Second, not all NPIs are emphatic, such as *ever* or unstressed uses of *any*. Third, Eckardt & Csipak (2013) show that the proposal cannot capture the varieties of types of NPIs found in languages.

Previous HPSG-approaches to NPIs, such as Richter & Soehn (2006) or Sailer (2007), address some of these problems, but do not capture the intuitive connection between the minimal semantics of many NPIs and their NPI-hood.

In this paper, we will present a representational rendering of basic ideas from Krifka (1995). The main component of our theory is an operator **ScAs**. It is defined in such a way that it has the same effect as Krifka's **ScalarAssert** when used with highest scope in an unembedded utterance. It is, however, an ordinary operator and can, therefore, be used in embedded contexts as well. This operator is defined in (22).

(22) For each formula β with subexpression ϕ_τ, and each expression $\Sigma_{\tau t}$, $\textbf{ScAs}(\beta, \phi, \Sigma)$ is an *emphatic expression*, where $[\![\textbf{ScAs}(\beta, \phi, \Sigma)]\!] = [\![\beta \wedge \forall P \in \Sigma(\beta \rightarrow \beta'))]\!]$, where β' is just like β but with P replacing ϕ.

In this definition, the expression ϕ has the function of Krifka's focus. The formula β corresponds to Krifka's background applied to the focus. Σ is the set of alternatives to ϕ. $\mathbf{ScAs}(\beta, \phi, \Sigma)$ is a complex expression whose truth conditions are defined holistically instead of compositionally. Such an emphatic expression is true iff β is true and for each alternative P in Σ, β implies the result of replacing every occurrence of ϕ in β with P.

We use this operator in our analysis of a Romanian E-NPI. The semantic specification of the E-NPI are given in (23), followed by an example sentence in (24) for which we provide the relevant semantic attributes as well. The at issue content of the sentence, $\boxed{1}$, contains only its basic truth conditions that Maria lacks visibility. The NPI triggers a set of alternatives as a presupposition, $\boxed{2}$. The PRESUP value specifies that the alternatives are such that each of them must entail the minimal range of visibility. The NPI also contributes a **ScAs** operator. The first argument of this operator is the at issue content. The second argument is the focus element, i.e. the basic semantic predicate contributed by the NPI. Here, it is a minimal range of visibility, **min(imal)-range**. The third argument is the presupposed set of alternatives. As the variable A occurs freely inside the **ScAs** expression, the presupposition needs to take scope over it.

(23) LRS value of an E-NPI1: *vede la un pas*

$$\left[\text{LRS}\begin{bmatrix}\text{PARTS} & \left\langle \boxed{1}, \boxed{2}, \mathbf{ScAs}(\alpha, \mathbf{min\text{-}range}, A)\right\rangle \\ \text{AT-ISSUE} & \boxed{1}\ \alpha[\exists x(\mathbf{min\text{-}range}(x) \wedge \mathbf{see}(x, y))] \\ \text{PRESUP} & \left\langle \boxed{2}\ \exists A(\forall P \in A(P \subseteq \mathbf{min\text{-}range}) \wedge \beta)\right\rangle\end{bmatrix}\right]$$

(24) Maria nu vede la un pas.
Maria not sees within a step 'Maria doesn't have any visibility.'

$$\left[\text{LRS}\begin{bmatrix}\text{EX-C} & \boxed{2}\ \exists A(\forall P \in A(P \subseteq \mathbf{min\text{-}range}) \wedge \mathbf{ScAs}(\boxed{1}, \mathbf{min\text{-}range}, A))) \\ \text{AI} & \boxed{1}\ \neg\exists x(\mathbf{min\text{-}range}(x) \wedge \mathbf{see}(\mathbf{maria}, x)) \\ \text{PRESUP} & \langle\rangle\end{bmatrix}\right]$$

Our analysis captures the scalar effect of the E-NPI correctly: it presupposes a set of alternatives and is true if the asserted content entails any alternative if used instead of the NPI.

It is important that the **ScAs** expression is not part of the at issue content. This means that it is backgrounded in the sense of Potts (2005). Potts argues that if backgrounded material is not true, the sentence cannot be interpreted properly. The **ScAs** expression is similar to CIs in that its truth value is independent of that of the at issue content. However, it is not a CI, as CIs are outside the scope of presuppositions (Potts, 2005), whereas the **ScAs** expression needs to be in the scope of the presupposition, as explained above.

