Deriving ATB from Box System*

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1. Introduction

Since Ross (1967), the Across-The-Board (ATB) phenomenon has been extensively discussed in the literature. One of the interesting properties of ATB *wh*-questions is that there is an argument/adjunct asymmetry with respect to the availability of identity and non-identity readings (Munn 1992, 1999). For example, the *wh*-argument *which boy* in (1) allows only an identity reading like (1a), while the *wh*-adjunct *where* in (2) allows not only an identity reading like (2a), but also a non-identity reading like (2b).

(1) Which boy did John meet ***e*** and Mary like ***e***?
   a. John met Bill and Mary liked Bill.
   b. #John met Bill and Mary liked Frank.

(2) Where did Mary vacation ***e*** and Bill decide to live ***e***?
   a. Mary vacationed in Paris and Bill (also) decided to live in Paris.
   b. Mary vacationed in Paris and Bill decided to live in Toronto. (Munn 1999: 421)

The purpose of this study is to identify the factors behind the availability of identity/non-identity readings, and to explain these factors in terms of a framework recently developed by Chomsky (2023), called *Box System*. In Section 2, on the basis of novel data from Japanese, we propose that an identity reading is allowed only with *wh*-elements which are θ- and Case-marked. We point out that previous approaches to ATB *wh*-questions would have difficulty explaining our empirical findings. In Section 3, while the box system entails that θ-marking plays a crucial role in boxing of a *wh*-element, we propose that not only θ-marking but also Case marking contributes to boxing of a *wh*-element. We argue that the possible readings of

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ATB *wh*-questions follow as a natural consequence of the box system, along with an independently motivated ellipsis operation. In Section 4, we briefly consider some implications of our analysis and conclude the discussion.

Section 2. Novel ATB Data from Japanese

Section 2.1. The key factors of the ATB Interpretation

Let us first confirm that the argument/adjunct asymmetry in ATB *wh*-questions really exists. With the English example in (2), we have seen that the *wh*-adjunct *where* allows both the identity and non-identity readings. The same fact is illustrated by (3, 4) (Munn 1999: 421).

(3) How tired did Bill look ***e*** and Mary seem ***e***?
   a. Bill looked exhausted and Mary also looked exhausted.
   b. Bill looked exhausted and Mary looked OK.

(4) Why did Bill leave ***e*** and Fred arrive ***e***?
   a. Bill left because John arrived and Fred arrived because he arrived.
   b. Bill left because Fred arrived and Fred arrived because he had a meeting.

(3) is an ATB *wh*-question of the *wh*-adjunct *how*, and (4) is an ATB *wh*-question of the *wh*-adjunct *why*. In both cases, not only identity readings like (3a, 4a), but also non-identity readings like (3b, 4b) are possible. The *wh*-adjunct ATB questions have no reading restriction.

On the other hand, the possible reading of the *wh*-argument ATB question is restricted. As shown by the English example in (1), the *wh*-argument *which boy* allows only the identity reading. One might say that the restriction is due to pragmatic factors. But the following conversation between A and B indicates that the availability is not affected by pragmatic factors.

(5) A: Every student read a different book for class today.
   B: Which book did Mary read and John read?
   A: What? Wait, I just said they all read DIFFERENT books.

In the first utterance, A is forcing a non-identity reading, and afterward B is asking an ATB *wh*-question of the *wh*-argument *which book*. If the *wh*-argument ATB question allowed a non-identity reading, then A would give an appropriate answer to B's question. But A doesn't do so, but rather is puzzled by such a question. This suggests that pragmatic factors do not affect the unavailability of the non-identity reading of a *wh*-argument ATB question.

Turing now to Japanese ATB questions, the argument/adjunct asymmetry with the availability of identity/non-identity readings is also observed in Japanese, as shown by (6, 7):

(6) Dono hon-o John-wa tosyokan-kara ***e*** kari, Bill-wa syoten-de ***e*** katta no?
which book-acc J.-top library-from borrow, B.-top bookstore-at bought Q
'Which book did John borrow from the library and Bill buy at the bookstore?'
a. John-wa … *The Great Gatsby*-o kari, Bill-mo … *The Great Gatsby*-o katta.
J.-top *The Great Gatsby*-acc borrow, B.-also *The Great Gatsby*-acc bought
'John borrowed *The Great Gatsby* … and Bill bought it (=*The Great Gatsby*) …, too.'
b. #John-wa … *The Great Gatsby*-o kari, Bill-wa … *The Years*-o katta.
J.-top *The Great Gatsby*-acc borrow, B.-top *The Years*-acc bought
'John borrowed *The Great Gatsby* … and Bill bought *The Years* ….'

(7) Dono mati-de John-wa Bill-ga ***e*** kyuuka-o tori, Mary-ga taisyoku-go ***e*** sugosita to itta no?
which city-at J.-top B.-nom vacation-acc take, M.-nom retirement-after spent that said Q
'In which city did John say that Bill vacationed and Mary spent after retirement?'
a. … Bill-ga Pari-de kyuuka-o tori, Mary-mo … Pari-de sugosita …
B.-nom Paris-in vacation-acc take, M.-also Paris-in spent
'John said that Bill vacationed in Paris and Mary spent in Paris after retirement, too.'
b. … Bill-ga Pari-de kyuuka-o tori, Mary-ga … Sooru-de sugosita …
B.-nom Paris-in vacation-acc take, M.-nom Seoul-in spent
'John said that Bill vacationed in Paris and Mary spent in Seoul after retirement.'

