

On the *wh*-island effects in a phase-based theory: A solution with a chain formation analysis

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1. Introduction

In Taguchi (2013), we provided a uniformed explanation for the phenomena in which subject *wh*-phrases and object *wh*-phrases behave differently. We assumed the phase-based theory of Chomsky (2008), but we departed from his proposal in terms of locus of features and proposed that the non-phase heads T¹ and V have an edge-feature and an Agree-feature. A problem of his phase-based theory is that the inheritance of a feature from C to T is countercyclic since C must be merged before Spec TP is filled by the subject. Our proposal does not arise this problem because T inherently has the feature and C merges after Spec TP is filled by the subject, that is, the derivation is cyclic. However, this analysis raises a problem about the *wh*-island effects. The extraction of an element from an embedded question is generally excluded, but the extraction of an object leads to a less severe deviance compared to the extraction of a subject or an adjunct. Taguchi's (2013) analysis fails to account for this fact. The purpose of this article is to resolve this problem and present a more principled account of the subject-object asymmetry in *wh*-extractions. In order to do that, we adopt Kitahara's (1997) chain formation analysis. He claims that Move raising (a feature of) α to a position P can form more than one

¹ In Taguchi (2013), we revise C to c* and T to C. In this article, however, we use C and T because there is no clear evidence of the revision of the labels.

chain(s) consisting of P and any other position associated with (a feature of) α . We are going to show that the *wh*-island effects can be explained by incorporating this idea.

The rest of this article is organized as follows. Section 2 summarizes our previous analysis (Taguchi 2013). In Section 2.1, we briefly review the analysis of feature-inheritance in Chomsky (2008). In Section 2.2, we summarize Taguchi's (2013) proposal. We disagreed to Chomsky's (2008) idea and claimed that T and V (non-phase heads) have an edge-feature and an Agree-feature. In Section 2.3, we address the remaining problems. In particular, it is shown that Taguchi's (2013) analysis cannot account for the *wh*-island effects. Section 3 provides a solution to the problem. We show that it can be explained by adopting Kitahara's (1977) chain formation analysis. Following the summary of his analysis in Section 3.1, in Section 3.2, we show how the chain formation analysis applies to the *wh*-island effects. Section 4 summarizes the main claims of this article.

2. Previous analyses

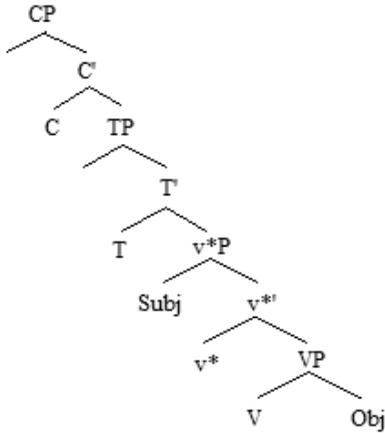
In this section, we outline Chomsky's (2008) phase-based theory, whose basic framework is assumed in Taguchi (2013). We proposed an account of the subject-object asymmetry in *wh*-extractions based on Chomsky's (2008) phase-based theory. In Section 2.1, we overview Chomsky's (2008) phase-based theory, and in particular his feature-inheritance will be critically reviewed. In Section 2.2, we summarize Taguchi's (2013) proposal, which does not assume the feature-inheritance while maintaining the phase-based approach. In Section 2.3, we argue that what remains to be explained is the *wh*-island effects.

2.1 Chomsky (2008)

First of all, we briefly review Chomsky (2008). He assumes that a

sentence has the following structure (we also assume this structure).

(1)



The base position of a subject is Spec v^*P^2 , and the base position of an object is the complement of V. He argues that phases are CPs and v^*P s, and that they have two probes: an edge-feature (EF) and an Agree-feature (ϕ -features). An EF attracts a *wh*-phrase to the edge of the v^*P phase at the v^*P phase and to Spec CP at the CP phase, while an Agree-feature attracts a DP. He claims that the Agree-feature of C is inherited by T and that T attracts the subject to the Spec TP. He gives the following examples as evidence.

