

# Island effects in Vietnamese relativization: A formal judgment study

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## Abstract

This paper examines island effects in Vietnamese relativization using methods in experimental syntax developed by Sprouse (2007). Typologically a *wh*-in-situ language, it is debatable whether Vietnamese employs *wh*-movement in the formation of relative clauses. If Vietnamese relativization is the result of *wh*-movement process, relativizing certain elements from inside island structures would result in ill-formedness. Using a formal acceptability judgment task and a factorial design of island effects that incorporates structure (island vs. non-island) and length of dependency (matrix vs. embedded) as variables, this paper found island effects associated with relativizing elements out of all the island types under investigation. The findings confirm that Vietnamese relative clause formation is constrained by islands and thus solidify the universal status of island phenomenon, i.e. both *wh*-movement and *wh*-in-situ languages are sensitive to island violations. It is also suggested that formal acceptability judgment methods provide a useful tool for uncovering subtle linguistic phenomena.

## 1 Introduction

One of the hallmarks of human language is the existence of dependency between two or more elements that can span an unbounded domain, as exemplified in (1) where the dependency between  $who_i$  (filler/antecedent) and  $t_i$  (trace/gap) spans three clauses.

1.  $Who_i$  does John think that Mary suspects Josh killed  $t_i$  ?

While long-distance dependency can be unconstrained with respect to length or amount of intervening materials, there seem to be constraints on the types of structures that can contain the gap. The structures that cannot license a gap are referred to as *islands* and the low acceptability arising as a result of the gap occurring inside islands is *island effect*. Empirical investigation into the phenomenon has uncovered a number of island structures, notably among which are *wh*-island, complex NP island, subject island, and adjunct island. A number of accounts have been proposed to explain the ungrammaticality of island violations such as Subjacency Condition (Chomsky, 1973), Barriers theory (Chomsky, 1986) and Conditions on Extraction Domains (Huang, 1982; Nunes and Uriagereka, 2000).

Nevertheless, as an acceptability-based phenomenon, the sources of island phenomena continue to be a topic of debate in linguistic literature, and *wh*-in-situ (henceforth WIS) languages take on an important role. In WIS languages, not much is revealed through the S-structure of sentences, i.e. whether movement takes place or not, and therefore it is often difficult to empirically determine whether WIS languages are subject to island effects. Some scholars have argued for the presence of island effects (Lee, 1982; Han, 1992; Nishigauchi, 1990), while others have argued against it (Choi, 2006; Hwang, 2007; Ishihara, 2002; Sprouse et al., 2011). The source of such disagreements may lie in the fact that their claims are grounded in informal acceptability judgments, which are essentially behavioral responses that, without careful control, can be confounded by a host of extraneous factors other than

grammaticality. This situation points to the need for carefully designed, formal acceptability experiments to determine exactly what the facts are. The goal of this paper is to investigate if Vietnamese relativization falls under the broad category of  $\bar{A}$  dependency. To this end, we examine if Vietnamese relative clause formation is constrained by syntactic islands. Since island effect is an acceptability-based phenomenon, this paper adopts a formal experimental approach developed by (Sprouse, 2007) in order to systematically probe into island properties in Vietnamese.

## 2 Syntactic background

### 2.1 Vietnamese relative clause and island effects: some data

In Vietnamese, a relative clause (RC) modifying a head noun consists of a relativizer followed by a clause containing a gap. Vietnamese RC differs from some other WIS languages, i.e. Japanese, Korean and Chinese, in terms of directionality. Specifically, Vietnamese RC occurs to the right of the head noun while RC in other WIS languages occurs to the left. There is evidence that relativization in Vietnamese is constrained by some island structures (Tran, 2009; Trinh, 2011). Consider the following data <sup>1</sup>:

2. Co gai<sub>i</sub> [<sub>RC</sub> ma [<sub>IP</sub> toi doan [<sub>CP</sub> rang [<sub>IP</sub> Hung sap cuoi t<sub>i</sub>]]]] dang co bau.  
'The girl that I guess Hung is going to marry is pregnant.'
3. Co gai<sub>i</sub> [<sub>RC</sub> ma An khong biet [<sub>wh-island</sub> ai da bat coc t<sub>i</sub>]] vua tro ve.  
'The girl that An doesn't know who kidnapped has just returned.'
4. \*Co gai<sub>i</sub> [<sub>RC</sub> ma Lan gap [<sub>CNP</sub> vien canh sat; [<sub>RC</sub> t<sub>j</sub> da danh t<sub>i</sub>]] vua den.