Let us assume we use our NPI without a licensing operator, i.e., we remove *nu* 'not' in (24). In this case, the sentence would not be ungrammatical and the at issue content could even be true. However, the **ScAs** expression would not be true and we get a similar effect as for untrue CIs. Consequently, just as in Krifka's and other pragmatic theories, we do not need to specify the negation in the lexical specification of an E-NPI, as it will follow from the requirements of the **ScAs** operator. Not being a CI, however, the **ScAs** expression might turn out as part of the at issue content of a higher clause in a structure.

In this section, we showed how an NPI-licensing theory based on scalar inference can be expressed within a representational framework. Our LRS encoding has at least the two advantages: First, the NPI can be lexically specified to contribute the predicate **min-range** and the **ScAs** operator at the same time, see (23). This last aspect has remained unaddressed in the purely semantic-pragmatic literature and solved by some syntactic feature mechanism in Chierchia (2004). Second, while **ScAs** is an ordinary operator, it is backgrounded but neither presupposed nor a CI.

5 Analysis 2: Result clauses

We will adopt the analysis of result clauses from Meier (2003) and, again, provide an HPSG/LRS rendering. We will, then, point out some differences between RCXs in English and Romanian and discuss the lexical entries for the Romanian RCl-complementizers *încât* and *de*.

Meier (2003) uses a *degree parameter*, d, for gradable adjectives. The degree – or *extent* – is an interval denoting the *extent* of a property. The semantic representation of a simple sentence with a gradable adjective is given in (25). The sentence is true iff the maximal extent of darkness of the room is higher than or equal to some contextually given standard.

(25) The room was dark. $\mathbf{Max}(\{d|\mathbf{dark}(d,\mathbf{the\text{-}room})\}) \geq \mathbf{standard}$

Meier analyzes RCXs as a comparison of extents. She also observes that there is a modal component. Sentence (26) is true iff the maximal extent of darkness of the room is at least as high as the minimal extent of the room's darkness that is necessary for Alex not to seen anything.

(26) The room was so dark that Alex didn't see anything.
$\mathbf{Max}(\{d|\mathbf{dark}(d,\mathbf{the\text{-}room})\})$
$\geq \mathbf{Min}(\{d|\mathbf{dark}(d,\mathbf{the\text{-}room}) \rightarrow \Box\neg\exists x(\mathbf{see}(\mathbf{alex},x))\})$

There are two occurrences of the formula $\mathbf{dark}(d,\mathbf{the\text{-}room})$ in (26). For convenience, we define the more compact notation in (27) and use it for sentence (26) in (28).

(27) For each extent variable d and each formulæ α and β,
$[\![\mathbf{ResOp}\, d\, (\alpha:\beta)]\!] = [\![\mathbf{Max}(\{d|\alpha\}) \geq \mathbf{Min}(\{d|\alpha \rightarrow \Box\beta\})]\!]$

(28) $\mathbf{ResOp}\, d\, (\mathbf{dark}(d,\mathbf{the\text{-}room}) : \neg\exists x(\mathbf{see}(\mathbf{alex},x)))$ (= (26))

In English, the degree particle *so* is obligatory, so we can assume that it contributes the result clause meaning. The RCl starts with the ordinary, optional complementizer *that*, see (29).

(29) The room was *(so) dark [(that) Alex couldn't see anything].
ResOp d (**dark**(d, **the-room**) : $\neg\exists x$(**see**(**alex**, x)))

This contrasts with Romanian, see (30). There, the degree particle is optional. However, we find a meaningful difference between the possible complementizers *de* and *încât*. This leads us to the assumption that, in Romanian, both the degree particle and the RCl-complementizer contribute a result meaning.

(30) Camera este (atât de) întunecată [*(încât) Alex nu vede nimic].
room.the is so dark that Alex not sees nothing
'The room is so dark that Alex doesn't see anything.'
ResOp d (**dark**(d, **the-room**) : $\neg\exists x$(**see**(**alex**, x)))

We can now provide the lexical specification for the result complementizers *de* and *încât* in (31), and for the degree particle *atât de* in (32).

The complementizer in (31) contributes the operator **ResOp**. It takes a clausal complement, the RCl and requires that its complement's semantics, β^*, be integrated into the second part of **ResOp**. The RCl will be integrated into a larger sentence as a modifier, selecting its head with the SELECT feature. The semantics of the modified element, α^*, occurs in the first argument of **ResOp**.