- (2) a. it was the CAR (not the TRUCK) of which [they found the (driver, picture)]
 b. of which car did [they find the (driver, picture)]?
- (3) a. *it was the CAR (not the TRUCK) of which [the (driver, picture) caused the scandal]
 b. *of which car did [the (driver, picture) cause a scandal]
- (4) a. it was the CAR (not the TRUCK) of which [the (driver, picture) was found]

² The specifier Spec is the position that is directly dominated by the maximal projection of X in terms of the X-bar theory. The Spec does not exist in the framework of the Minimalist Program, but we use this conventional term for ease of exposition in this article.

b. of which car was [the (driver, picture) awarded a prize]

These are examples of the violation of the subject–island condition. (4) falls together with (2), not (3), though the surface subject is in the same position as in (3). If so, then the effect is determined by the base structures of (4), not the surface structures, in which the distinction between the cases has been effaced by the raising of the subject from the verb phrase. The relevant base structures are (5).

(5) a. C [T [v [V the (driver, picture) of which]]]]

b. C [T [α [the (driver, picture) of which][v* [V XP]]]]

In (5a), v is unaccusative/passive, so only (5b) has the internal phrase α . Then it follows that T is not the probe that yields A–movement of [*the (driver, picture) of which*] to Spec TP in (4) before C is merged. If it were, the required distinction would be effaced before the *wh*-movement. Rather, A– as well as A'–movement must be triggered by probes in C. The EF accesses *which* in its base position in (4), raising *of-which* to Spec CP, while the Agree–feature, inherited by T, raises the full DP [*the (driver, picture) of which*] to Spec TP, with the two operations proceeding in parallel.³

2.2 Taguchi (2013)

In the preceding section, we summarized the analysis of feature–inheritance in Chomsky (2008). However, this analysis raises a problem. If C has an Agree–feature and T inherits it, as he claims, the derivation will be countercyclic because C must be merged before Spec TP is filled by the subject. To resolve this problem, Taguchi (2013) proposes that T, not C, has an EF and an Agree–feature, contrary to Chomsky. For the purpose of checking, the edge–feature of T attracts a *wh*-phrase, which has a *wh*-feature, and its

³ Chomsky claims that an edge–feature cannot access a *wh*-feature within the external argument of α because there is a cost to extract something embedded in it. In (3), for example, the PP-complement of the subject cannot be extracted since its base position is not in the search domain of the probe v*.

Agree-feature attracts the subject, which has ϕ -features. Furthermore, we assume (6) as the nature of the phase heads.

(6) Phase heads attract the remaining features that cannot have been checked. For example, in object questions, the Agree-feature of T attracts the subject, which has ϕ -features, to its Spec, so that the Agree-feature can be checked and deleted. However, since the subject does not have a *wh*-feature, the EF of T cannot be checked, and it remains. Here, there is no way for the EF to be checked if the EF stays at T, so the phase head C attracts the EF. Then, the EF in C attracts a *wh*-phrase, which has a *wh*-feature, to Spec CP, so that the EF can be checked.

Similarly, for the v*P phase, it is assumed that V has an EF and an Agree-feature. First, V enters into an Agree-relation with the object, which has ϕ -features, and the Agree-feature can be checked. However, the EF cannot be checked because the object does not have a *wh*-feature, so the phase head v* attracts the *wh*-feature. Then, the EF in v* attracts a *wh*-phrase, which has a *wh*-feature, to the edge of v*P so that the EF can be checked.

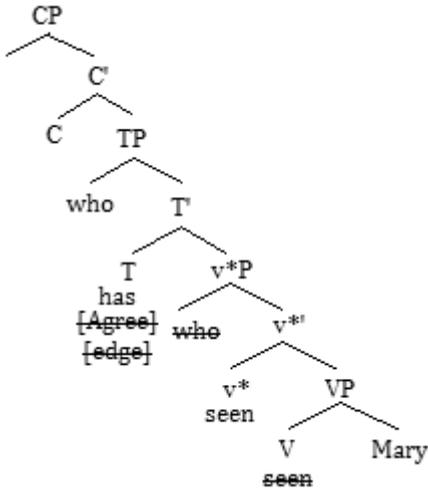
Now, let us show how the system works, using examples of Subject-Auxiliary Inversion (SAI).