<sup>1</sup>Data are taken from (Tran, 2009) with some slight lexical modifications. Relative degree of acceptability is informally judged by native speakers of Vietnamese including the author of the source data and the author of this paper. Glossing abbreviations as follows: *RC* = relative clause; *CNP* = complex noun phrase; *REL* = relativizer; *COMP* = complementizer, *CL* = classifier; *PST* = past marker; *PRES* = present tense marker; *PROG* = progressive aspect; *ASP* = aspect marker; *NEG* = negation marker; *NOM* = nominative case; *ACC* = accusative case; *ADN* = adnominal.

'The girl that Lan met the police who hit has just arrived.'

5. ?? Co gai [<sub>RC</sub> ma [<sub>sententialsubject</sub> Lan ghet t<sub>i</sub>] lam nhieu nguoi rat ngac nhien]] vua qua doi.  
'The girl who that Lan followed surprised many people has passed away.'
6. ?Day la co gai ma Lan se vui [<sub>adjunct-island</sub> khi/neu An gap t<sub>i</sub>].  
'This is the girl who Lan will be happy when/if An meets.'
7. \*Day la co gai<sub>i</sub> ma Lan vui [<sub>adjunct-island</sub> vi An da gap t<sub>i</sub>].  
'This is the girl who Lan was happy because An met.'

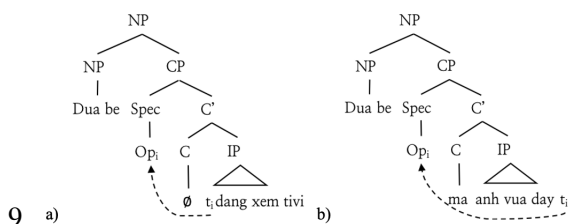
Some facts about Vietnamese relativization can be deduced from the above data. Firstly, long distance relativization is possible in Vietnamese as illustrated in (1) where the dependency between the head noun co-gai<sub>i</sub> and its trace t<sub>i</sub> spans two clause boundaries. Secondly, relativization can escape wh-island as (2) illustrates that the gap t<sub>i</sub> can be contained inside a matrix question. Thirdly, relativizing an object out of sentential subject results in decrement in acceptability as indicated by two question marks in (4). Finally, with respect to adjunct island, relativizing an element out of adjunct clause headed by because is worse than adjunct clause headed by if/ when as can be seen in (5) and (6).

As observed above, it appears to be inconclusive as to whether Vietnamese RC are subject to island constraints. As it turns out, the same can be observed in several WIS languages including Korean, Chinese and Japanese in which there is no consensus on whether rc-dependency is syntactically constrained. To date there has been two major approaches to RC construction, namely operator movement analysis and operator binding analysis. The former holds that rc-dependency is formed with  $\bar{A}$  movement and subject to island constraints as a result. The latter, on the other hand, posits that rc-dependency is formed via variable binding and no syntactic movement takes place, implying that rc-dependency is not subject to island violations. The following sections discuss the two analyses in details.

## 2.2 Operator movement analysis of RC

The operator movement analysis of RC holds that the gap inside the relative clause is a trace/copy of a null-operator (Op) which has moved to [Spec, CP] of the relative clause (Yang, 1987; Han, 1992; Han and Kim, 2004). For example, in the subject relative clause in (8a), a null operator originates in the subject position of the relative clause and moves to [Spec, CP], as illustrated in (9a). Similarly, in the object relative clause in (8b), a null operator originates in the object position of the relative clause and moves to [Spec, CP], as illustrated in (9b). The relation between head noun and the null-operator is formed by feature percolation, as demonstrated by co-indexation.

8. a) Dua be<sub>i</sub> [CP Op<sub>i</sub> [IP t<sub>i</sub> dang xem TV]] la con gai toi.  
Child PROG watch TV COP daughter 1SG.  
'The child who is watching TV is my daughter.'
- b) Dua be<sub>i</sub> [CP Op<sub>i</sub> (ma) [IP anh vua day t<sub>i</sub>]] la con gai toi.  
Child (that-COMP) 2SG ASP push COP daughter 1SG.  
'The child that you just pushed is my daughter.'



