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ASYMMETRIES IN SUB-EXTRACTION OUT OF NP IN SLOVENIAN: A MAGNITUDE ESTIMATION STUDY****

1. THE SUBJECT ISLAND IN SLOVENIAN

Golden (1995, 1996, 1997a: ch.8, 1997b) reports sentences in which a wh-phrase is sub-extracted out of the subject constituent as acceptable in everyday Slovenian:

(1)
Čigavim predlogom se mu je [*ugovarjati _ na oddelčnih   sestankih*] *zdelo   nesmisleno?*
whose   proposals cl. him is to-discuss   at departmental meetings seemed pointless
'*Whose proposals did to discuss at the departmental meetings seem pointless to him?'

The existing formal theories of syntactic locality (see, e.g. Chomsky 1986) generally predict that sub-extraction out of subject phrases, or subject islands, must be impossible, as illustrated by the English translation of (1). The acceptability of (1) and similar sentences suggests that some core structural factors that usually conspire to preclude these sentences fail to do so for some reason in Slovenian, and therefore raises a question as to why this might be so.

Taking Golden's observation as a starting point, Stepanov et al. (to appear), in a larger-scale questionnaire study, investigated the pattern of grammaticality of similar subject island sentences using nominal subjects as in (2).

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(2) a) *Kakšni   je gospa mislila, da   so* [_ *študenti*] *prišli na žur?*
       what-kind-of is lady   thought that are   students   came on party
       '*What kind of did the lady think that students came to the party?'

  b) *Čigava je stric mislil, da   je* [_ *asistentka*] *ovirala   policista?*
     whose is uncle thought that is   assistant   hampered policeman
     '*Whose did the uncle think that assistant hampered the policeman?'

The results of that study revealed that sentences like (2) are perceived as substantially degraded by Slovenian speakers. On the basis of that, the authors concluded that at least in the nominal domain, Slovenian manifests a proper subject island effect. The results of that study, therefore, suggest that Slovenian is well-behaved with respect to the locality theories which predict degraded acceptability of subject island sentences.

At the same time, some of the results reported in Stepanov et al. (to appear) could in principle receive alternative interpretations because of two potentially relevant methodological issues. One issue regards the choice of the testing materials which involved Left Branch Extraction (LBE) of the nominal wh-specifier such as *kakšen* ("what kind of") or *čigav* ("whose"). Since the seminal work of Ross (1967), it has been generally recognized that LBE is disallowed in languages like English (cf. *Whose did you see house?*). At the same time, LBE freely occurs in some Slavic languages including Russian and Bosnian/Croatian/Serbian. In Slovenian, examples like (3) are reported as acceptable in colloquial speech, and our informants agree on this and similar examples on which the materials for Stepanov et al. (to appear) were modeled:

(3) a) *Čigave mi   prinašaš* [_ *pozdrave*]*?*   Golden (1996: fn. 5)
       whose me.dat. bring.2sg.   greetings
       'Whose greetings are you bringing me?'

  b) *Visoke je videl* [_ *študente*].   Bošković (2009: 70)
     tall   is seen   students
     'He saw tall students.'

(3) suggests that LBE is not precluded in Slovenian as well, and therefore, LBE should not incur additional penalty while testing extraction out of subject NPs, at least with respect to the wh-specifiers *kakšen* and *čigav*. At the same time, it is also the case that LBE appears to be generally more limited in Slovenian than in the above mentioned languages, although the literature remains somewhat vague as to the extent of this limitation. For instance, Bošković (2009: fn. 20) notes that factors including formal features of the element being extracted, agreeing auxiliary etc. affect the acceptability of examples like (3) in quite significant ways. Furthermore, Franks (2014) goes as far as to claim that Slovenian "generally eschews" LBE, referring to examples as in (4):

(4) a) **Milojkina odhaja hči.*
       Milojka's   leaves daughter
       'Milojka's daughter is leaving.'

  b) cf. *Milojkina hči odhaja.*   Franks (2014: 162)

It might therefore be argued that the results of Stepanov et al. (to appear) concerning the degraded status of sentences involving wh-extraction out of subject islands may potentially be confounded with an additional constraint precluding LBE. The degraded status might then be due to either a) a subject island effect only, or b) LBE only; or c) a combination of subject island and LBE effects. This situation raises a further need to tease apart the subject island effect proper and a potentially intervening LBE effect. In order to do that, the situation with LBE in Slovenian must be further clarified.

The second potential issue is that the effect of subject islandhood reported in the study in Stepanov et al. (to appear) was found to be statistically marginal ($p = 0.078$). The marginality of the subject island effect (reported $p = 0.065$) was also a result of the large-scale study in Sprouse et al. (2015) which used materials involving sub-extraction out of subject NP in English and Italian. Both studies chose to interpret their result as significant. Nevertheless, we felt that statistical marginality of the results calls for a follow-up investigation replicating the subject island effect with a greater statistical power.