- (7) a. What has Mary seen?
 b. *What Mary has seen?
 c. *Has who seen Mary?
 d. Who has seen Mary?

SAI is the phenomena in which a subject inverts with an auxiliary. As (7a) and (7b) indicates, SAI must occur in object questions, that is, the auxiliary *has* must precede the subject *Mary*. In contrast, SAI does not occur in subject questions. The precedence of *has* over *Mary* yields ungrammaticality, as shown in (7c).

First, consider subject questions. The structure of (7a) is (8).

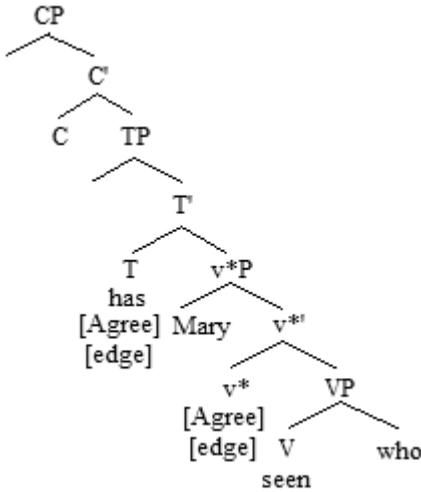
(8)



The EF and the Agree-feature of T seek the goal and attract the subject *who* to Spec TP. Since *who* has a *wh*-feature and ϕ -features, both the EF and the Agree-feature can be checked, and the derivation converges. No further operation is needed, so *who* stays at TP and do not move to Spec CP. In this system, the problem of countercyclicity does not arise because it is T that has an EF and an Agree-feature, so its attraction of the subject *wh*-phrase is not countercyclic.

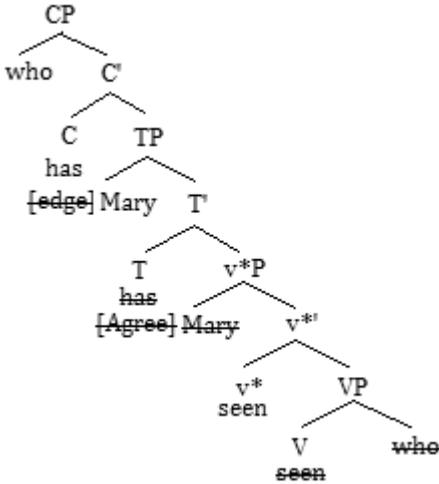
Next, consider object questions. The base structure of (7d) is (9).

(9)



First, let us consider the v^*P phase. As we discussed earlier, the verb *see(n)* enters into an Agree relation with *who*, which has ϕ -features, and the Agree-feature of V can be checked. However, the EF cannot be checked in this environment, so the phase head v^* attracts the remaining EF, following (6). Then, the EF in v^* attracts *who*, which has a *wh*-feature, to the edge of the v^*P phase, so that the EF can be checked. At the CP phase, the Agree-feature of T seeks the goal and attracts the subject *Mary* to Spec TP. Since *Mary* has ϕ -features and does not have a *wh*-feature, only the Agree-feature can be checked and the EF remains. Following (6), the phase head C attracts the EF and the EF in C attracts *who* to Spec CP. Since *who* has a *wh*-feature, the EF can be checked and the derivation converges. After the derivation, the structure will be (10).

(10)



We assumed that the movement of the auxiliary from T to C, so-called SAI, is a by-product of the attraction of the EF of the phase head C.

2.3 Problem

We have shown that Taguchi's (2013) analysis can resolve the problem that Chomsky's (2008) analysis raises. However, it raises another problem. It cannot explain the *wh*-island effects such as the following.