This analysis predicts that a gap cannot occur inside island structures. However, such a prediction is not always borne out, as illustrated in (10) where relativization out of an embedded question, which is often considered a syntactic island, seems unproblematic. The dependency between the trace and the head noun is intervened by a *wh*-island and yet the sentence appears acceptable, an observation that is unexpected under the operator-movement analysis.

10. Dua be<sub>i</sub> [CP Opi (ma) An khong biet [CP ai da bat coc ti]] vua tro ve.  
Child (that)-COMP 3SG NEG know who PST kidnap ASP return.  
'The child that An doesn't know who kidnapped has returned.'

Korean relative clauses appear to exhibit similar insensitivity to *wh*-islands, as illustrated in (11):

11. Op<sub>i</sub> Tom-i nay-ka [etten cilmwun-ul t<sub>i</sub> cwun-nun-ci] a-nun haksayng  
Tom-NOM I-NOM which question-ACC give-PRES-whether know-ADN student  
'The student who Tom knows which question I gave'

(Kwon, 2008)

The seemingly legitimate sentences such as (10) and (11) pose a challenge to the movement analysis of RC. It should be noted, however, that syntacticians are not always in agreement with respect to the judgments of island violations such as (10) and (11) above. Furthermore, violations of adjunct and complex NP, in contrast with *wh*-islands, appear to be consistently judged as problematic, as illustrated in (8), repeated here as (12), for Vietnamese and (13) for Korean. We return to the discussion of strong vs. weak islands in the subsequent section.

12. \*Day la co gai<sub>i</sub> [CP Op<sub>i</sub> ma [IP Lan vui [AdvP vi An da gap t<sub>i</sub>]].  
DEM COP girl that-COMP 3SG happy because 3SG PST meet.  
'This is the girl who Lan was happy because An met.'
13. \*[Op<sub>i</sub> [John-i ku namca-lul t<sub>i</sub> manna-ss-ki ttaymwuney] Sue-ka hwakana-n] sikan  
John-NOM that man-ACC meet-PAST-NMZ because Sue-NOM be angry-AND time  
'The time when Sue was angry because John met that man'

(Han, 2013)

## 2.3 Operator binding analysis of RC

The operator binding analysis is a non-movement account that explains why gaps appear to be permissible inside islands. This binding account holds that the gap inside an RC is an empty pronoun bound in-situ by a null operator. For example, in (8), the subject gap contains an empty pronoun which is bound by the null operator in [Spec, CP], as illustrated in the diagram (14) below. Since there is no movement, relative clauses are expected to be unconstrained by

islands. This account can accommodate for the acceptability of sentences such as (10) and (11) above.

Furthermore, since the gap is analyzed as an empty pronoun in this account, the gap in RC is predicted to be replaceable with an overt pronoun as empty pronouns can also be replaced with an overt pronoun in other syntactic contexts without affecting the grammaticality. In (14) below, the empty pronoun is replaced with a third person singular pronoun *no* whose antecedent is the head noun. An overt pronoun in place of the gap inside one level-embedded RC in Korean is also considered unproblematic as indicated in (15).

14. *Cau be<sub>i</sub> [CP Op<sub>i</sub> ma [IP co khong biet [CP ai da bat coc noi]] vua tro ve.*  
 Boy that 3SG NEG know who PST kidnap 3SG ASP return.  
 ‘The boy that she does not know who kidnapped him has just returned.’
15. *Op<sub>i</sub> Mary-ka Tom-i kui-lul kosohay-ss-tako sayngkakka-n wuncensai*  
 Mary-NOM Tom-NOM he-ACC sue-PAST-COMP think-AND driver  
 ‘The driver who Mary thought that Tom sued’

(Kwon, 2008)

As mentioned previously, one consequence of the operator binding analysis is that overt pronouns can replace empty pronouns whenever gaps occur. Nevertheless, it is not always possible, as frequently reported in the syntax literature, to replace empty pronouns in simple relative clauses, especially those with short operator-gap dependency. For instance, replacing the gap with an overt pronoun might result in awkwardness as exemplified in (16) for subject RC in Vietnamese and in (17) for object RC in Korean.