(6) is an ATB *wh*-question of the *wh*-argument *dono hon-o* 'which book,' and (7) is an ATB *wh*-question of the *wh*-adjunct *dono mati-de* 'in which city.' In the *wh*-argument ATB question (6), only an identity reading like (6a) is possible but an non-identity reading is not. But in the *wh*-adjunct ATB question (7), not only an identity reading like (7a) but also a non-identity reading like (7b) is possible. This fact indicates that the argument/adjunct asymmetry with the ATB interpretation exists in Japanese too. The mismatch conversation between A and B in (8) also shows that the non-availability of the non-identity reading of a *wh*-argument ATB *wh*-question is not subject to pragmatic factors in Japanese either.

(8) A: Kyoo-no kokugo-no zyugyo-de minna sorezore tigau hon-o
today-gen Japanese-gen class-at everyone each different book-acc
roodoku sita yo.

reading-aloud did Par
'Everyone each read a different book for Japanese class today.'

B: Dono hon-o John-wa tosyokan-kara kari, (sosite)
which book-acc John-Top library-from borrow, (and)
Bill-wa syoten-de katta no?
Bill-Top bookstore-at bought Q
'Which book did John borrow from the library and Bill buy at the bookstore?'

A: Minna sorezore tigau hon-o roodoku sita to itta yo-ne.
everyone each different book-Acc reading-aloud did that said Par-Par
'I just said everyone each read DIFFERENT books.'

Given that the argument/adjunct asymmetry is observed in Japanese as well as English, without being affected by pragmatic factors, it is plausible to claim that the asymmetry is not an accidental property, but rather a significant property reflecting some core syntactic factors. What would be the factors behind it, then?

Noticing that *which boy* in (1) and *dono hon-o* 'which book' in (6) that allow only the identity readings are θ-marked *wh*-elements, while *where* in (2), *how* in (3), *why* in (4), and *dono machi-de* 'in which city' in (7) that allow both the identity and non-identity readings are non-θ-marked *wh*-elements, one might say that the key factor that determines the possible readings is whether *wh*-elements are θ-marked or not. If this generalization is on the right track, a non-identity reading should not be possible in an ATB *wh*-question of a θ-marked *wh*-element. But examples like (9) illustrate that this observation is not correct:

(9) (kinoo-no kenka-nituite) Nan-to John-wa ***e*** sinziteite, Mary-wa ***e*** omoikondeiru no
(yesterday-gen fight-about)what-that J.-top believe, M.-top thinks Q
'(About a fight that happened yesterday) What is it that John believes and Mary thinks?'

a. John-wa [Bill-ga tataita to] sinziteite, Mary-mo [Bill-ga tataita to] omoikondeiru.
J.-top Bill-nom hit that believe, M.-also Bill-nom hit that thinks
'John believes that Bill hit and Mary also thinks that Bill hit.'

b. John-wa [Bill-ga tataita to] sinziteite, Mary-wa [Tim-ga tataita to] omoikondeiru.
J.-top Bill-nom hit that believe, M.-top Tim-nom hit that thinks
'John believes that Bill hit and Mary thinks that Tim hit.'

(9) is an ATB *wh*-question of the θ-marked clausal *wh*-argument *nan-to* 'what-that.' Nevertheless, not only an identity reading (9a) but also a non-identity reading (9b) is allowed,

contrary to the expectation. Hence, we cannot attribute the key factor determining the possible readings of ATB *wh*-questions only to a θ-marking.

Notice here that *to* 'that'-clause and *nan-to* 'what-that' in (9) can never be Case-marked, as exemplified by the unacceptability of **Bill-ga tataita to-ga/o/ni* 'Bill hit that-Nom/Acc/Dat' and **nan-to-ga/o/ni* 'what-Nom/Acc/Dat'. From what we have seen so far, *wh*-elements that allow only the identity readings like *which boy* in (1) and *dono hon-o* 'which book' in (6) are Case-marked *wh*-elements, while those that allow both the identity and non-identity readings like *where* in (2), *how* in (3), *why* in (4), *dono machi-de* 'in which city' in (7), and *nan-to* 'what-that' in (9) are non-Case-marked *wh*-elements. One might claim that the key factor that determines the possible readings is whether *wh*-elements are Case-marked or not. If this generalization is on the right track, a non-identity reading should not be possible in an ATB *wh*-question of a Case-marked *wh*-element. But examples like (10) show that this generalization is not correct either:

(10) Nani-o John-wa ***e*** sawagi, Mary-wa ***e*** yorokondeiru no?
what-acc J.-top fuss M.-top be.pleased Q
'Why is John fussing and Mary happy?'
a. John-wa [inu-o kau node] sawagi, Mary-mo [inu-o kau node] yorokondeiru.
J.-top dog-acc have because fuss, M-also dog-o have because be.pleased
'John is fussing because he has a dog and Mary is also happy because she has a dog.'
b. John-wa [inu-o kau node] sawagi, Mary-wa [dekakeru node] yorokondeiru.
J.-top dog-acc buy because fuss, M-top come.out because be.pleased
'John is fussing because he has a dog and Mary is happy because she goes out.'

(10) is an ATB *wh*-question of the accusative Case-marked *wh*-adjunct *nani-o* 'what-acc' meaning *why* (Kurafuji 1996, 1997). Nevertheless, not only the identity reading (10a), but also the non-identity reading (10b) is allowed, contrary to the expectation. Therefore, we cannot attribute the key factor determining the possible readings of ATB *wh*-questions solely to Case-marking, either.

What we have observed so far is summarized in Table 1.

Table 1.