- (11) a. ?*What do you wonder who saw?
 b. *Who do you wonder what saw?
 c. *How do you wonder who fixed the car?

(11) shows that a *wh*-phrase cannot be extracted from an embedded question. These sentences vary in their degree of deviance depending on what kind of element is extracted. As (11a) indicates, the extraction of an object yields marginal deviance. In contrast, the extraction of a subject or an adjunct yields severe deviance, as shown in (11b) and (11c). Taguchi's (2013) analysis can explain the severe deviance of (11b) but cannot explain the marginal deviance of (11a) and the severe deviance of (11c). In Taguchi (2013), we assumed the

following Phase Impenetrability Condition (PIC) proposed by Chomsky (2000).

(12) In phase α with head H, the domain of H is not accessible to operations outside of α , but only H and its edge.

This condition can be extended to the *wh*-island effects. Recall that, in Taguchi's (2013) framework, a subject stays at Spec TP, while an object moves to Spec CP. For example, in (11b), the embedded subject *who* moves from the embedded Spec v*P to the embedded Spec TP and stays there. Then, the embedded object *what* is attracted to the embedded Spec CP. In the next step, *who* needs to move to the matrix Spec CP but this movement violates the PIC because the embedded Spec TP, the position of *who*, is neither the phase head nor the phase edge. Therefore, (11b) is correctly excluded. However, (11a) and (11c) are problematic. In (11a) and (11c), similarly to (11b), the embedded subject *who* moves from the embedded Spec v*P to the embedded Spec TP and stays there, so the embedded Spec CP is empty at this point. Hence, the embedded object *what* can use this position as an escape hatch, that is, *what* can move to the matrix Spec CP through the embedded Spec CP without violating the PIC. Therefore, Taguchi's (2013) analysis predicts that (11a) and (11c) are grammatical, contrary to fact. In this article, we are going to show that this problem can be resolved by incorporating Kitahara's (1997) chain formation analysis.

3. Solution to the remaining problem

In this section, we are going to show that the *wh*-island effects can be explained by assuming Kitahara's (1997) chain formation analysis. In Section 3.1, we summarize Kitahara's (1997) proposal of chain formation analysis. Section 3.2 demonstrates that the *wh*-island effects can be explained by using the chain formation analysis.

3.1 Kitahara (1997)

Kitahara (1997) proposes a chain formation algorithm and the Chain Formation Condition (CFC) to explain the derivations that employ only one illegitimate step but vary in their degree of deviance. He deals with examples of *wh*-island violations. *Wh*-island violations involving adjuncts are more severe than those involving arguments. *Wh*-island violations involving subjects are more severe than those involving objects. *Wh*-island violations involving quasi objects are more severe than those involving objects. He shows that degrees of deviance exhibited by such derivations can be explained by the chain formation analysis. He assumes the following Minimal Link Condition (MLC) first proposed by Chomsky (1995).

(13) $H(K)$ attracts α only if there is no β , β closer to $H(K)$ than α , such that $H(K)$ attracts β .

The notion “closer” is defined as (14).

(14) β is closer to $H(K)$ than α iff β c -commands α , and β is not in the minimal domain of CH , where CH is the chain headed by γ , and γ is adjoined to $H(K)$.

The notion “minimal domain” is defined as (15).

(15) The minimal domain $\text{Min}(\delta(CH))$ of CH is the smallest subset K of $\delta(CH)$ such that for any $\gamma \in \delta(CH)$, some $\beta \in K$ reflexively dominates γ .

First of all, we will show that the MLC cannot account for the derivations that employ only one illegitimate application of Move but vary in their degree of deviance. For example, as is well known, *wh*-island violations involving adjuncts are far more severe than those involving arguments, as shown in (16).

(16) a. *How do you wonder whether John fixed the car?

b. ??What do you wonder whether John fixed?