The present study has two main goals. Our first goal is to investigate whether Slovenian observes a subject island constraint, if the LBE factor is excluded. In essence, we wanted to replicate Stepanov et al.'s (to appear) findings concerning the islandhood of subject NPs, in principally non-LBE contexts. The second goal is to test whether Slovenian observes the constraint on LBE in NPs. Aside from the need to further clarify the relevant empirical pattern in this language, this goal is also pertinent in light of the recent proposals in the literature that postulate a one-way correlation between the absence of overt articles and allowing LBE in a language (Bošković 2005, 2008 and subsequent work). Slovenian does not have overt articles, and, therefore, presents an interesting case in terms of applicability of LBE, even though a priori it does not necessarily challenge the postulated correlation (see Section 4.2 for further discussion). Note that the two postulated goals are logically independent of each other in terms of contributing to the overall picture of locality in Slovenian. If it turns out that Slovenian does not allow LBE, **and** also observes the subject island constraint independently of the LBE factor, then we will have succeeded in ruling out the LBE factor from the inquiry into subject islands. If, however, Slovenian does not allow LBE, **and** it also does not observe the subject island constraint at the same time, that would mean that the original subject island results reported in Stepanov et al. (to appear) were actually due to LBE, not to the subject island constraint. Finally, if Slovenian comes out as allowing LBE, that would support the previous results concerning the subject islandhood status of Slovenian, at least in the domain of nominal subjects.

2. THE FACTORIAL DEFINITION OF ISLAND EFFECT

In order to determine whether Slovenian manifests a subject island effect, Stepanov et al. (to appear) used the factorial definition of island as developed in Sprouse et al. (2012, 2015). We employ the same definition of island in the present study as well. The rationale behind this definition lies in acknowledging that long-distance syntactic

dependencies in general, and island structures in particular, are syntactically complex structures whose comprehension may be affected, in particular, by the following two factors. Factor LENGTH reflects the length of the dependency between the fronted wh-phrase and its corresponding gap, that is, the position from which wh-movement takes place. This factor basically distinguishes extraction from a matrix clause and extraction from an embedded clause. The second factor, STRUCTURE, regulates whether a sentence contains an island sub-structure or not, independently of wh-movement. The factorial definition of island effect recognizes that each of these two factors negatively affects acceptability on their own. The character of this influence can be described in processing-related terms, on the assumption that the cognitive mechanisms engaged in processing island structures are subject to the same parsing constraints and limitations (e.g. related to working memory) that operate in any language under the strictly incremental character of syntactic processing. For instance, processing a longer dependency generally requires more memory resources than processing a shorter dependency. In a similar vein, processing a more complex structure such as a complex NP with rich internal structure, e.g. a relative clause, is generally more costly than processing a less complex NP such as *John*. Since each of the two factors has two values, the respective stimulus set involves four sentence types as shown below for the subject island (examples from Sprouse et al. 2015):

(5)
a) *Who __ thinks the speech interrupted the primetime TV show?*
[non-island | matrix]
b) *What do you think __ interrupted the primetime TV show?*
[non-island | embedded]
c) *Who __ thinks the speech about global warming interrupted the primetime TV show?*
[island | matrix]
d) *What do you think the speech about __ interrupted the primetime TV show?*
[island | embedded]

One line of thought in syntactic and processing literature maintains that island effects may be reduced to considerations of parsing efficiency alone (e.g. Hofmeister & Sag 2010, see also Hawkins 1999). Viewed in the context of the above two factors, this amounts to a cumulative, additive effect of those factors. That is, the degree of unacceptability that equals a sum of the degrees of unacceptability caused by each of these two factors alone (e.g. (5a-5d) = (5a-5b)+(5a-5c)), would imply that an island effect can be exhaustively modeled by these two factors. If the island effect is only due to these two factors, then a simple additive effect is all that is to be expected under these circumstances. If, however, the island effect exists over and above these processing considerations, then the factorial definition makes it possible to isolate it, in the form of a superadditive effect whereby the degree of unacceptability of an island construction such as (5d) is greater than the sum of the degrees of unacceptability caused by each of the two above mentioned factors alone, viz. (5a-5d) > (5a-5b)+(5a-5c). This superadditive effect

can be identified by using the measure known as *differences-in-differences* (DD), that is, DD = (5a-5d) – ((5a-5b)+(5a-5c)). If DD = 0, there is no island effect; if DD > 0, there is an isolated island effect independent of the above two factors (though the authors of the method do not provide a metric of islandhood based on the DD score). Alternatively, the superadditive effect can be detected as a statistically significant interaction of the LENGTH and STRUCTURE factors, in an ANOVA-type analysis. In general, a super-additive effect suggests that there exists a constraint over and above the processing-motivated LENGTH and STRUCTURE factors. An island effect can then be effectively teased apart from these processing-related factors. Thus the methodology based on the factorial definition of island offers a clear advantage over the standard methodology of data collection, which is not as sensitive to the potential influence of various factors in determining the grammaticality status of island sentences.

The prediction in our case is that, if the respective sentences in Slovenian manifest a true subject island effect, we expect DD > 0 and a significant interaction between the two factors. If, in contrast, there is no true island effect, then it must be that DD = 0 and there is no statistically significant interaction between the two independent factors.