Examples	*wh*-types	θ	Case	Identity	Non-identity
English (1)	*which boy*	+	+	✓	#
English (2)	*where*	-	-	✓	✓
English (3)	*how*	-	-	✓	✓
English (4)	*why*	-	-	✓	✓
Japanese (6)	*dono hon-o* 'which book'	+	+	✓	#
Japanese (7)	*dono machi de* 'in which city'	-	-	✓	✓
Japanese (9)	*nan-to* 'what-that'	+	-	✓	✓
Japanese (10)	*nani-o* 'what' meaning *why*	-	+	✓	✓

These facts suggest that both θ-marking and Case-marking, rather than either only θ-marking or Case-marking, play a key role in determining the possible readings of ATB *wh*-questions. We therefore propose the following descriptive generalization as an account for the facts summarized in Table 1.

(11) Descriptive Generalization about the ATB Interpretation

An ATB *wh*-question only allows an identity reading when the *wh*-element is both θ- and Case-marked.

This generalization correctly captures the fact that it is examples like (1, 6), but not others, that only allow the identity readings. It should be noted here that if we assumed either θ-marking or Case-marking alone to be the key factor determining the possible readings, we could not deal with examples like (9, 10) appropriately. Hence, we can conclude from the above observation that an ATB *wh*-question only allows an identity reading when the *wh*-element is θ- and Case-marked.[1]

[1] It is worth noting that there are other cases where Case-marking and the availability of an identity reading correlate with each other. See the control constructions in Russian in (i) (Landau 2013: 162-163).

(i) a. Exhaustive control
My predpočli [PRO sobrat'sja vse/??vsem v šest'].
we.NOM preferred PRO.NOM to.gather all.NOM/??DAT at six
'We preferred to all gather at six.'

b. Partial control
Predsedatel' predpočel [PRO sobrat'sja vsem/*vse v šest'].
Chair.NOM preferred PRO.DAT to.gather all.DAT/*NOM at six
'The chair preferred to all gather at six.'

Landau (2008, 2013) claims that PRO has Case, which is invisible but revealed on agreeing predicative elements

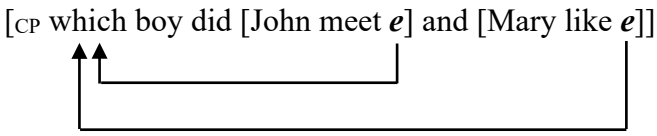
The next question to ask is why a generalization like (11) holds. Before answering this, we would like to point out in the following sub-section that previous approaches to ATB *wh*-questions would have difficulty explaining the above empirical findings.

Section 2.2. Problems with previous approaches

There are several approaches to ATB *wh*-questions. In the following, we take up only the major approaches and quicky go over how they derive the sentence (1) (for a nice summary of empirical arguments that motivate each analysis as well as potential problems they may have, see Hein and Murphy 2020, in particular).

The first approach is *parallel movement approach* (Ross 1967; Williams 1978; Blümel 2017), according to which (1) is derived as in (12) (henceforth, movement/IM is indicated by a solid line).

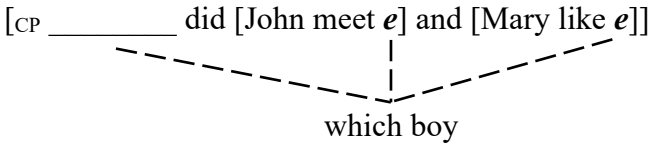
(12) *Parallel movement approach*



In (12), *which boy* undergoes *wh*-movement from both conjuncts in parallel, and each of the gaps are related to that *wh*-movement.

The second approach is *multidominance approach* (Citko 2005, 2011), according to which (1) is derived as in (13).

(13) *Multidominance approach*



like floating quantifiers. (ia), where PRO is assigned Nominative Case, illustrates control by a plural subject. The dominant reading of (ia) is an exhaustive reading, though the embedded predicate *sobrat'sja* 'gather' is collective. In (ib), where PRO is assigned Dative Case, the singular subject partially controls PRO. In other words, Nominative PRO is required to have an identity reading with a controller whereas Dative PRO is required to have a non-identity reading with a controller. Assuming that obligatory control is implemented as a Agree relation between a matrix functional head and PRO, Landau argues that exhaustive control like (ia) forces Nominative transmission from a controller to PRO in terms of direct PRO control from a matrix functional head, whereas partial control like (ib) forces independent Dative Case assignment to PRO due to indirect PRO control mediated by the embedded C. See Landau (2008, 2013) for the details.

In (13), *which boy* is simultaneously associated with its derived SPEC-CP position and the gaps in each conjunct by multidominance (as indicated with a long dashed line). Although these two approaches differ in the derivational processes, they are the same in that the gaps in each conjunct are directly related to the *wh*-element in SPEC-CP in the first conjunct. Hence, we call these approaches *symmetrical approaches*.

The third approach is *parasitic gap approach* (Munn 1999), according to which (1) is derived as in (14).

(14) *Parasitic gap approach*

[$_{CP}$ which boy did [John meet ***e***] and [*Op* Mary like ***e***]]

In (14), *which boy* undergoes *wh*-movement from the first conjunct, and in the second conjunct, null operator undergoes empty operator movement deriving a parasitic gap (Chomsky 1981). The fourth approach is *sideward movement approach* (Hornstein and Nunes 2002), according to which (1) is derived as in (15).