First, consider the derivation of (16a). Given that, in the framework that Kitahara (1997) assumes, the matrix C has a strong feature triggering *wh*-movement, the MLC forces it to attract the closest category that can enter

into a checking relation with its sublabel, namely, *whether*. Thus, the application of Move raising *how* to the matrix Spec CP violates the MLC. Similarly, in the derivation of (16b), the MLC forces the matrix C to attract the closest category that can enter into a checking relation with its sublabel, namely, *whether*. Thus, the application of Move raising *what* to the matrix Spec C also violates the MLC. Although each derivation employs only one illegitimate application of Move, (16a) and (16b) differ the degree of deviance.

Even among *wh*-island violations involving arguments, the degree of deviance varies, as shown in (17).

(17) a. *What do you wonder whether was fixed?

b. ??What do you wonder whether John fixed?

First, consider the derivation of (17a). At some point in the derivation, C_{HL} employs an application of Move raising *what* from the embedded object position to the embedded Spec TP, which satisfies the MLC. Later in the derivation, C_{HL} employs an application of Move raising *what* from the embedded subject position to the matrix Spec CP, which violates the MLC. Next, consider the derivation of (17b). At some point in the derivation, C_{HL} employs an application of Move raising *what* from the embedded object position to the matrix Spec CP, which violates the MLC. Therefore, (17a) and (17b) exhibit the difference in the degree of deviance despite only one illegitimate application of Move is involved in each.

Furthermore, even among *wh*-island violations involving verbal complements, a “measure” object, which Kitahara (1997) calls *quasi object*, and a “patient” object, which he calls *object*, shows a similar contrast, as shown in (18).

(18) a. *How many pounds do you wonder whether John weighed?

b. ??What do you wonder whether John weighed?

First, consider the derivation of (18a). At some point in the derivation, C_{HL} employs an application of Move raising *how many pounds* to the matrix Spec CP,

which violates the MLC. Similarly, at some point in the derivation of (18b), C_{HL} employs an application of Move raising *what* to the matrix Spec CP, which also violates the MLC. That is, each derivation involves only one illegitimate application of Move, but differs in the degree of deviance.

To resolve this problem, Kitahara (1997) argues that degrees of deviance exhibited by these derivations are determined in terms of LF legitimacy. That is, a derivation employing one illegitimate step but yielding an LF representation satisfying the condition of Full Interpretation (FI) is only marginally deviant, while a derivation employing one illegitimate step but yielding an LF representation violating FI is more severely deviant. He defines the condition of FI as follows.

(19) Every object at the interface must receive an external interpretation.

He assumes the following chain formation algorithm.

(20) Move raising (a feature of) α to a position P can form ≥ 1 chain(s) consisting of P and any other position associated with (a feature of) α .

The LF chains that concern us here include argument chains, adjuncts chains, and operator-variable chains, defined as (21).

- (21) a. An argument chain is headed by an element in a Case-checking position and terminates with an element in a θ -marked position.
 b. An adjunct chain is headed by and terminates with an element in a non-L-related position(s).
 c. An operator-variable chain is headed by an element in a non-L-related position and terminates with an element in a Case-checking position.

The notion “(non-)L-related” is defined as (22).

(22) A position is L-related if it is in a checking configuration with a head containing a lexical feature (e.g., a V-feature); otherwise, it is non-L-related.

For example, consider the following sentence.

(23) What did John fix?

In the derivation of (23), Move overtly raises *what* from the object position to Spec CP and it covertly adjoins FF[*what*] to the complex head *fix+v** to check the Case features of *what* and *fix* because Case features are [-interpretable] and must be checked and deleted before LF. This is illustrated in (24).

(24) [_{CP}[α *what*] [_C did [_{TP} John FF[α]+[*fix+v**] *t*(α)]]]

Given (21), the pair (α , *t*(α)) formed by the overt application of Move raising α is not an operator–variable chain because the position occupied by *t*(α) is not a Case-checking position. However, the LF application of Move adjoining FF[α] to the complex head *fix+v** forms the argument chain CH (FF[α], *t*(α)) headed by FF[α] in a Case-checking position and terminating with *t*(α) in a θ -marked position. Thus, following (20), it can form the operator–variable chain CH (α , FF[α]) headed by α in a non-L-related position and terminating with FF[α] in a Case-checking position.