16. *??Con cho<sub>i</sub> [CP Op<sub>i</sub> ma [IP no<sub>i</sub> khong biet sua]] la con cho ngu.*  
 CL dog that-COMP 3SG NEG know bark COP  
 CL dog stupid.  
 ‘A dog that does not know how to bark is a stupid dog.’

17. *\*[Op<sub>i</sub> hyeungsa-ka kui-lul enceyna sinloyhan] kica<sub>i</sub> detective-NOM he-ACC always trust-ADN reporter*  
 ‘the reporter who the detective always trust’

(Kwon, 2008)

The data above can be interpreted as evidence against the operator binding analysis. (Han, 2013) suggests that contrasting judgments on RC formed from simple clausal structure or complex clausal structures, i.e. island structure, might be a reflex of processing burden rather than a reflex of grammatical constraints. To elaborate, it could be the case that sentences (15) and (16) are perceived as more acceptable than (12) and (13) because inserting an overt pronoun in the gap position inside complex RCs can reduce processing load. Meanwhile, doing so inside simple RCs as in (16) and (17) might require an additional task, i.e. reference tracking, that increases processing burden and results in low acceptability judgment. If the binding approach to RC was to hold, it should be posited that empty pronouns are preferable over overt pronouns in simple relative clauses while overt pronouns are preferable in complex relative clauses, i.e. those containing one or more embedded clauses and island structures. In this case, the binding account is comparable to a processing account of island effects (Kluender, 1998; Hofmeister and Sag, 2010).

#### 2.4 Experimental approaches to island phenomenon

Developments in linguistic theories often rely on informal grammaticality judgments. In using informal judgment methods linguists often assume a transparent mapping between acceptability and grammaticality. More specifically, it is assumed that no grammatical constraint is violated if a sentence has relatively high acceptability and vice versa. Apparently, acceptability is an observable property of sentences while grammaticality is an abstract property of mental linguistic representation. While it is often the case that acceptability can closely track grammaticality, these two notions can sometimes diverge, which could mislead researchers. Additional, informal judgment methods might not be as sensitive and accurate when phenomena under investigation lie in

disputable areas of grammar. As an example, the argument-adjunct asymmetry with respect to island sensitivity in WIS languages has been established through analyses of informal judgment data in which adjunct *wh*-phrases, not argument *wh*-phrases, are sensitive to island violations (Huang, 1982). Recently Lu, Thompson and Yoshida (2019), using experimental syntax techniques, have shown that argument and adjunct *wh*-phrases are equally sensitive to complex NP island violations and the asymmetry effect arising is only a result of the main *wh*-category effect. By using quantitatively defined effects rather than simple categorical mappings between acceptable/unacceptable and grammatical/ungrammatical, Lu et al. (2019) convincingly show that WIS languages are island sensitive and there is no additional empty category principle effect that distinguishes movement of *wh*-arguments from *wh*-adjuncts. The above discussion raises some interesting questions about how to interpret the presence of apparent grammatical effects in the absence of ‘unacceptability’. A nontrivial question arises for Vietnamese re-dependency: Despite the lack of categorical unacceptability for some island violations in Vietnamese RCs, are there nevertheless island effects? If a formal experimental tool can help uncover island effects, there will be interesting consequences for the analyses of RC discussed above. As mentioned earlier, two competing accounts for RCs are proposed to explain the observations that gaps are either permitted (operator binding analysis) or prohibited (operator movement analysis) inside islands. However, such observations are solely based on informal judgments that seem inconsistent among linguists. Therefore, a formal and quantitative method will hopefully lead us to a better-grounded analysis of relativization. In an attempt to quantify island effects, Sprouse (2007) developed a factorial design that isolates the effect of grammatical constraints from the possible effects of extra-grammatical factors, i.e. processing effects. The factorial design for island effects explicitly isolates two non-syntactic components that could give rise to low acceptability, i.e. (i) the presence of long-distance dependency in the sentence, labelled as LENGTH, and (ii) the presence of complex syntactic structure (island structure) in the sentence, labelled as STRUCTURE. Crucially, each of these components could

potentially lower acceptability for reasons that are independent of island constraints. Long-distance dependencies tend to cause more processing load than short-distance dependencies. If this processing difficulty impacts acceptability judgments, then sentences with long-distance dependencies will be rated lower than short-distance dependencies regardless of whether island constraints are violated. The factorial design for island effects is typically a 2 x 2 design, as illustrated with examples for complex NP island in rc-dependency in (18) below:

18. A factorial design for measuring island effects:  
 STRUCTURE x LENGTH
- a) I know the fisherman who<sub>i</sub> heard that Laura is dating the boat captain. (matrix/non-island)
  - b) I know the boat captain who<sub>i</sub> the fisherman heard [that Laura is dating<sub>i</sub>]. (embedded/non-island)
  - c) I know the fisherman who<sub>i</sub> heard [the rumor that Laura is dating the boat captain]<sub>i</sub>. (matrix/island)
  - d) I know the boat captain who<sub>i</sub> the fisherman heard [the rumor that Laura is dating<sub>i</sub>]. (embedded/island)

As can be seen from examples in (18) above, the factor STRUCTURE manipulates the presence (island) or absence (non-island) of an island configuration while the factor LENGTH determines the base position of the relativized element. In matrix condition (short dependency), the base position of the relativized element is inside the matrix clause while in embedded condition (long dependency), the base position of the relativized element is located in a more deeply embedded constituent, i.e. lower embedded CP in (18b) and clausal complement of NP the rumor in (18d). Here is how this factorial design allows us to isolate island effects from the independent effects of non-syntactic factors. Firstly, the independent cost of LENGTH on the acceptability judgment is determined by the difference in acceptability between matrix/non-island and embedded/non-island conditions, i.e. the difference between (18a - 18b). Secondly, the independent cost of STRUCTURE on the acceptability judgment is quantified by the acceptability difference between (18a - 18c). Finally, we can quantify the re-

maining effect after the two independent effects on acceptability have been accounted for. Such quantification can be obtained by subtracting the sum of the two independent costs from the total acceptability difference between (18a-18d). If there is any remaining effect, i.e. the subtraction result is positive, it is taken as the island effect itself, or the super-additivity effect in Sprouse's (2007) term. Therefore, we take differences-in-difference score, or DD score (?) to be the measure of island effects, characterized as (19) below:

$$19. \text{ Island effect} = (18a - 18d) - ((18a-18b) + (18a-18c))$$

The factorial design is particularly useful for the purpose of the current study. Firstly, since the design can help discriminate between a processing account and a pure syntactic account of a linguistic phenomenon, using a factorial design may help determine the operation underlying Vietnamese RC formation. As earlier discussions on RC have pointed out, there are two competing accounts, i.e. a movement account which is essentially syntactic in nature and a non-movement binding analysis which is comparable to a processing account. It is hoped that the factorial design can provide evidence for one of the two accounts. Secondly, as the DD score obtained from the subtraction can be regarded as a non-standard measure of island effect size, it is possible to compare the degree of violations among different types of islands. As discussed above, island violations are not equally bad, with some being worse than the other, which raises the need for a quantitatively definitive method to determine which violations are truly stronger than the other. Therefore, it is assumed that island structures associated with larger DD scores can be regarded as strong islands and vice versa.

### 3 The study

#### 3.1 Research question

Discussions laid out in the previous sections have identified some discrepancies in the syntax literature that call for further investigations. Firstly, empirical data appear to be inconclusive as to whether rc-dependency formation in WIS languages including Vietnamese is tied to operator movement and

thus sensitive to island constraints or tied to operator binding and thus insensitive to island constraints. Secondly, acceptability judgment data informally collected might not provide adequate evidence for or against subtle linguistic phenomena, which calls for the need of carefully-designed formal acceptability methods. It also should be noted that little is known whether variations among island constraints attested with wh-dependency are also observed with rc-dependency. Therefore, the current study is set out to investigate island phenomenon in rc-dependency with Vietnamese – a WIS language that provides a good test case for these debatable issues. Accordingly, the study attempts to answer the research question whether relativization in Vietnamese formed via movement and thus constrained by islands.