3. THE PRESENT STUDY

As stated above, the present study has a dual purpose. On the one hand, we wanted to see whether Slovenian manifests the subject island effect if the LBE factor is excluded. Independently of that, we were also interested to determine if Slovenian manifests a LBE effect in interrogative and non-interrogative sentences. The two parts of the study are also slightly different methodologically. The first part is concerned with detecting an island effect as emerging from interaction of two independent factors, while the second is concerned with detecting an LBE effect as such. Consequently, we use the factorial definition of island effects for the first part of the study, but not for the second where we compare sentences with LBE with sentences without LBE. For the second part of the study we decided to ask a more comprehensive question, namely, whether the sensitivity of Slovenian speakers to the LBE contexts could possibly be non-trivially affected by a) the length of the respective dependency, contrasting matrix and embedded clauses, similarly to the subject island sub-experiment; and b) the type of LBE-triggering movement, contrasting wh-movement and non-wh-movement, the latter understood for the present purposes as displacement for reasons other than wh-movement. In essence, then, the present study comprises two sub-experiments in one.

3.1   Materials

3.1.1   Subject Islands

We used the factorial definition of island as a basis for tracking potential island effects in extraction out of subject NPs in Slovenian. This definition was implemented in a 2 x 2 design crossing factors LENGTH and STRUCTURE in the sense outlined above.

Stepanov et al. (to appear) tested for a subject island effect using materials involving LBE out of subject NPs, using a similar design (cf. (2)). In order to avoid potential LBE-related concerns, in this part of the study we used constructions involving PP extraction out of NPs modified by adjectives, as in the following example:

(6) *Od koga si   videl* [*veliko sliko _*] *v dvorani?*
    of whom are.2sg seen   large   picture in hall
    'Who did you see a large picture of in the hall?'

A sample set of examples is given in (7):

(7)
a) *Kdo __ je mislil, da je* [*slika*]   *visela v dvorani?*   [NON-ISL. | MATR.]
   who   is thought that is picture   hung in hall
   'Who thought that the picture hang in the hall?'
b) *Kaj je Rok mislil,   da je* [_] *viselo v dvorani?*   [NON-ISL. | EMB.]
   what is Rok thought that is   hung   in hall
   '*What did Rok think that hang in the hall?'
c) *Kdo __ je mislil, da je* [*velika slika Kosovela*] *visela v dvorani?* [ISL. | MATR.]
   who   is thought that is   large picture Kosovel   hang in hall
   'Who thought that a/the large picture of Kosovel hang in the hall?'
d) *Od koga je Rok mislil, da je* [*velika slika __*] *visela v dvorani?* [ISL. | EMB.]
   of whom is Rok thought that is large picture   hang in hall
   '*Who did Rok think that a/the large picture of hang in the hall?'

The type of emdedded verb has been previously shown in the literature to affect the acceptability scores in subject island sentences (Polinsky et al. 2013). We controlled for potential variability in this domain by selecting only unaccusative and passive(-like) structures as embedded clauses in our Slovenian materials. In selecting unaccusative verbs, we followed a diagnostic suggested in (Marvin 2000): unaccusative verbs, unlike transitive ones can form past participle in this language. This is illustrated in (8) (Marvin's examples (4b,c)):

(8) a) *Videl sem žensko,   prispelo danes zjutraj*   [Past Part-unaccusative]
     seen am woman.acc. arrived   today morning
     'I saw a woman who arrived this morning.'
   b) **Videl sem žensko,   napisalo knjigo*   [Past Participle-transitive]
      seen am woman.acc. written   book
     'I saw a woman who wrote a book'

3.1.2   LBE: Materials

The LBE part of the study was implemented as a 2 x 2 x 2 design crossing the factors "LBE-hood" (yes, no), LENGTH (matrix, embedded) and TYPE of movement (wh-,

non-wh). This resulted in eight conditions. The [wh-] subset of conditions is exemplified in (9), and the [non-wh-] subset is exemplified in (10):

(9) a) *Kakšno   žogo je Maja kupila _ , ko   je šla v trgovino?*   non-LBE / M
     what-kind-of ball is Maja bought   when is gone in market
     'What kind of ball did Maja buy, when she went to the market?'

   b) *Kakšno žogo   je gospod mislil, da je Maja kupila _ ?*   non-LBE / E
     what-kind-of ball is man   think that is Maja bought
     'What kind of ball did the man think that Maja bought?'

   c) *Kakšno   je Maja kupila __ žogo, ko   je šla v trgovino?*   LBE / M
     what-kind-of is Maja bought   ball when is gone in market
     'What kind of ball did Maja buy, when she went to the market?'

   d) *Kakšno   je gospod mislil, da je Maja kupila __ žogo?*   LBE / E
     what-kind-of is man   think that is Maja bought   ball
     'What kind of ball did the man think that Maja bought?'

(10) a) *Rdečo kapo je Anka nosila _ , ko   je spoznala Mateja.*   on-LBE / M
     red   hat   is Anka worn   when is met   Matej
     'It is a red hat that Anka wore when she met Matej.'

   b) *Rdečo kapo je Matej mislil,   da je Anka nosila _.*   non-LBE / E
     red   hat   is Matej thought that is Anka wore
     'It is a red hat that Matej thought that Anka wore.'

   c) *Rdečo je Anka nosila __ kapo, ko   je spoznala Mateja.*   LBE / M
     red   is Anka worn   hat   when is met   Matej
     'It is a red hat that Anka wore when she met Matej.'

   d) *Rdečo je Matej mislil,   da je Anka nosila __ kapo.*   LBE / E
     red   is Matej thought that is Anka wore   hat
     'It is a red hat that Matej thought that Anka wore.'