To explain the contrasts in (16), (17) and (18), Kitahara (1997) proposes the following Chain Formation Condition (CFC).

(25) *Chain Formation Condition*

An application of Move forms ≥ 1 chain(s) only if it is legitimate (= violation free)

First, consider the contrast between adjuncts and arguments, namely, (16), repeated as (26).

(26) a. *How do you wonder whether John fixed the car?

b. ??What do you wonder whether John fixed?

The representations of (26a) and (26b) are (27a) and (27b), respectively.

(27) a. [_{CP}[α *how*] [_C do [_{TP} you wonder+v*

[_{CP} whether [_{TP} John fixed+v* the car *t*(α)]]]]]

b. [_{CP}[α *what*] [_C do [_{TP} you wonder+v*

[_{CP} whether [_{TP} John FF[α]+[*fixed+v**] *t*(α)]]]]]

As I mentioned above, in the derivation of (27), C_{HL} employs an application of Move raising *how* (27a) or *what* (27b) to the matrix Spec CP, which violates the

MLC. Given the CFC, in the derivation of (27a), the application of Move raising *how* forms no chain consisting of the moved *wh*-phrase and its trace because it violates the MLC. Since there is no morphological need to trigger further movement of any feature of α , all subsequent applications of Move leave α and $t(\alpha)$ unaffected. Hence, the derivation of (27a) yields an LF representation in which the quantifier *how* is not a member of any two-membered chain. Given that such LF representations violate FI, the derivation of (27a) crashes and exhibits severe deviance. Similarly, in the derivation of (27b), the application of Move raising *what* forms no chain because it violates the MLC. However, C_{HL} employs an application of Move adjoining $FF[\alpha]$ to the complex head *fix+v** to check the Case feature of α and *fixed*, in the LF component. According to the chain formation algorithm (20), this application of Move can form not only the argument chain CH ($FF[\alpha]$, $t(\alpha)$), headed by $FF[\alpha]$ in a Case-checking position and terminates with $t(\alpha)$ in a θ -marked position, but also the operator-variable chain CH (α , $FF[\alpha]$), headed by α in a non-L-related position and terminates with $FF[\alpha]$ in a Case-checking position. Thus, the derivation of (27b) yields an LF representation in which the quantifier *what* is a member of the two-membered chain CH (α , $FF[\alpha]$). Given such LF representations satisfy FI, the derivation of (27b) converges and exhibits marginal deviance.

This analysis can be extended to the severe deviance of (17a), repeated in (28).

(28) *What do you wonder whether was fixed?

The representation of (28) is (29).

(29) [$_{CP}$ [α what] [$_{C'}$ do [$_{TP}$ you wonder+v*
 [$_{CP}$ whether [$_{TP}$ $t'(\alpha)$ [$_{T'}$ was fixed $t(\alpha)$]]]]]]]]

First, C_{HL} employs an application of Move raising *what* from the embedded object position to the embedded Spec TP, which satisfies the MLC. It can form the argument chain CH ($t'(\alpha)$, $t(\alpha)$), headed by $t'(\alpha)$ in a Case-checking position

and terminates with $t(\alpha)$ in a θ -marked position. Later, C_{HL} employs an application of Move raising *what* from the embedded subject position to the matrix Spec CP. This violates the MLC and forms no chain. Therefore, the derivation of (29) yields an LF representation in which the quantifier *what* is not a member of any two-membered chain, that is, it crashes and exhibits severe deviance.

Finally, consider the severe deviance of (18a), repeated in (30).

(30) *How many pounds do you wonder whether John weighed?

This can be explained by appealing to the Case-theoretic distinction that objects have Case features, while quasi objects do not. The representation of (30) is (31).