A total of 128 high school students aged 16-18 who speak the southern variety of Vietnamese participated in the study. All of the participants were residing in a small community in a southeast province of Vietnam. They reported to have never been to a foreign country before and be fluent in Vietnamese only, and only have some very elementary knowledge of English grammar from formal English education. The reason behind the choice of high school students in rural areas is to ensure that their native language judgment would not be clouded by any beyond-elementary knowledge of syntax of other languages. Subject participation consents were obtained prior to the main testing session.

#### 3.2 Experimental design

This paper adopts Sprouse (2007)'s factorial definition of island effects. This definition takes into account two factors, i.e. length of dependency and the presence of island structure, that can potentially affect the processing of relative clauses and, therefore, give rise to low acceptability judgment by native speakers. Accordingly, the experiment employs a 2 x 2 factorial design, yielding four testing conditions by crossing two levels of the two factors, i.e. LENGTH (matrix/ embedded) x STRUCTURE (non-island/island). The same design applies to all four island types under investigation, namely whether island, complex NP island, subject island, and adjunct island.

### 3.3 Materials

As discussed above, the target construction for investigation is Vietnamese relativization. Specifically, we investigate rc-dependencies that form restrictive relative clauses in which all head nouns take the form of CL + N. The presence of CL helps individuate the N and thus assigns a specific reading of the NP.(5) Furthermore, the subject RC is introduced by a relative pronoun that occupies [Spec, CP] position as discussed above while object RC is introduced by a complementizer *ma*. In Vietnamese object RCs can be introduced by a relativizer, but doing so is often considered overly formal and not usually preferred by native speakers. While the difference between subject RC and object RC might possibly affect the general result, we need to take into account the risk of detecting low acceptability not due to island constraints but due to speakers' sensitivity to the register of test sentences. Four types of islands are constructed as follows. For wh-islands which necessarily include a wh-word/phrase, the Vietnamese equivalent of whether, i.e. *co phai*, was used. As for complex NP islands, an N-complement other than a relative clause was used to avoid the risk of increasing processing load due to the presence of double relatives. As for subject islands, the relativized element is PP adjunct to the subject NP. As for adjunct island, object complement is relativized out of the adjunct clause headed by a Vietnamese equivalent to English temporal adjunct when. Example materials for all test conditions and island types are provided in the appendix with glossing and notations given for expository purposes and are not included in the surveys. Four lexicalizations were created for each condition and each island structure as exemplified above, yielding  $4 \times 4 \times 4 = 64$  main test items. All test items were distributed across four different lists following Latin square design such that every condition in each list contained a test item derived from a different lexicalization and that each participant was only presented with one item per condition and never encountered more than one item from the same lexicalization. In addition, thirty-two ungrammatical sentences were included as fillers to balance the weight of grammaticality. Under the assumption that one quarter of the main test items would be rated as unacceptable

which means the ratio of acceptable items to unacceptable items is 1:3, the addition of 32 fillers would increase the ratio to 1:1 of acceptable items to unacceptable items and thus help eliminate potential bias in speakers' judgment (Cowart, 1997). Fillers were constructed such that each sentence has roughly the same length as main test items. Half of the fillers are wh-fronted questions from matrix and embedded and the other half are relative clauses containing resumptive pronouns in subject/object position and from matrix/embedded clauses. These above fillers were then combined with main test items that belong to the four lists as previously mentioned. Out of each of the four lists, all test items were pseudo-randomized to create two more lists, resulting in a total of eight surveys. The survey task was a 5-point Likert scale with 1 at the lowest end and 5 at the highest end of acceptability. Subjects were instructed, in Vietnamese, to read each sentence carefully and give their judgment on the acceptability of the sentence on the scale of 1 to 5 in which number 1 means the sentence is completely unacceptable and number 5 means the sentence is completely acceptable. All subjects were financially rewarded for their participation.

### 3.4 Analysis

Data from 128 participants were analyzed as follows. First, the raw ratings from each participant were z-score transformed. Next, several linear mixed effects models were constructed with subjects and items entered as random factors on each of the island types and LENGTH and STRUCTURE as fixed factors. This is comparable to a repeated-measures two-way ANOVA, but with subjects and items entering the model simultaneously. Then, p-values for the two main effects and the interaction of two main effects were obtained using likelihood ratio tests. Finally, mean differences-in-differences score for each island as a non-standardized measure of effect size for each island type was calculated to determine the strength of island effect between island types. All statistical analyses were performed with R (R Core Team 2017).