3.2   Questionnaires

We constructed eight sets of target sentences related to the subject islands (cf. (7)) using the same lexicalization for each set, eight sets of LBE-related sentences in the interrogative form, (cf. (9)) and eight sets of LBE-related sentences in the non-interrogative form (cf. (10)). Each series of eight sets was then distributed across eight lists using the Latin square procedure. The eight lists were then combined in pairs, which resulted in four master lists containing two sentence tokens (=lexicalizations) for each of the four conditions for each series, such that lexically related sentences never appeared in the same list. Thus each master list contained 24 target sentences that were not lexically related. Each master list was then supplemented with 24 filler sentences (half acceptable, half unacceptable, as judged by a linguist native speaker of Slovenian). This diversified the content of the questionnaires also minimizing possible rating biases. Two pseudo-random orders of each list were created, which resulted in 8 unique questionnaires of 48 items. Additionally, it was ensured that the first four items in each list are fillers.

3.3 An Acceptability Rating Task

In this study, we used the task of magnitude estimation. Magnitude estimation is a method of subjective evaluation whereby a participant evaluates some gradable property (e.g. intensity of light) relative to some available standard, by assigning a numerical value on the basis of a subjective judgment, in relation to the numerical value assigned to the standard (Stevens 1975). The subjects are not restricted either in the range of numerical values that they are allowed to give (on the positive number scale), or in the granularity of the numerical scale adopted by each participant for the purposes of the experiment. We used a version of the magnitude estimation task adapted for judging acceptability of sentences (Bard et al. 1996). This task is well suited to the present study because of its capability to capture a potentially greater variability and range of acceptability ratings by using the unbounded positive number line.

The task began with a training session, the goal of which was to familiarize the participants with the concept of magnitude estimation. During the training session, the subjects were offered to estimate the length of seven straight lines relative to the given line to which the numerical score 100 was assigned. Subjects were instructed to rely only on their subjective intuitions in evaluating the length of the lines; if the line seemed, for instance, twice as large as the standard, they were encouraged to give a value 200, and if it seemed about one third as large, then the would give a value 30. Both whole and decimal numbers could be used.

The training was followed by a sentence-rating questionnaire comprising the materials as described above. In our study, participants were presented with a reference sentence and a numeric value representing its acceptability. In our case, the sentence was (11), and it was pre-assigned the value 100 (note that the number itself does not imply any particular acceptability status; this point was also stressed in the instructions).

(11)   *Proti   kateremu pravilu je Klara mimogrede rekla, da   je Cene protestiral?*
       against which   rule   is Klara in-passing said   that is Cene protested
       'Against which rule did Klara say in passing that Cene protested?'

The participants were then instructed to indicate the acceptability of each of the subsequent sentences relative to the score assigned to the standard. The participants were also instructed to judge the sentences following their first intuitive hunch, not the normative standards for Slovenian, and not to dwell on particular sentences as they go along.

The study was conducted in the form of a paper survey. The reference remained visible throughout the entire procedure by being placed on top of each page of the questionnaire and separated by a line from the rest of the stimuli. Participants were under no time constraints to complete the task. On average, the surveys were completed within 25 minutes.

3.4 Participants

Forty adult native speakers (thirty-two females) of Slovenian aged 19-53 (mean age: 28.75) participated in the experiment voluntarily and anonymously. All participants

had normal or corrected to normal vision. They were naïve to the purposes of the study. None of the participants had previously taken part in similar experiments for at least two years. The participants completed the task individually under the experimenter's supervision. No participant data were excluded from the analysis.

3.5   Statistical Procedures

Prior to analysis, the raw numerical ratings from each participant were z-score transformed. The z-score transformation converts each participant's ratings to a standardized score, in which each transformed rating represents the number of standard deviations by which the corresponding raw rating is different from that participant's mean rating. This kind of conversion eliminates potential scale biases between participants (such as choosing different ranges of values among participants or using one end of the scale), and therefore allows for a cleaner comparison of the participants' performance.

For the statistical analyses, we used linear mixed-effects models (Baayen et al. 2008). LENGTH and STRUCTURE were used as fixed factors for the subject island part of the study, and "LBE-hood", LENGTH and movement TYPE were used as fixed factors for the LBE part of the study. In both parts of the study, participants and items were entered as random factors into the models. We report p values based on the likelihood-ratio test whereby a model containing the fixed effect of interest is compared to a model that is identical in all respects except the fixed effect in question. Analyses were performed using the "lme4" package (Bates et al. 2014) in R (R Core Team 2014).

For the subject island portion of the experiment, we also computed DD scores for each participant, on the basis of which we calculated mean DD scores for each island as a non-standardized effect-size measure for the island types under question (see Section 2).

3.6   Results

3.6.1   Subject Islands

Linear mixed-effects modeling revealed a main effect of factor LENGTH, as well as a main effect of factor STRUCTURE. Unsurprisingly, these two factors were found to play a role in assessing the grammaticality of the island sentences. Furthermore, we found that these two factors significantly interact with each other in a superadditive manner. Under the factorial definition of island, the presence of a robust and clear superadditive effect that obtains over and above the influence of each of these two factors alone suggests a true island effect independent of the processing considerations as well as free from a potential confound in the form of the LBE effect. In addition, we found that DD > 0, consistently with the superadditive character of this effect.