(31) [_{CP} [α how many pounds] [_{C'} do [_{TP} you wonder+v*
 [_{CP} whether [_{TP} John weighed+v* $t(\alpha)$]]]]]]

In (31), C_{HL} employs an application of Move raising α to the matrix Spec CP, which violates the MLC. This illegitimate application forms no chain. Since there is no morphological need to trigger further movement of any feature of α , all subsequent applications of Move leave α and $t(\alpha)$ unaffected. The derivation of (31) yields an LF representation in which the quantifier α is not a member of any two-membered chain because the quasi object *how many pounds* does not have a Case feature. Therefore, the derivation of (31) crashes and exhibits severe deviance.

In this section, we summarized Kitahara's (1997) proposal and explained how it works. In the next section, we argue that the chain formation analysis can be extended to the examples of the *wh*-island effects that Taguchi's (2013) analysis cannot explain.

3.2 The extension of the chain formation analysis

We have shown that Kitahara's (1997) chain formation analysis can account for derivations that employ only one illegitimate application of Move but vary in

their degree of deviance. In this section, we are going to show that, by adopting Kitahara's (1997) chain formation analysis, we can explain the *wh*-island effects that remained unaccounted for in Taguchi (2013). The examples in (11) is repeated here in (32).

- (32) a. ?*What do you wonder who saw?
 b. *Who do you wonder what saw?
 c. *How do you wonder who fixed the car?

Recall that the extraction of an object from an embedded question yields marginal deviance, while the extraction of a subject or an adjunct from an embedded question yields severe deviance, as shown in (32). First, consider (32a). The representation of (32a) is (33).

- (33) $[_{CP} [_{\beta} \text{ what}] [_{C'} \text{ do}] [_{TP} \text{ you wonder} + v^*]$
 $[_{CP} \text{ t}'(\beta) [_{TP} [_{\alpha} \text{ who}] [_{v^*P} \text{ t}(\alpha) \text{ FF}[\beta] + [\text{saw} + v^*] \text{ t}(\beta)]]]]]$

First, C_{HL} employs an application of Move raising *who* from the embedded Spec v^*P to the embedded Spec TP, which satisfies the MLC. It can form the argument chain CH $(\alpha, \text{t}(\alpha))$, headed by α in a Case-checking position and terminates with $\text{t}(\alpha)$ in a θ -marked position. In the next step, C_{HL} employs an application of Move raising *what* from the embedded object position to the embedded Spec CP. This violates the MLC because there is the category that is closer to the embedded C than *what*, namely, *who*. However, C_{HL} also employs an application of Move adjoining $\text{FF}[\beta]$ to the complex head $\text{saw} + v^*$ to check the Case features of *what* and *saw*. This application can form not only the argument chain CH $(\text{FF}[\beta], \text{t}(\beta))$, headed by $\text{FF}[\beta]$ in a Case-checking position and terminates with $\text{t}(\beta)$ in a θ -marked position, but also the operator-variable chain CH $(\text{t}'(\beta), \text{FF}[\beta])$, headed by $\text{t}'(\beta)$ in a non-L-related position and terminates with $\text{FF}[\beta]$ in a Case-checking position. Later in the derivation, C_{HL} employs an application of Move raising *what* from the embedded Spec CP to the matrix Spec CP. This satisfies the MLC and forms the adjunct chain CH $(\beta, \text{t}'(\beta))$. Therefore, the derivation of (33) yields an LF

representation in which each quantifier *who* and *what* is a member of the two-membered chain CH (α , $t(\alpha)$) and CH (β , $t'(\beta)$), respectively. Thus, it converges and exhibits marginal deviance because of a single violation of the MLC.

Second, consider (32b), which undergoes the derivation represented in (34).