(15) *Sideward movement approach*

[$_{CP}$ which boy did [John meet ***e***] and [Mary like ***e***]]

In (15), *which boy* first undergoes sideward movement from the object position of *like*, which is built in a workspace, to the object position of *meet*, which is also built in the workspace, and then undergoes *wh*-movement from the first conjunct. The fifth approach is *ellipsis approach*, according to which (1) is derived as in (16):

(16) *Ellipsis approach (I)*

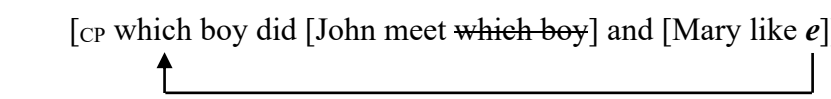
[$_{CP}$ which boy did [$_{TP}$ John [$_{vP}$ <which boy> meet <which boy>]] and [$_{TP}$ Mary

[$_{vP}$ ~~which boy~~ like <which boy>]]]

In (16), *which boy* undergoes successive cyclic *wh*-movement in each conjunct. The copies of *which boy* in the *v*P-edge and the object position of *meet* of the first conjunct and the one in the object position of *like* in the second conjunct undergo PF deletion of non-top copies. The

copy in the *v*P-edge of the second conjunct undergoes ellipsis (Salzmann 2012a, b). The sixth approach is also *ellipsis approach*, according to which (1) is derived as in (17).

(17) *Ellipsis approach (II)*



In (17), *which boy* undergoes *wh*-movement from the second conjunct, and the gap in the first conjunct is derived by ellipsis of *which boy* (Ha 2008, Salzmann 2012a, b). These four approaches also differ in the derivational processes, but they are the same in that only one of the gaps in either conjunct is directly related to the *wh*-element in SPEC-CP in the first conjunct. Hence, we call these approaches *asymmetrical approaches*.

What is important for our present purposes is that neither the symmetrical approaches nor the asymmetrical approaches can straightforwardly account for the above empirical findings of the availability of identity and non-identity readings (see Table 1 and (11)). Specifically, the problem with the symmetrical approaches is that it is not clear how to analyze the non-identity readings, since the gaps in each conjunct are related to the same single *wh*-element. Given that a denotation of the non-identity reading of (1b), for example, is like *for which x, x a person, John met x and for which y, y a person, Mary liked y*, the gap in each conjunct should be linked to a different *wh*-operator that occupies SPEC-CP in each conjunct, where it takes scope. Hence a challenge for the symmetrical approaches would be how to derive the non-identity readings. On the other hand, the problem with the asymmetrical approaches is that it is not clear how to analyze the identity readings, since only one of the gaps in either conjunct is related to the single *wh*-element. Given that a denotation of the identity reading of (1a), for example, is like *for which x, x a person, John met x and Mary liked x*, the gaps in each conjunct should be linked to the same *wh*-operator that occupies SPEC-CP in the first conjunct, where it takes scope. Therefore, a challenge for the asymmetrical approaches is how to derive the identity readings.

To overcome these problems, it would be, of course possible, to devise mechanisms. But in order to do so, it would first be necessary to verify whether such mechanisms are formulable. Particularly in the highly restricted minimalist framework of Chomsky (2021, 2023), in which an explanation of linguistic phenomena is considered to be "genuine explanation" only if it is achieved by relying solely on third-factor principles such as computational efficiency, it is claimed that parallel movement, sideward movement, multidominance, *etc*., are not formulable. According to Chomsky, since these "extensions of Merge" violate *Minimal Yield*, one of the

conditions that the core syntactic structure-building operation *Merge* should satisfy, they are eliminated from the system as unformulable operations (see Goto and Ishii 2023 for relevant discussion). Moreover, even if they are formulable, it would also be necessary to answer the question of why they are available only for the ATB phenomenon, not others. Otherwise, any mechanism devised only for ATB will be regarded as an *ad hoc* stipulation. Whatever the possible solutions may be, given that there have been no previous studies, to the best of our knowledge, that characterize the possible readings of ATB *wh*-questions in terms of the properties such as θ-role and Case-feature, the facts we pointed out and the generalization we made will be a serious challenge to any approach to ATB *wh*-questions.

In the following, we explain the above empirical findings in terms of the most recent framework of Chomsky (2023), called *Box System*. In sub-section 3.1, we briefly review his box analysis of *wh*-movement. In sub-section 3.2, we propose that not only θ-marking but also Case-marking contributes to boxing of a *wh*-element. We show that the possible readings of ATB *wh*-questions follow as a natural consequence of the box system, along with an independently motivated ellipsis operation.

Section 3. Box Analysis of ATB

Section 3.1. Box System

Assuming that I-language is a system of thought, Chomsky (2021, 2023) argues that there are two categories of thought relevant to language structure and use, the θ-based propositional system and the discourse/information-related clausal system. This property is called *Duality of Semantics*. Given that the primary syntactic structure-building operation is Merge, Chomsky argues that *External Merge* (EM) provides θ-structures (*i.e.*, the propositional system) and *Internal Merge* (IM) is associated with discourse/information-related functions (*i.e.*, the clausal system). Putting aside phase-internal raising like raising to the Spec of I and object raising, EM and IM correspond with A- and A'-systems. Chomsky claims that there is evidence such as a ban on improper movement that the A- and A'-systems must be segregated not to interact with each other.

To implement segregation of A- and A'-systems, Chomsky (2023) proposes that IM creates an element that has no further interactions with the EM-structure.

(18) Segregation by IM

> "IM creates an element that has no further interactions with the EM-generated structures that constitute the propositional domain or with operations that apply there."
>
> (Chomsky 2023: 8)

According to Chomsky, such an element (that has no further interactions with the EM-structure) is created by applying IM to the phase edge and putting it in a "box." It is assumed that the boxed element is separate from the ongoing derivation, immune to θ-marking, and inaccessible to Merge (although its terms are accessible to other operations such as Agree, Labeling, Anaphora at later phases).