We also estimated the processing costs of LENGTH and STRUCTURE separately by computing the relevant pairwise comparisons: the length cost was identified with a pairwise comparison of NON-ISLAND | MATRIX and NON-ISLAND | EMBEDDED conditions, and

the structure cost was identified with a pairwise comparison of ISLAND | MATRIX and NON-ISLAND | MATRIX conditions (see also Sprouse et al. 2012). The cost effects of LENGTH and STRUCTURE came out not significant for the subject island structure. The results of this part of the study are summarized in Table 1 and Figure 1.

Table 1: χ^2, t and p-values for the linear mixed-effects models fitting the subject island data

	SUBJECT	
FULL 2 X 2 MODEL	χ^2	p
main effect of LENGTH	17.522	<0.0001
main effect of STRUCTURE	12.213	0.0005
interaction LENGTH x STRUCTURE	**11.352**	**0.0007**
PAIRWISE COMPARISONS	t	
LENGTH (STRUCTURE=non-island)	1.390	0.5138
STRUCTURE (GAP=matrix)	0.614	0.9268

Figure 1: Interaction plot for the subject island
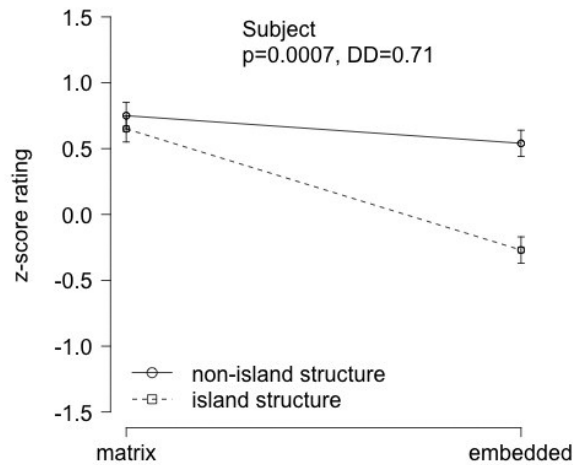
3.6.2 LBE

We first evaluated the overall 2 x 2 x 2 model for the LBE sub-experiment. Main effects were observed for each of the three factors involved, that is, LBE-hood, LENGTH and TYPE. In other words, each of the above factors emerged as a significant predictor of the acceptability scores. There was also a significant three-way interaction among these factors. The results are summarized in Table 2 and Figure 2.

Table 2: χ^2, t and p-values for the linear mixed-effects models fitting the wh-LBE data

FULL 2 X 2 X 2 MODEL	χ^2	p
main effect of LBE-hood	75.797	<0.0001
main effect of LENGTH	27.848	<0.0001
main effect of TYPE	27.418	<0.0001
interaction LBE-hood x LENGTH x TYPE	28.914	<0.0001

Figure 2: Z-score comparison of the sentences involving and not involving LBE.
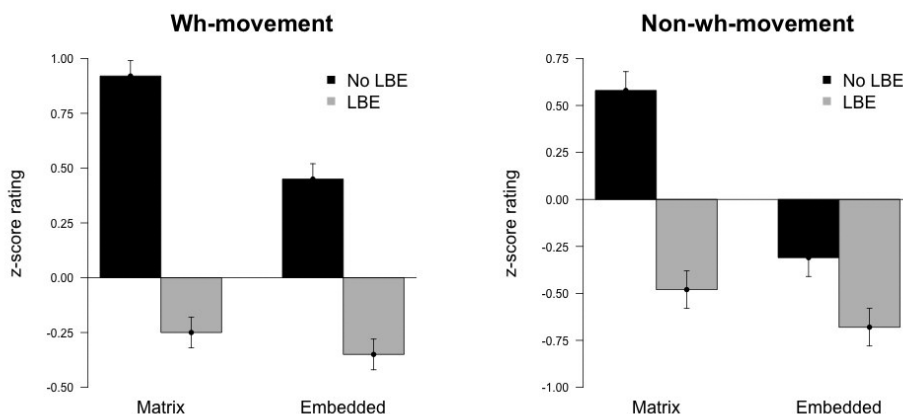
To better understand this three-way interaction, we then considered two smaller 2 x 2 models crossing factors LBE-hood and LENGTH and pertaining to wh-movement and non-wh-movement, respectively. We found a robust main effect of LBE-hood in both interrogative and non-interrogative sentences. There was also a main effect of LENGTH in both construction types, with extraction out of matrix clauses receiving higher score than out of embedded clauses. Planned pairwise comparisons confirmed that LBE constructions were judged significantly lower than non-LBE sentences, in both matrix and embedded contexts, and for both movement types ($p < 0.004$ for all pairs). Furthermore, we observed a significant interaction between LBE-hood and LENGTH, suggesting that the length of a dependency affects acceptability of the LBE structures.