(34) [_{CP} [_α who] [_{C'} do [_{TP} you wonder+v*
 [_{CP} [_β what] [_{TP} $t'(\alpha)$ [_{v*P} $t(\alpha)$ FF[β]+[saw+v*] $t(\beta)$]]]]]]]

The first step is the same as (34). C_{HL} employs an application of Move raising *who* from the embedded v*P to the embedded Spec TP, which satisfies the MLC. It can form the argument chain CH ($t'(\alpha)$, $t(\alpha)$), headed by $t'(\alpha)$ in a Case-checking position and terminates with $t(\alpha)$ in a θ -marked position. In the next step, C_{HL} employs an application of Move raising *what* from the embedded object position to the embedded Spec CP. This violates the MLC because *who* in the specifier of the embedded T is closer to the embedded C than *what*, and thus, forms no chain. However, C_{HL} also employs an application of Move adjoining FF[β] to the complex head *saw+v** to check the Case features of *what* and *saw*. This application can form not only the argument chain CH (FF[β], $t(\beta)$), headed by FF[β] in a Case-checking position and terminates with $t(\beta)$ in a θ -marked position, but also the operator-variable chain CH (β , FF[β]), headed by β in a non-L-related position and terminates with FF[β] in a Case-checking position. Later in the derivation, C_{HL} employs an application of Move raising *who* from the embedded Spec TP to the matrix Spec CP. This also violates the MLC because *what* in the embedded Spec CP is closer to the matrix C than *who*. Hence, the derivation of (34) violates the MLC twice, so (34) is more severely deviant than (33). Furthermore, the application of Move raising *who* from the embedded Spec TP to the matrix Spec CP forms no chain and all subsequent application of Move leave α and $t'(\alpha)$ unaffected because there is no morphological need to trigger further movement of any feature of α . Thus, the

derivation of (34) yields an LF representation in which the quantifier *what* is a member of the two-membered chain CH (β , FF[β]), but the quantifier *who* is not a member of any two-membered chain. Therefore, it crashes and exhibits severe deviance.

Finally, consider (32c). At some point in the derivation, C_{HL} constructs the following structure.

(35) [_{CP} do [_{TP} you wonder+v*
 [_{CP} [β how] [_{TP} [α who] [_{v*P} t(α) fixed+v* the car t(β)]]]]]]]

The first step is the same as (33) and (34). C_{HL} employs an application of Move raising *who* from the embedded Spec v*P to the embedded Spec TP, which satisfies the MLC. It can form the argument chain CH (α , t(α)), headed by α in a Case-checking position and terminates with t(α) in a θ -marked position. In the next step, C_{HL} employs an application of Move raising *how* to the embedded Spec CP. This violates the MLC because *who* in the embedded Spec TP is closer to the embedded C than *how*, and thus, forms no chain. Since there is no morphological need to trigger further movement of any feature of α , all subsequent application of Move leave β and t(β) unaffected. Thus, the derivation of (35) yields an LF representation in which the quantifier *who* is a member of the two-membered chain CH (α , t(α)), but the quantifier *how* is not a member of any two-membered chain. Therefore, it crashes and exhibits severe deviance.

4. Conclusion

In this article, we have shown that we can explain the *wh*-island effects that Taguchi's (2013) analysis cannot account for by assuming Kitahara's (1997) chain formation analysis. He proposes the Chain Formation Condition: an application of Move forms more than one chain(s) only if it is legitimate. This condition can also explain the *wh*-island effects that Taguchi's (2013) analysis cannot account for. In the case of the extraction of an object from an

embedded question, the application of Move raising the embedded object to the embedded Spec CP violates the MLC, so it can form no chain. However, the application of Move adjoining the feature of the embedded object, which satisfies the MLC, can form the argument chain and the operator–variable chain. Later in the derivation, raising the object from the embedded Spec CP to the matrix Spec CP, which satisfies the MLC, can form the adjunct chain of which the raised object is a member. Thus, it exhibits marginal deviance. In the case of the extraction of a subject from an embedded question, the application of Move raising the embedded object to the embedded Spec CP and the application of Move raising the subject from the embedded T to the matrix Spec CP violates the MLC. Both applications can form no chain. Thus, it exhibits severe deviance. In the case of the extraction of an adjunct from an embedded question, raising the adjunct to the embedded Spec CP violates the MLC, so it can form no chain. Thus, it exhibits severe deviance. Therefore, we can explain the *wh*-island effects that Taguchi’s (2013) analysis cannot account for and reinforce Kitahara’s (1997) chain formation analysis.

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