(19) Boxing by IM

"we can think of the element E that is IM-ed to the phase edge as being put in a box, separate from the ongoing derivation D." (Chomsky 2023: 8)

In the box system, therefore, movement of a *wh*-element in the narrow syntax virtually terminates, once it is IM-ed to the "lowest phase" edge. This makes a significant departure from the traditional approach to the overt *wh*-movement phenomenon in languages like English. Traditionally it has been assumed that *wh*-movement of a *wh*-element takes place phase-by-phase to the SPEC of C with a Q-feature (C_Q). But in the box system, such a successive-cyclic *wh*-movement no longer exists. This, in effect, means that in a *wh*-question, IM never fills SPEC-CP, an A'-position, with a *wh-syntactic object* (SO). Instead, "instructions" for *wh*-scope interpretation at the Conceptual-Intentional (CI) interface and *wh*-spell-out under Externalization at the Sensory-Motor (SM) interface are provided by another operation other than IM.

In the box system, Chomsky suggests that instructions are provided by an operation called "access." Thus, in a *wh*-question, C_Q accesses a boxed *wh*-element for instructions. Given that instructions are, in fact, provided to the interfaces in the form of *features*, his suggestion implies that C_Q that initiates access obtains relevant *feature instructions* of the boxed element for interpretation at the interfaces. For the interfaces to interpret a *wh*-question appropriately, C_Q would contain at least formal features like a Q-feature for Labeling, semantic features for *wh*-scope interpretation, and so on.

With these in mind, let us consider how a simple *wh*-question is derived in the box system, taking a concrete example in (20).

(20) What did you buy?

First, EM merges the verb *buy* and the *wh*-object *what*, deriving the VP structure in (21) (where a label is assigned to the structure just for exposition).

(21) {$_{VP}$ buy, what}

By the VP structure, a θ-role is assigned to *what*. Then, EM merges the VP structure and the phase head *v**, deriving the *v**P structure in (22), where we ignore the object shift to SPEC-VP for <φ-φ> labeling suggested in Chomsky (2013, 2015); see Section 4 for relevant discussion.

(22) {$_{v^*P}$ *v**, {$_{VP}$ buy, what}}

By the *v**P structure, a θ-role is assigned to the subject (Chomsky 2023: 9) (in what follows, we ignore the derivation of the subject, for ease of exposition). Here, if IM merges *what* to the *v**P phase edge, *what* is put in a "box," separate from the ongoing derivation. As noted above, Duality of Semantics imposes segregation of EM and IM, and hence IM cannot interact with the theta-structure created by EM. So, in (23), *what*, IM-ed to the *v**P phase edge, is put in a "box," not to interact with the EM-structure.

(23) {$_{v^*P}$ what, {$_{v^*P}$ *v**, {$_{VP}$ buy, what}}}

The boxed *what* does not undergo movement any further, since the boxed element is inaccessible to Merge. As the derivation proceeds, the phase head C_Q is introduced, as shown in (24).

(24) {$_{CP}$ C_Q … {$_{v^*P}$ what, {$_{v^*P}$ *v**, {$_{VP}$ buy, what}}}}

Here C_Q accesses the boxed *what* for instructions and get features relevant for interpretation at the interfaces (henceforth, access is indicated by a dotted line). In (25) below, the C_Q with relevant feature instructions of *what* is indicated by "what$_3$," where the subscript numerals are assigned just for expository purposes (henceforth, feature instructions are indicated in this way).

(25) {$_{CP}$ C_Q-"what$_3$" … {$_{v^*P}$ what$_2$, {$_{v^*P}$ *v**, {$_{VP}$ buy, what$_1$}}}}

With the C_Q getting feature instructions of "what$_3$" through access to the boxed *what*, *what* can take scope in the matrix SPEC-CP. It is important to remember that *what* can never appear in the matrix SPEC-CP in such a form of SO as IM generates. Again, since the boxed element

is inaccessible to Merge, what exists around the C_Q in (28) is only the relevant features of *what*, not an SO of *what*.

To derive (20) from (25), under Externalization, while the phonological features of "what$_3$" are spelled-out at SPEC-CP, the two copies of *what*, *i.e.*, *what*$_1$ at the object position of *buy* and *what*$_2$ at the phase edge position of *v**, must be deleted. For copy and deletion, Chomsky (2021, 2023) argues that "structurally identical" elements that are in a "c-command configuration" ("cc-configuration") are interpreted as identical copies at the CI interface, while the lower copies of identical elements are deleted at the SM interface by the universal economy-based rule under Externalization. Thus in (25), since *what*$_{3\sim1}$ are in a cc-configuration, *what*$_{3,2,1}$ are interpreted as identical copies at the CI interface, and the lower copies *what*$_{2\sim1}$ are deleted at the SM interface, as shown in (29) (henceforth, spell-out is indicated by boldface and deletion by strikethrough).

(26) $\{_{CP}$ C_Q-"**what$_3$**" … $\{_{v^*P}$ ~~what$_2$~~, $\{_{v^*P}$ *v**, $\{_{VP}$ buy, ~~what$_1$~~$\}\}\}\}$

In this way, the box system derives a *wh*-question without assuming successive cyclic *wh*-movement/IM.

Of course, there remain many unresolved issues in the box system (for example, under what conditions are boxing and access possible? How can other *wh*-elements such as *wh*-subject be analyzed? How should SPEC-INFL be accommodated?, *etc*.). However, we find it to be worthwhile to pursue the box system further and explore its consequences, because the box theory not only presents a simple and elegant account for Duality of Semantics, one of "Language-Specific Conditions" that any theory of language has to satisfy, but also can solve empirical problems with Labeling, improper movement/copying, and so on, in a fundamental way (see Chomsky 2023 for details).