We also constructed two 2 x 2 models crossing factors LBE-hood and movement TYPE, pertaining to matrix and embedded clauses, respectively. LBE-hood again had a main effect, and so did TYPE, for each of the clausal types. In other words, it matters for the participants whether extraction takes places in the form of wh-movement or another movement type, irrespective of LBE. Interestingly, however, a significant interaction between factors LBE-hood and movement type was observed only for the embedded, though not for the matrix, clauses, suggesting that the type of movement

affects acceptability of LBE structures only in the former. Post-hoc pairwise comparisons also showed that LBE structures were given scores significantly lower in the non-wh-movement contexts compared to the wh-movement contexts, as far as embedded clauses ($p < 0.02$), but not matrix clauses ($p = 0.31$), are concerned. These four 2 x 2 models are summarized in Tables 3 and 4.

Table 3: χ^2 and p-values for the 2 x 2 models crossing LBE-hood and LENGTH

2 X 2 MODELS	WH-extraction		NON-WH-extraction	
	χ^2	p	χ^2	p
main effect of LBE-hood	60.063	<0.0001	26.657	<0.0001
main effect of LENGTH	12.396	0.0004	18.123	<0.0001
interaction LBE-hood x LENGTH	7.0925	0.0077	12.479	0.0004

Table 4: χ^2 and p-values for the 2 x 2 models crossing LBE-hood and TYPE

2 X 2 MODELS	MATRIX		EMBEDDED	
	χ^2	p	χ^2	p
main effect of LBE-hood	57.826	<0.0001	31.026	<0.0001
main effect of TYPE	9.0547	0.00262	28.323	<0.0001
interaction LBE-hood x TYPE	0.3736	0.5411	9.0822	0.0026

3.7 Discussion

3.7.1 Subject Islands

Our goal in this part of the study was to test for subject island effects in Slovenian excluding the LBE factor. There are two main results of the sub-experiment involving subject islands. First, we establish that there is a robust subject island effect in Slovenian. This effect shows up in the form of a superadditive effect as a result of the interaction of the independent factors LENGTH and STRUCTURE. This result largely replicates the results reported in Stepanov et al. (to appear), with two important differences, each of which relates to the respective concern posed in the beginning of this study. First, the latter work used materials that involve extraction out of subject NP in the form of LBE (cf. (2)). Our present concern was that the lowered acceptability on the subject island sentences reported in that study could in principle be interpreted in at least three ways: a) being due to a combination of LBE and subject island; b) due to LBE alone; and c) due to a subject island alone (see Section 1). The present study teases apart these possibilities. Since there is no LBE involved in our materials, a potential LBE confound is therefore eliminated, and the observed effect can reasonably be attributed to the subject island alone.

The second difference is that the present study reports a cleaner and more robust effect pertaining to the subject island than that reported in Stepanov et al. (to appear). In the latter study, in which extraction out of subject NP was an instance of LBE, the observed superadditive effect was of marginal significance. In the present study involving PP extraction out of NP, the effect is shown to be statistically significant, eliminating potential ambiguities concerning its interpretation.

The contributing costs of factors LENGTH and STRUCTURE into the overall unacceptability of respective sentences, as estimated by pairwise comparison tests, were found insignificant in the present study (see Table 1), replicating the findings of Stepanov et al. (to appear). This state of affairs suggests that the observed true island effect in subject islands in Slovenian is due to reasons beyond these processing factors, namely those that have to do with the grammar proper rather than performance. Earlier, using similar materials, Sprouse et al. (2012) reported that the factor STRUCTURE did not incur an independent processing cost in subject island sentences in English. We speculate that an explanation of this state of affairs might lie in the constructed syntactic complexity, and the related processing complexity, of the relevant noun phrases. The structures used in Sprouse et al. (2012) to represent the NON-ISLAND and ISLAND values of the factor STRUCTURE had a shape such as *what* vs. *the speech about global warming*, respectively (see (5)). Thus the added complexity in the ISLAND condition comes from the prepositional phrase (PP) *about global warming.* In the Slovenian materials used the present study, the contrast between the two conditions lies in the presence of an adjective, e.g. *velika slika* "picture" vs. *velika slika Kosovela* "a large picture of Kosovel" (cf. (7)). Possibly, this added syntactic complexity is not sufficient to incur a significant processing cost either in English or in Slovenian. This is different, for instance, from wh-islands, which typically represent a clausal piece of structure, hence, presumably, are a priori more syntactically complex (see the above studies for more details).

Our results also indicate that the factor LENGTH does not incur an independent processing cost. In a similarly constructed study of Sprouse et al. (2012) with English materials, LENGTH was found to incur such independent cost in the subject island-related sentences. Stepanov et al. (to appear) speculated that a relevant cross-linguistic difference might lie in the nature of the testing materials. The difference between our materials in the present study and those used in the English study is that our materials involve D-linked wh-phrases, that is, (the Slovenian counterpart of) *which*-phrases, whereas in the reported English study bare *wh*-words such as *what* and *who* are extracted (cf. (5) vs. (7)). D-linked phrases are generally known to be subject to more liberal constraints on extraction than bare *wh*-words. Processing-wise, it has been demonstrated that items that are richer in featural composition leave a longer and more robust trace in the working memory, and consequently are subject to a slower memory decay compared to items that have less relevant features (e.g. Hofmeister and Vasishth 2014). Thus a D-linked phrase having a richer featural make-up may be able to linger in the memory for a longer time, overcoming potential effects of dependency length. The observed lack of independent processing cost incurred by LENGTH could possibly be

due to that. However, this does not mean that indefinitely increasing the length of the dependency will have no effect on the acceptability whatsoever: there must be some threshold value that even the D-linked character of the wh-phrase cannot overcome. This is suggested, in particular, by our results concerning LBE effects below. It should also be mentioned that, in the study of Stepanov et al. (to appear), wh-islands in Slovenian were found to properly incur independent processing costs of both LENGTH and STRUCTURE, as expected under this kind of considerations.