(31) Lexical entry of the result complementizers:

$$\begin{bmatrix} \mathrm{PHON} & \langle \textit{de/încât} \rangle \\ \mathrm{SYNS} & \begin{bmatrix} \mathrm{HEAD} & \begin{bmatrix} \textit{RCl-complementizer} \\ \mathrm{SELECT}\ A \begin{bmatrix}\mathrm{INDEX} & d \\ \mathrm{MAIN} & \alpha^* \end{bmatrix} \end{bmatrix} \\ \mathrm{VAL} & \left[\mathrm{COMPS}\ \left\langle \mathrm{S}\left[\mathrm{MAIN}\ \beta^*\right]\right\rangle\right] \\ \mathrm{CONT} & \begin{bmatrix} \mathrm{INDEX} & d \\ \mathrm{MAIN} & \textbf{ResOp}\end{bmatrix} \end{bmatrix} \\ \mathrm{LRS} & \left[\text{AT-ISSUE}\ \textbf{ResOp}\, d\, (\alpha[\alpha^*] : \beta[\beta^*])\right] \end{bmatrix}$$

The lexical entry of the degree particle is given in (32).

(32) Lexical entry of the degree particle *atât de*

$$\begin{bmatrix} \mathrm{PHON} & \langle \textit{atât de} \rangle \\ \mathrm{SYNS} & \begin{bmatrix} \mathrm{HEAD} & \begin{bmatrix} \textit{degree-particle} \\ \mathrm{SELECT}\ \boxed{1}\, A \begin{bmatrix}\mathrm{INDEX} & d \\ \mathrm{MAIN} & \alpha^* \end{bmatrix} \end{bmatrix} \\ \mathrm{VAL} & \begin{bmatrix} \mathrm{COMPS} & \left\langle \left(\mathrm{CP} \begin{bmatrix} \mathrm{HEAD} & \begin{bmatrix} \textit{RCl-compl} \\ \mathrm{SELECT}\ \boxed{1} \end{bmatrix} \\ \mathrm{CONT} & \boxed{2} \\ \mathrm{EXTRA} & + \end{bmatrix} \right) \right\rangle \end{bmatrix} \\ \mathrm{CONT}\ \boxed{2} & \begin{bmatrix} \mathrm{INDEX} & d \\ \mathrm{MAIN} & \textbf{ResOp}\end{bmatrix} \end{bmatrix} \\ \mathrm{LRS} & \left[\text{AT-ISSUE}\ \textbf{ResOp}\, d\, (\alpha[\alpha^*] : \beta)\right] \end{bmatrix}$$

The degree particle similar to the result complementizer, but selects an optional RCl. If present, the RCl must be extraposed and has the same semantics as the particle, $\boxed{2}$. If there is no RCl, the comparison needed for the result clause operator, β, is inferred from context.

We can now turn to the properties of RCXs from Section 2. There, we saw that an RCl with an emphatic content can be interpreted as an intensification of the matrix predicate. We provide a modelling of this observation which makes use of different features of projective meaning introduced in Section 3. The result complementizers come with an additional CI, which states that if the RCl is emphatic, the main clause predicate is also interpreted as emphatic, i.e., as being intensified. We can use the **ScAs** operator to formalize this CI, see (33). The formula should appear on the CI list in the lexical entry in (31).

(33) a. At issue: $\textbf{ResOp}\, d\, (\alpha : \beta)$

b. CI content of the result construction:
$\exists A(\textbf{ScAs}(\beta,\gamma,A)) \rightarrow \exists A' \textbf{ResOp}\, d\, (\alpha : \textbf{ScAs}(\alpha,d,A'))$

This CI is a formal encoding of a generalization in Hoeksema & Napoli (2019) according to which, if the matrix predicate has an extreme result, it holds to an extreme degree.

While both *încât* and *de* can be found with intensifying RCls, result-*de* is restricted to them (**OBS2**). We capture this by adding a presuppostion that the content of the RCl expresses something emphatic. In (34), the CI from (33) is added to the CI-list together with the above-mentioned presupposition.