## 4 Results

Mean acceptability ratings and standard deviations for each condition in the four island types are reported in Table 1. Interaction plots along with mean DD scores for four islands are summarized in Figure 1.

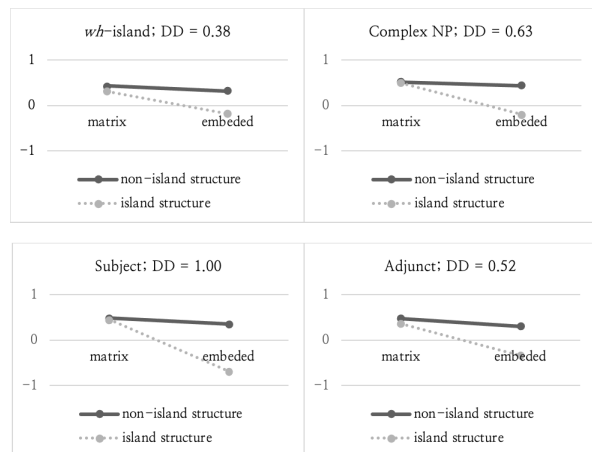


Figure 1: Vietnamese rc-dependency, interaction plots for each island type (N = 128)

As shown in Table 1, Vietnamese speakers gave the lowest acceptability ratings to the embedded/island conditions for all four island types. Subject island violations were least acceptable (mean z-score is -0.69) while whether island violations appear to be perceived as least severe (mean z-score is -0.18). Interaction plots in Figure 1 also clearly indicate island effects across all island structures. There appears to be variations with respect to the acceptability of violations of different island types as can be inferred from the varying mean DD scores across different islands.

To determine whether Vietnamese speakers were sensitive to island effects in RC constructions, several linear mixed-effects models were constructed to determine the main effects of the two variables under investigations and the interaction of the two main effects. The models constructed follow this formula: judgment = structure + length + structure\*length + (1—item) + (1—subject). Results of the models are summarized in Table 1.

As can be seen from Table 2, two factors STRUCTURE and LENGTH significantly affect acceptability ratings in almost every island structure, except

Effects	Estimate	t-value	p-value
<b>Whether</b>			
Structure	0.501	6.564	.0001 ***
Length	0.070	0.918	0.359
Structure*Length	-0.329	-3.048	0.002 **
<b>Complex NP</b>			
Structure	0.542	7.289	.0001 ***
Length	0.598	8.045	.000 ***
Structure*Length	-0.627	-5.963	.0001 ***
<b>Subject</b>			
Structure	1.038	13.77	.0001 ***
Length	0.842	11.18	.0001 ***
Structure*Length	-1.099	-10.31	.0001 ***
<b>Adjunct</b>			
Structure	0.587	7.577	.000 ***
Length	0.594	7.659	.000 ***
Structure*Length	-0.687	-6.269	.000 ***

Table 1: Results of linear mixed-effect models for all island types.

for whether island where LENGTH does not appear to significantly interfere with acceptability ratings. Such results indicate that native speakers of Vietnamese distinguish between relativizing from matrix clause and from embedded clause, as well as between relativizing from island structure and relativizing from non-island structure. Crucially, the interactions of two main effects are statistically significant for all island types. The interactions result from significant decrement in acceptability ratings for the island/embedded conditions which contain relativizing elements from inside island structures, as compared to higher acceptability ratings in the other three conditions. The interactions also indicate that the effect of island structures is more robust with long RC-dependency (relativizing from embedded clause) than with short RC-dependency (relativizing from matrix clause), suggesting that Vietnamese native speakers are sensitive to the effects of the four types of island constraints. Regarding the two main effects of STRUCTURE and LENGTH, it can be the case that such effects were mostly driven by the island/embedded condition. Therefore, to further probe into the independent effect of STRUCTURE and LENGTH, it is important to isolate the two effects from the ungrammatical condition. To isolate the effect of STRUCTURE, the baseline non-island/matrix condition is contrasted with the island/matrix condition. Likewise, to isolate the effect of LENGTH, the baseline non-island/matrix condition is contrasted with non-island/embedded condition. A series of pairwise comparisons conducted for all island types reveal the effect of STRUCTURE for whether island,  $t(508) = -2.2721$ ;  $p = 0.0235$ , and



the effect of LENGTH for whether island,  $t(508) = 3.1727$ ;  $p = 0.0016$ , and subject island,  $t(508) = 3.4406$ ;  $p = 0.0006$ . These results indicate that the low acceptability ratings for sentences containing relativized elements out of island structures, i.e. island effects are not necessarily the combination of the two independent effects, i.e. LENGTH and STRUCTURE. In other words, island effects are the direct result of the illegitimate relativization out of island structures.