3.7.2   LBE

The results of the second part of our study strongly suggest that Slovenian observes a constraint on LBE, in interrogative as well as non-interrogative sentences. Speakers generally dislike extraction of a wh- as well as a non-wh-specifier out of NP in the object position. Furthermore, factor LENGTH plays a role as well: sentences with matrix LBE are judged more acceptable than sentences with embedded LBE, in both wh- and non-wh-versions. This is different from the subject island case where LENGTH was not found to be a significant factor. It should be noted, however, that, all else equal, the dependencies in the subject island-related sentences are a priori shorter than those in our LBE-related sentences (both involving and not involving LBE) where extraction out of the object position takes place. This is because extraction from subject NPs, in a canonical SVO configuration, a priori incurs a shorter dependency than extraction from object NPs. Therefore, a LENGTH effect observed in the LBE-related sentences is not surprising, and is on a par with a similar effect involving extraction from object in various types of islands, e.g. wh-island or complex NP island (see Sprouse et al. 2012, 2015; Stepanov et al. to appear for discussion).

Our results also suggest that the non-wh extraction sentences are perceived by the speakers as significantly worse than the wh-extraction sentences (see Section 3.6.2). In other words, the effect of movement type suggests that non-wh-fronting is generally disliked by the speakers regardless of LBE. This might reflect a genuine grammatical and/or processing constraint distinguishing among these movement types. As further elucidation of this putative constraint requires a more fine-grained excursus into theoretical details concerning the clausal and information structure of Slovenian, we leave it for future research, noting its potential importance in the context of computational mechanisms and triggers for various types of syntactic movement and their manifestation in this language. An alternative possibility is that this result might be due to the presentation format of our study. It is well known that fronted non-wh-constituents in Slavic languages usually bear an additional informational burden (e.g. contrastive focus) that can be properly construed only if an appropriate discourse context is provided. Since the relevant sentences were presented for evaluation to our participants context-free, it is possible that the participants gave such sentences a low score because of the lack of such context and the ensuing difficulty to assign these sentences a proper syntactic and semantic analysis (in contrast, sentences with wh-movement do not require such articulated context). Therefore, a follow up study regarding the influence of the movement type on the LBE structures might be in

order, perhaps using a different experimental methodology that would test this and other alternative interpretations.

4. A WORD ON POTENTIAL THEORETICAL CONSEQUENCES

4.1 Subject Islands

In contrast to the earlier claims (see Section 1), Slovenian appears to be well-behaved with respect to the subject island constraint. With respect to subject NPs, Slovenian can be placed on a par with many other languages manifesting the same constraint on extraction. This result extends so far to nominal subjects only. We have not tested sentential subjects in our study and it remains to be seen whether our conclusion can also be extended to those.

It should be noted that Golden (1995, 1996, 1997) reports examples of wh-extraction out of adjuncts in Slovenian as ungrammatical, and this comports well with similar observations from other languages in the literature. The fact that Slovenian manifests a subject island effect, taken together with the reported degradation of adjunct island sentences in the earlier literature, suggests that Slovenian is well-behaved with respect to the Condition on Extraction Domain (CED) in its original formulation (cf. Huang 1982). The CED predicts that subjects and adjuncts are a natural class of domains immune to sub-extraction from them. Some languages have since been shown in the literature to manifest a diverging behavior with respect to acceptability of sentences involving sub-extraction from subjects, whereas languages tend to be uniform in their ban on extraction from structural adjuncts (see e.g. Stepanov 2007). Each case of such divergence therefore presents an a priori challenge and an interesting empirical test case to the CED as a principle of grammar. If the earlier claims to the effect that Slovenian does not observe a subject island constraint were confirmed, Slovenian would then present another be an interesting case to study with respect to the nature of the divergence. The present study demonstrated, however, that Slovenian presents no such challenge to the CED from the part of nominal subject island constructions.

4.2 LBE

A number of authors argued that the possibility for LBE correlates with the lack of articles in a given language (see, e.g. Uriagereka 1988; Corver 1992; Bošković 2005). For instance, the Germanic languages generally have articles, and do not allow LBE. In contrast, the Slavic languages such as Serbian or Russian do not have articles, and they permit LBE. Now, Slovenian is a language that does not have overt articles of the kind found in Germanic languages. From this perspective, Slovenian might appear problematic in light of the observed constraint on LBE, which makes it more similar to the Germanic languages. However, Bošković (2005, 2008) argues that the correlation is one-way only: an articleless language may, but does not have to allow, LBE. Japanese is an example of the latter. In other words, the set of articleless languages is a superset of languages that allow LBE. Bošković (2005, 2008) also argues that languages that do

not have articles actually lack the DP layer of the structure of nominal phrases. Thus languages with articles have DPs, while languages without articles have NPs only. In Bošković's system, then, the lack of the DP layer is a necessary (but not sufficient) condition for LBE. [1]