(34) Lexical entry of the RCl-complementizer *de*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{de} \rangle \\ \text{SYNS} & \begin{bmatrix} \text{LID} & \textit{result-de} \\ \text{HEAD} & \begin{bmatrix} \textit{RCl-complementizer} \\ \text{SELECT } A \begin{bmatrix} \text{INDEX} & d \\ \text{MAIN} & \alpha^* \end{bmatrix} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{COMPS} \left\langle \text{S}\left[\text{MAIN } \beta^*\right] \right\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{INDEX} & d \\ \text{MAIN} & \textbf{ResOp} \end{bmatrix} \end{bmatrix} \\ \text{LRS} & \begin{bmatrix} \text{AT-ISSUE} & \textbf{ResOp}\, d\, (\alpha[\alpha^*] : \beta[\beta^*]) \\ \text{PRESUP} & \left\langle \exists A(\textbf{ScAs}(\beta'[\beta^*], \gamma, A)) \right\rangle \\ \text{CI} & \left\langle \exists A(\textbf{ScAs}(\beta',\gamma,A)) \rightarrow \exists A' \textbf{ResOp}\, d\, (\alpha : \textbf{ScAs}(\alpha,d,A')) \right\rangle \end{bmatrix} \end{bmatrix}$$

We can, now, combine the analyzes of E-NPIs and RCXs. For free E-NPIs, i.e. E-NPI1s, we use the encoding from Section 4 inside an RCl. In (35) we use the NPI *vede la un pas*.

(35)

E	un	întuneric	afară	de	Maria	nu	vede	la	un pas.
there.is	a	darkness	outside	that	Maria	not	sees	within	a step

'It is so dark outside that Maria can't see anything.'

The LRS-value of the RCX in (35) is given in (36). The semantic representation of the RCl was already given in (24). The existential presupposition of the set of alternatives can, however, project out of the RCl and take widest scope. The resulting at issue content of the sentence is given in the AT-ISSUE-value. The PRESUP-value contains the definition of the set of alternatives. As we use the complementizer *de*, it also contains the information that the content of the RCl is interpreted emphatically, i.e. a **ScAs** expression. This condition is trivially fulfilled since the E-NPI contributes this operator. This explains why E-NPIs are well fit for use in *de*-RCXs. Finally, the CI-list contains the CI from (33). Given the presupposition that the content of the RCl is emphatic, this makes a high degree, i.e., intensification reading available.

(36) LRS-value of the RCX in (35):

$$\begin{bmatrix} \text{AI} & \mathbf{ResOp}\,d\,(\mathbf{dark}(d,\mathbf{outside}):\boxed{1}\mathbf{ScAs}(\neg\exists x(\mathbf{m\text{-}range}(x)\wedge\mathbf{see}(y,x)),\mathbf{m\text{-}range},A)) \\ \text{PR} & \left\langle \boxed{1}, \exists A(\forall P(P\in A\rightarrow P\subseteq\mathbf{m\text{-}range})\wedge\ldots) \right\rangle \\ \text{CI} & \left\langle \ldots(\boxed{1}\rightarrow\exists A'\mathbf{ResOp}\,d\,(\mathbf{dark}(d,\mathbf{outside}):\mathbf{ScAs}(\mathbf{dark}(d,\mathbf{outside}),d,A'))) \right\rangle \end{bmatrix}$$

Our analysis of E-NPI1s captures their behavior with respect to our four tests: As the NPI can occur outside result clauses, we get the free exchangeability with coordination (**T1**). It also follows that the NPI can be used even if there is no salient result relation (**T2**). Since the NPI contributes **ScAs** there can be free variation with respect to the complementizer (**T3**). We think that *de* is nonetheless preferred with E-NPI1s. The result clause makes a real descriptive contribution to the meaning of the overall construction (**T4**).

We can briefly turn to E-NPI2s. They are very much like the first type of E-NPIs, but they are bound to a result semantics. We can express this by using a collocational module as proposed for HPSG in Soehn (2009) and the reference therein. Soehn (2009) assumes a feature COLL. The value of COLL contains an attribute LIC(ENSER), whose value is a list of objects that describe under which circumstances the lexical sign is licensed.

We sketch this restriction in (37), which represents the relevant parts of the lexical description of the expression. In this AVM, the expression is restricted to occur in the scope of a result clause operator, **ResOp**.