Thus, in this paper, we adopt the box theory. Before we proceed to the analysis of the empirical facts, in the following sub-section, we will point out that boxing is closely related to θ-marking, or more generally, θ-Theory, which essentially states that an argument cannot receive more than one θ-role. We will then elaborate the box theory by examining the behavior of non-θ-marked *wh*-elements, which Chomsky (2023) does not deal with.

(27) Θ-Theory

An argument cannot receive more than one θ-role.

Section 3.2. An Elaboration

In the box system, Chomsky (2023) proposes that Merge should follow the guiding principles that he calls "Principle [S]" and "Principle [T]."

(28) Principle [S]

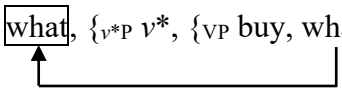
"The computational structure of language should adhere as closely as possible to SMT." (Chomsky 2023: 3)

(29) Principle [T]

"All relations and structure-building operations (SBO) are thought-related, with semantic properties interpreted at CI." (Chomsky 2023: 5)

In effect, Principle [S] requires that Merge should be binary, and Principle [T] that Merge should be θ-related. Regarding Principle [T], Chomsky (personal communication) says: "The phrase 'semantic property' can be understood to cover both receiving and assigning theta role, and also the secondary semantic properties of surface subject (and its VP counterpart)." Under Principles [S] and [T], therefore, EM selects X and Y from the workspace (WS) and/or the lexicon (LEX), and forms a θ-structure {X, Y}, where one member assigns a θ-role and the other member receives that θ-role. IM selects one member, say X, in WS and a term Y of X, and then forms a binary structure {X, Y}, where the term Y must be θ-marked.

With these in mind, let us return to the derivation of (23), where boxing by IM takes place. The relevant derivation is repeated in (30).

(30) $\{_{v^*P}$  $v^*, \{_{VP}$ buy, what$\}\}\}$

Here, *what*, a term of *v**P, undergoes IM to SPEC-*v**P, where it is put in a box. Under a strict interpretation of Principle [T], *what* must be θ-marked before it is selected by IM. As noted above, the object θ-role is assigned by the VP structure. *What* is θ-marked by the verb *buy*, "eligible" for IM. What is crucial to recall here is that the *v**P phase edge also counts as a θ-position for the external argument. If *what* were not boxed in the *v**P phase edge, it would be susceptible to the θ-marking, unless barred by stipulation. The resultant structure would violate Θ-Theory, since it would receive two θ-roles by the VP structure and the *v**P structure. Hence, for the θ-marked *what* not to violate θ-Theory, it must be immune to the θ-marking by being boxed by IM in the *v**P phase edge.

This indicates that θ-marking of a *wh*-element is closely related to the necessity of its boxing. Actually, in Chomsky's box analysis of *wh*-movement, since object argument *wh*-elements are θ-marked by the VP structure, they are obligatorily boxed in the *v**P phase edge, a θ-position, not to be assigned more than one θ-roles. We call such *wh*-elements *wh*[+θ]-elements. This consideration naturally leads us to expect that boxing is unnecessary for adjunct *wh*-elements, since they are not θ-marked. We call such *wh*-elements *wh*[-θ]-elements. We argue that the box theory has the following implication for boxing of a *wh*-element:

(31) Boxing of a *Wh*-element

When a *wh*-element is IM-ed to a phase edge, the *wh*-element is boxed if it is a *wh*[+θ]-element, whereas it is not boxed if it is an *wh*[-θ]-element.

Note that in the case of a *wh*[-θ]-element, even if it is not boxed in the *v**P phase edge, a θ-position, Θ-Theory would not be violated, since the element is never θ-marked.

Under the strict interpretation of Principle [T], one may wonder how *wh*[-θ]-elements like *wh*-adjuncts are accessible to Merge. On this matter, Chomsky (personal communication) suggests: "Principle T is loose enough so that adjuncts could be included: taking modification to be within the broader category of extended theta roles, including predication." Following Chomsky's suggestion, we include *wh*[-θ]-elements as elements eligible for Merge. Although he leaves open how boxing is related to *wh*[-θ]-elements, we claim in this paper that *wh*[-θ]-elements are eligible for Merge but not boxed, as stated in (35).

Even if Principle [T] is allowed to include *wh*[-θ]-elements, the above implication raises a question how *wh*[-θ]-elements are licensed. It is relevant to recall here that a *wh*[+θ]-element is licensed through access from C_Q to a boxed *wh*-element. If boxing is a necessary condition for access, this means that we cannot appeal to access to license unboxed *wh*[-θ]-elements. Therefore, we argue that an unboxed *wh*[-θ]-element is licensed by moving it to SPEC of C_Q by IM, as traditionally assumed in overt *wh*-movement:

(32) Licensing of a *Wh*-element

A *wh*[+θ]-element is licensed through access from C_Q whereas a *wh*[-θ]-element is licensed through IM to the Spec of C_Q.[2]

[2] The approach is reminiscent of unselective binding of Tsai (1994). According to this, *in-situ wh*-arguments can be licensed by unselective binding without moving to SPEC-CP, while *in-situ wh*-adjuncts do not have this option, and must move to SPEC-CP to be licensed. Note that the applicability of unselective binding relies on

It follows that while a *wh*[+θ]-element ceases to be accessible to Merge once it is IM-ed to a phase edge, a *wh*[-θ]-element continues to be accessible to Merge.

In the next section, in terms of this elaborated theory of the box system, we attempt to provide a "genuine explanation" for the above empirical findings (Table 1 and (11)).