It is beyond the scope of the present paper to go into the details of the productive NP/DP debate in the literature (see also fn. 1). If the main proposal is on the right track, then we face two potential theoretical possibilities. One is that Slovenian is like Japanese, meaning that whatever principle (other than the parametric variation in the NP/DP structure) accounts for the LBE-hood and the absence of the articles, it is irrelevant in the case of Slovenian. Another possibility, still within the NP/DP paradigm, is diachronic: Slovenian may be a language that is about to change from an "NP language" into a "DP language", one that may eventually develop a full-fledged article system. Bošković (2008: fn. 23) acknowledges this possibility. Some independent phenomena from the Slovenian syntax also indirectly suggest that this possibility is viable (Marušič and Žaucer 2014). The diachronic grammar-in-the-flux possibility could, in principle, also account for the apparently inconsistent character of the informally reported judgments, whereby certain instances of LBE are allowed (cf. (3)) whereas others are not. These possibilities will need to be distinguished in light of additional evidence that should emerge in future investigations.

5. CONCLUSION

In this study we aimed at strengthening the empirical base for the theories of syntactic locality by investigating two domains of syntactic locality in Slovenian. First, building on the previous findings concerning the presence of the subject island effect in Slovenian in Stepanov et al. (to appear), we replicated these findings while also excluding the LBE factor that was a potential confound in the previous study. We used a different set of sentences not involving LBE and found that the subject island effect in Slovenian persists, even in a more robust manner than what was observed before. Second, independently of that, we also asked whether Slovenian observes a constraint on LBE by using materials involving wh- and non-wh-displacement from the object position, both in matrix and embedded environments. We found that Slovenian speakers are sensitive to the constraint on LBE, modulated also by the length of the respective dependency (factor LENGTH), and that this sensitivity persists across wh- as well as non-wh-dependencies.

These results contribute to the growing body of evidence concerning syntactic locality domains in Slovenian. As noted in the beginning of this article, there are reasons

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1   More recent accounts of the phenomenon hold that the presence of a phase (not necessarily a DP phase) above the respective NP may block LBE in a language that otherwise allows it (see e.g. Bošković 2014 for relevant evidence from Serbian/Croatian/Bosnian; see Chomsky 2001 and later works on the concept of phase). We agree with an anonymous reviewer that this type of account offers a potentially promising venue for analyzing the seemingly diverging data patterns concerning LBE in Slovenian.

to believe that Slovenian observes constraints on certain syntactic islands including e.g. adjunct island, complex NP island or coordinate structure constraint. On the other hand, another recent finding reported in Stepanov et al. (to appear) was that Slovenian speakers do not observe the wh-island constraint. Considered together with the results of the present study, the wh-island emerges as the only island type in the Slovenian grammar whose status deviates from the expected range. This suggests one potential focus and provides a good continuation point for further theoretical studies of locality in Slovenian. Another interesting domain concerns further investigation of LBE involving extraction of different types of adjectival and/or adverbial specifiers.

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Summary
ASYMMETRIES IN SUB-EXTRACTION OUT OF NP IN SLOVENIAN:
A MAGNITUDE ESTIMATION STUDY

In this work, we aim to clarify the empirical paradigm that bears on two aspects of syntactic locality in Slovenian. First, building on previous work, we investigate how robustly Slovenian observes the syntactic locality constraint precluding constituent

sub-extraction out of subject noun phrases. Second, we ask whether Slovenian allows Left Branch Extraction in interrogative and non-interrogative sentences. To elucidate both issues, we conducted a magnitude estimation study, the results of which support our previous claim that there is a subject island effect in Slovenian. Furthermore, our results suggest that Slovenian disallows Left Branch Extraction, in contrast with some other Slavic languages. We also discuss theoretical consequences of our empirical findings.

Keywords: syntactic island, Left Branch extraction, magnitude estimation, Slovenian

Povzetek
NESOMERNOSTI PRI PREMIKU IZ SLOVENSKE SAMOSTALNIŠKE ZVEZE: ŠTUDIJA PO METODI OCENE MAGNITUDE

V pričujočem članku poskušamo razjasniti empirično paradigmo, ki vpliva na dva vidika skladenjske lokalnosti v slovenščini. Prvič, izhajajoč iz predhodne raziskave, smo želeli podrobneje proučiti, kako močno slovenščina upošteva omejitev skladenjske lokalnosti, ki preprečuje premik iz osebkovih samostalniških zvez. Drugič, ugotoviti smo želeli, ali slovenščina dopušča premik pridevnika iz samostalniške zveze v vprašalnih in nevprašalnih povedih. Da bi odgovorili na obe zastavljeni vprašanji, smo izvedli študijo po metodi ocene magnitude. Rezultati študije potrjujejo naše prejšnje zaključke, da slovenščina izkazuje prepoved premika iz osebkove zveze. Naši rezultati tudi pokažejo, da slovenščina ne dovoljuje premika pridevnika iz samostalniške zveze in tako kaže razločke z nekaterimi drugimi slovanskimi jeziki. Na koncu članek obravnava izsledke raziskave z vidika razvoja teorije skladnje.

Ključne besede: skladenjski otoki, premik pridevnika iz samostalniške zveze, metoda ocene magnitude, slovenščina