(37) Specification of an E-NPI2: se vede om cu om

$$\begin{bmatrix} \text{LRS} & \begin{bmatrix} \text{PARTS} & \left\langle \boxed{1}, \boxed{2}, \mathbf{ScAs}(\alpha,\mathbf{min\text{-}range},A) \right\rangle \\ \text{AT-ISSUE} & \boxed{1}\ \alpha[\exists x(\mathbf{min\text{-}range}(x)\wedge\mathbf{see}(x,y))] \\ \text{PRESUP} & \left\langle \boxed{2}\ \exists A(\forall P\in A(P\subseteq\mathbf{min\text{-}range})\wedge\beta[\boxed{1}]) \right\rangle \end{bmatrix} \\ \text{COLL} & \left[\text{LIC} \left\langle \left[\text{EX-CONT}\ [\kappa[\mathbf{ResOp}\,d\,(\alpha:\beta[\mathbf{min\text{-}range}(x)])]]\right] \right\rangle\right] \end{bmatrix}$$

The only difference between the two first types of E-NPIs lies in the collocational restriction, we, thus, predict the attested behavior of E-NPI2s. (**T1**) Alternation with coordination is possible as long as the result relation is salient in discourse. This means that the required **ResOp** operator can be contributed by the words in the sentence (as in overt RCXs), or it can be accommodated. (**T2**)

Consequently, if there is no – explicit or implicit – result relation, the E-NPI2 cannot be used. (**T3**) As the E-NPI2 contributes a **ScAs** operator, it is compatible with both *încât* and *de*. Finally, (**T4**), the referential reading of the idiom is present – in our case, the lack of visibility.

6 Analysis 3: Plain high degree readings

After this general discussion of NPIs and result clauses, we can turn to our third type of E-NPIs. Our analysis of this type will be analogous to that of *mixed expressives* such as slurs in Gutzmann (2011) and Gutzmann & McCready (2016), i.e., we will make use, again, of the difference between at issue content and CIs. Gutzmann & McCready's analysis is sketched in (38). The word *kraut* has as its at issue content the information that someone is German. However, the word triggers a CI that the speaker has a negative attitude towards Germans.

(38) Dan is a Kraut.
at issue: Dan is German.
CI: I have a negative attitude towards Germans.

We can adapt this theory to data on fixed RCls: such RCls, like *de mori* 'that one dies' – see (40) below – contribute an intensification as their at issue content, i.e., they basically mean the same as the particle *foarte* 'very'. At the same time, they trigger a CI that is based on the expression's literal meaning.

Let us look at the at issue semantics first. In (39), we add the intensification particle *foarte* 'very' to the Romanian version of example (25). We provide the EX-CONT value of the sentence, underlining its at issue content.

(39) Camera este foarte întunecată.
room.the is very dark 'The room is very dark.'
$\exists A(A = \{d' | \Diamond \mathbf{dark}(d', \mathbf{the\text{-}room})\}$
$\wedge \underline{\mathbf{ResOp}\, d\, (\mathbf{dark}(d, \mathbf{the\text{-}room}) : \mathbf{ScAs}(\mathbf{dark}(d, \mathbf{the\text{-}room}), d, A))})$

The particle *foarte* 'very' triggers a presupposed set of contextually relevant alternatives around some standard. The degree particle, then, adds a semantics that expresses exactly what was inferred for the other two types of E-NPIs above (see (33)), i.e., that the extent d to which the room is dark is at least as high as the minimal extent of darkness that is higher than all relevant alternatives.

We can apply this to fixed idiomatic phrases. We use the expression with a generic reading *de mori* 'that one dies' (lit.: that you.die) in (40):

(40) E [RCX: frumoasă [RCl: de mori]].
She.is beautiful that you.die 'She is very beautiful.'

In addition to an intensification at issue content, there is a CI component, parallel to mixed expressives such as in (38). In our case, however, the CI states that whenever some predicate's extent results in someone dying, this extent must be very high. We sketch the lexical entry of idiomatic *mori* in (41).

(41) Lexical entry of *mori* 'you.die' as used in *de mori*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{mori} \rangle \\ \text{SYNS} & [\text{CONT}\ [\text{MAIN}\ \textbf{die}]] \\ \text{LRS} & \begin{bmatrix} \text{AI} & \boxed{1}\ \textbf{ScAs}(\alpha[\alpha^*],d,A) \\ \text{PRES} & \langle \exists A(A=\{d'|\Diamond[\lambda d.\alpha](d')\}\wedge\gamma[\boxed{1}]) \rangle \\ \text{CI} & \langle \delta \wedge \forall P\,\exists A(\alpha\approx P(x)\rightarrow(\textbf{ResOp}\,d\,(P(x):\textbf{die}(x))\rightarrow \textbf{ScAs}(P(x),d,A))))\rangle \end{bmatrix} \\ \text{COLL} & \begin{bmatrix}\text{LIC} & \left\langle \begin{bmatrix} \text{LID} & \textit{result-de} \\ \text{HEAD} & \begin{bmatrix}\text{SEL|CONT} & \begin{bmatrix}\text{INDEX} & d \\ \text{MAIN} & \alpha^*\end{bmatrix}\end{bmatrix}\end{bmatrix}\right\rangle\end{bmatrix}\end{bmatrix}$$

The AT-ISSUE only consists of an emphatic expression (a **ScAs** expression). The word is collocationally restricted to occur in an RCX, i.e., it must be dominated by a phrase that is headed by the *de*-complementizer and modifies some element with a basic meaning α^*, which is exactly the content that is used in the **ScAs** expression. The set of contextually relevant alternatives is presupposed.