Section 3.3. Proposal and analysis

As just noted, θ-marking plays an important role in the box theory. Based on the descriptive generalization on the interpretations of ATB *wh*-questions (11), we propose that not only θ-marking but also Case-marking should contribute to boxing of a *wh*[+θ]-element. Specifically, we propose (37):

(33) Obligatoriness/Optionality of Boxing of a *Wh*[+θ]-element

When a *wh*[+θ]-element is IM-ed to a phase edge, the *wh*[+θ]-element is boxed obligatorily if it is Case-marked, whereas it is boxed optionally if it is not Case-marked.

This proposal leaves intact Chomsky's box analysis of *wh*-movement, as the only *wh*-element he deals with is a Case-marked *wh*[+θ]-element. This proposal also leaves intact non-boxing of a *wh*[-θ]-element, since a *wh*[-θ]-element is not boxed irrespectively of whether it is Case-marked or not. There remains the important question of why [±Case] affects boxing of a *wh*[+θ]-element, to which we return in the final section and suggest a possible direction toward a solution.

Before turning to an analysis of ATB *wh*-questions, let us briefly discuss coordination. As for coordination, we assume with Chomsky (2023) that what is combined is determined by the freely available operation *FormSet* (FS), which can form order-free multi-membered sets, and we do not commit ourselves to any specific formalization here (for relevant discussion on FS, see Chomsky 2021, 2023; Goto and Ishii 2022). Given FS, an ATB *wh*-question can have (at least) two possible derivations, depending on what categories are coordinated. Below we present an analysis under *v**P-coordination and CP-coordination, but our analysis holds under TP-coordination, too.

Now, let us first consider how our proposal can account for the reading facts of the ATB *wh*-questions in (1, 6) (repeated here as (34, 35) respectively) that allow only the identity readings:

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the notion of *nominality*, *i.e.*, Case.

(34) Which boy did John meet ***e*** and Mary like ***e***?

a. John met Bill and Mary liked Bill.

b. #John met Bill and Mary liked Frank.

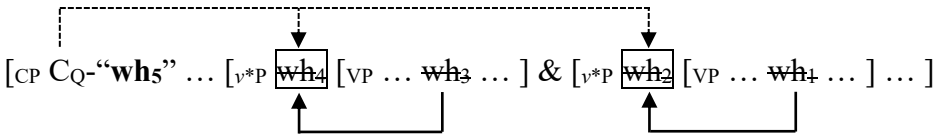
(35) Dono hon-o John-wa tosyokan-kara ***e*** kari, Bill-wa syoten-de ***e*** katta no?
which book-acc J.-top library-from borrow, B.-top bookstore-at bought Q
'Which book did John borrow from the library and Bill buy at the bookstore?'

a. John-wa … *The Great Gatsby*-o kari, Bill-mo … *The Great Gatsby*-o katta.
J.-top *The Great Gatsby*-acc borrow, B.-also *The Great Gatsby*-acc bought
'John borrowed *The Great Gatsby* … and Bill bought it (=*The Great Gatsby*) …, too.'

b. #John-wa … *The Great Gatsby*-o kari, Bill-wa … *The Years*-o katta.
J.-top *The Great Gatsby*-acc borrow, B.-top *The Years*-acc bought
'John borrowed *The Great Gatsby* … and Bill bought *The Years* ….'

According to (33), Case-marked *wh*[+θ]-elements, such as *which book* in (34) and *dono hon-o* 'which book-acc' in (35), are obligatorily boxed. The derivation under *v**P-coordination is schematically represented as follows.

(36) Derivation of an ATB *wh*[+θ, +Case]-question under *v**P-coordination



(deriving the identity reading facts in (34, 35))

In (36), wh_1 and wh_3 are introduced by EM in each conjunct and assigned a θ-role by each VP structure. Since they are Case-marked *wh*[+θ]-elements, they are obligatorily boxed by IM to SPEC-*v**P of each conjunct, as indicated by wh_2 and wh_4. In *v**P-coordination, C_Q is introduced at the matrix position in the first conjunct and accesses the boxed wh_2 and wh_4 for instructions. The C_Q with relevant feature instructions is indicated by "wh_5." Given feature instructions of "wh_5," $wh_{5,4,3}$ and $wh_{5,2,1}$ are in a cc-configuration. Consequently, $wh_{5,4,3,2,1}$ are all interpreted as identical copies at the CI interface, and the lower copies $wh_{4\sim1}$ are deleted at the SM interface.

Thus, the identity reading facts of the ATB *wh*-questions in (34) and (35) follow from this derivation. Note that from the derivation (38), there is no way to derive an ATB *wh*-question with a non-identical reading.

On the other hand, the derivation under CP-coordination is schematically represented as follows.

(37) Derivation of an ATB *wh*[+θ, +Case]-question under CP-coordination

For the same reason as (38), wh_1 and wh_4 in (39) are obligatorily put in a box by IM to SPEC-*v**P of each conjunct, as indicated by wh_2 and wh_5. (37) differs from (36) in that CPs are coordinated in (39), and therefore C_Q is introduced at the matrix position in each conjunct. The C_Q in the second conjunct accesses the boxed wh_2, and the C_Q in the first conjunct accesses the boxed wh_5, getting features relevant for interpretation at the interfaces, respectively. The C_Q in the second conjunct with relevant feature instructions is indicated by "wh_3," and the C_Q in the first conjunct with relevant feature instructions is indicated by "wh_6." Given the feature instructions of "wh_6" and "wh_3," $wh_{6,5,4}$ and $wh_{3,2,1}$ are in a cc-configuration. Consequently, $wh_{6,5,4}$ and $wh_{3,2,1}$ are each interpreted as identical copies at the CI interface, and their lower copies $wh_{5\sim4}$ and $wh_{2\sim1}$ are deleted at the SM interface.