## 5 Discussion

In this study we examined island effects in Vietnamese relativization using the factorial design of island effects originally explored in (Sprouse, 2007; Sprouse et al., 2011; Sprouse et al., 2012) so as to gain a better understanding of long-distance dependencies and island sensitivity in WIS languages. In particular, we were interested in determining whether it is possible to experimentally validate or invalidate the claim that Vietnamese relativization is constrained by islands in virtue of involving long distance movement. In the experiment we found statistically significant interaction effects for all four island types tested. Crucially we found little evidence for the independent effects of the two factors LENGTH and STRUCTURE in all four island types, suggesting that island effects attested are not necessarily the result of accumulating of the two independent effects. To put it differently, island effects are the direct result of the illegitimate relativization out of island structures. Another critical finding is the positive DD scores in all four island structures, indicating Vietnamese relativization is sensitive to island constraints. Given the results presented above, the research question raised previously can be answered as follows. Regarding whether Vietnamese relativization is constrained by islands, the findings suggest that relativization out of islands is not possible, as indicated by native speakers' low acceptability of island violations. Crucially, the factorial design to investigate island phenomenon has revealed that such island effects stem from syntactic constraints on rc-dependency rather than from processing constraints in which low acceptability manifests speakers' difficulty with simultaneously processing long-distance dependency and island structure. The

results thus support the operator-movement analysis of RC that prohibits gaps inside islands and cast doubt on the operator-binding analysis of RC that allows gaps inside islands. Vietnamese RC, therefore, belongs to a group of constructions that contain long-distance dependencies and obeys the relevant island constraints. Some significant implications can be drawn from the results of this study. Firstly, the findings shed some lights on a number of important syntactic theories. Findings from this study cast doubts on the two claims (i) WIS languages are insensitive to island effects and (ii) island effects are reflexes of processing constraints, which have been proposed to argue against the universalist account of islands. WIS languages have been regarded as languages without wh-movement and island effects are rendered largely irrelevant for this group of languages (Choi, 2006; Hwang, 2007; Kuno, 1975; Ishihara, 2002). Nevertheless, the analysis laid out above provides strong evidence for island effects in WIS languages and further reinforces the universalist account of islands. Similar evidence is found in recent formal experiments with WIS wh-dependencies which provide data in support for islandhood (Han, 2013; Kim and Goodall, 2014; Lee, 2018; Lu et al., 2019). Crucially, the aforementioned studies have argued for a syntactic origin of island phenomenon and refuted the claim that island effects are syntactically irrelevant and can be reduced to processing difficulties. In these studies, it has been convincingly shown that island effects persist even when all processing effects have been accounted for. All in all, it is strongly suggested that island effects should be tied to grammar and appear to be universally present in world languages. It should be acknowledged that evidence reported in this study might not completely refute the operator binding analysis of RC. In order to empirically argue for/against this analysis, it is necessary to design other formal acceptability experiments that can determine if native speakers' grammar allows for gaps inside islands to be filled with resumptive pronouns or not. We leave this issue for future investigation.

## 6 Conclusion

In this study we performed an experiment on island phenomenon with Vietnamese relativization in hope

of characterizing a better profile of island effects in WIS languages – a group of languages whose islandhood has been rather unclear. Interestingly, the study found strong evidence for island effects in Vietnamese RC formation and thus supported a movement analysis of relativization in Vietnamese. Findings from the study cast doubt on theories that refute island sensitivity in WIS languages and support a syntactic origin of islandhood. Crucially, the study exemplifies cases in which the use of highly controlled experiments can shed lights on disputable areas that traditional methods cannot. We hope that this study will encourage more frequent deployment of formal techniques to investigate grey areas of human grammar.

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