The CI value says: for any predicate P such that $P(x)$ is similar to the matrix proposition α, if $P(x)$ results in dying, then $P(x)$ is an emphatic statement. This shows that the CI allows us to integrate the literal meaning of the RCl without committing to the factivity of the result clause, i.e., in (40), the speaker does not factually die from another person's beauty.

We can apply this analysis to E-NPI3s, i.e., to E-NPIs with a purely intensifier meaning, see (42). Our analysis is just like for *de mori* above. The NPI-licensing requirement is satisfied in the representation of the referential reading of the RCl, i.e., the lack of visibility. This reading, however, is not asserted but occurs inside the CI-value, encoding a speaker's knowledge that this RCX can be used for high degree statements for the matrix predicate.

(42) Mi-e foame de nu te văd.

(lit.: I am hungry that I cannot see you.) 'I am extremely hungry.'

(43) Sketch of the lexical entry of *văd*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{văd} \rangle \\ \text{SYNS} & [\text{CONT}\ [\text{MAIN}\ \textbf{see}]] \\ \text{LRS} & \begin{bmatrix} \text{AI} & \boxed{1}\ \textbf{ScAs}(\alpha[\alpha^*],d,A) \\ \text{PRES} & \langle \exists A(A=\{d'|\Diamond[\lambda d.\alpha](d')\}\wedge\gamma[\boxed{1}]) \rangle \\ \text{CI} & \left\langle \begin{array}{l} \delta \wedge \forall P\,\exists A(\alpha\approx P(x)\rightarrow \\ (\textbf{ResOp}\,d\,(P(d,x):\textbf{ScAs}(\beta[\textbf{see},\textbf{min-range},A'])\rightarrow \textbf{ScAs}(P(d,x),d,A))))) \end{array}\right\rangle \end{bmatrix} \\ \text{COLL} & \begin{bmatrix}\text{LIC} & \left\langle \begin{bmatrix} \text{LID} & \textit{result-de} \\ \text{HEAD} & \begin{bmatrix}\text{SEL|CONT} & \begin{bmatrix}\text{INDEX} & d \\ \text{MAIN} & \alpha^*\end{bmatrix}\end{bmatrix}\end{bmatrix}, \ldots \right\rangle\end{bmatrix}\end{bmatrix}$$

We can check that this analysis captures the expression's behavior with respect to our tests. The collocational requirement of the E-NPI blocks it from occurring outside a *de*-marked RCX (**T1**). Consequently, (**T2**) is not applicable. The use of *încât* is excluded by the COLL value as well (**T3**). Finally, (**T4**) says that the referential reading of the NPI is not asserted. This is clearly the case as the referential reading is integrated into a CI.

The analysis of E-NPI3s combines our treatment of NPIs and RCXs with an analysis of mixed expressives. We use the NPI-licensing mechanism from Section 4 on the referential reading of the RCl. However, the referential reading does not contribute to the at issue content, which is just a plain intensification.

7 Conclusion

This paper looked at the distribution of NPIs in Romanian RCXs. We identified three main types of NPIs. We introduced some aspects of LRS and provided a representational re-encoding of a scalar theory of NPI licensing. We also adapted the semantic analysis of RCXs from Meier (2003) and added the refinements necessary for Romanian. For E-NPI1s, it was enough to provide a scalar NPI analysis. From this, it followed immediately that these NPIs can be used in high-degree RCXs, as they contribute the **ScAs** operator, which is required for high degree readings. The only difference for E-NPI2s is that they need to specify a collocational requirement to ensure that they can only be used in the scope of an **ResOp** operator.

For E-NPI3s, this collocation requirement is not about a semantic operator, but about a particular lexical item, the complementizer *de*. In addition, these expressions are mixed expressives in the sense that they make a non-trivial meaning contribution both to the at issue content and to the CI content.

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