What is crucial here is that since the chain of $wh_{6,5,4}$, *i.e.*, $<wh_6, wh_5, wh_4>$, and the chain of $wh_{3,2,1}$, *i.e.*, $<wh_3, wh_2, wh_1>$, are not in a cc-configuration, they are not interpreted as identical copies, nor can deletion be applied to "wh_6" and "wh_3." Hence, in this case, "wh_6" and "wh_3" are spelled-out in the matrix SPEC-CP in each conjunct. This derives non-ATB *wh*-questions with a non-identity reading like (38):

(38) **Which boy** did John meet and **which boy** did Mary like?

Hence, whether it be *v**P-coordination or CP-coordination, there is no way to derive an ATB *wh*-question with a non-identical reading, when the Case-marked *wh*[+θ]-elements are involved.

Let us next consider how our proposal can account for the reading facts of the ATB *wh*-questions in (2, 3, 4, 7, 10) (repeated here as (39, 40, 41, 42, 43) respectively) that allow both identity and non- identity readings:

(39) Where did Mary vacation ***e*** and Bill decide to live ***e***?

a. Mary vacationed in Paris and Bill (also) decided to live in Paris.

b. Mary vacationed in Paris and Bill decided to live in Toronto. (Munn 1999: 421)

(40) How tired did Bill look ***e*** and Mary seem ***e***?
a. Bill looked exhausted and Mary also looked exhausted.
b. Bill looked exhausted and Mary looked OK.

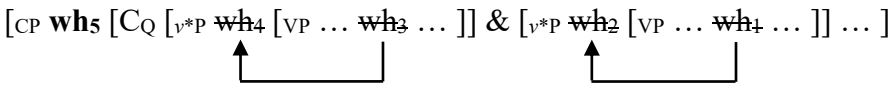
(41) Why did Bill leave ***e*** and Fred arrive ***e***?
a. Bill left because John arrived and Fred arrived because he arrived.
b. Bill left because Fred arrived and Fred arrived because he had a meeting.

(42) Dono mati-de John-wa Bill-ga ***e*** kyuuka-o tori, Mary-ga taisyoku-go ***e*** sugosita to itta no?
which city-at J.-top B.-nom vacation-acc take, M.-nom retirement-after spent that said Q
'In which city did John say that Bill vacationed and Mary spent after retirement?'
a. … Bill-ga Pari-de kyuuka-o tori, Mary-mo … Pari-de sugosita …
B.-nom Paris-in vacation-acc take, M.-also Paris-in spent
'John said that Bill vacationed in Paris and Mary spent in Paris after retirement, too.'
b. … Bill-ga Pari-de kyuuka-o tori, Mary-ga … Sooru-de sugosita …
B.-nom Paris-in vacation-acc take, M.-nom Seoul-in spent
'John said that Bill vacationed in Paris and Mary spent in Seoul after retirement.'

(43) Nani-o John-wa ***e*** sawagi, Mary-wa ***e*** yorokondeiru no?
what-acc J.-top fuss M.-top be.pleased Q
'Why is John fussing and Mary happy?'
a. John-wa [inu-o kau node] sawagi, Mary-mo [inu-o kau node] yorokondeiru.
J.-top dog-acc have because fuss, M-also dog-o have because be.pleased
'John is fussing because he has a dog and Mary is also happy because she has a dog.'
b. John-wa [inu-o kau node] sawagi, Mary-wa [dekakeru node] yorokondeiru.
J.-top dog-acc buy because fuss, M-top come.out because be.pleased
'John is fussing because he has a dog and Mary is happy because she goes out.'

According to (33), *wh*[-θ]-elements, such as *where* in (39), *how* in (40), *why* in (41), *dono machi-de* 'in which city' in (42), and *nani-o* 'what-acc' in (43), are not boxed whether they are Case-marked or not. An ATB *wh*[-θ]-question has two possible derivations, depending on what categories are coordinated. The derivation under *v**P-coordination is schematically represented as follows:

(44) Derivation of an ATB *wh*[-θ]-question under *v**P-coordination



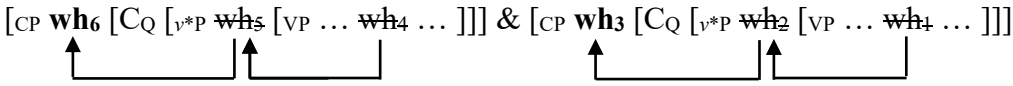
(deriving the identity reading facts in (39, 40, 41, 42, 43))

In (44), although wh_1 and wh_3 are not assigned any θ-role, they are introduced by EM in each conjunct for modification, which is within the broader category of extended theta roles (see personal communication with Chomsky above). Under the standard assumption that *wh*-movement takes place phase-by-phase (cf. the Phase-Impenetrability Condition, PIC), wh_1 and wh_3 are IM-ed to SPEC-*v**P of each conjunct, as indicated by wh_2 and wh_4. In *v**P-coordination, C_Q is introduced at the matrix position in the first conjunct, and its SPEC is filled with the Syntactic Object (SO) wh_5 by IM of either wh_2 or wh_4. Given the SO wh_5, $wh_{5,4,3}$ and $wh_{5,2,1}$ are in a cc-configuration. Consequently, $wh_{5,4,3,2,1}$ are all interpreted as identical copies at the CI interface, and the lower copies $wh_{4\sim1}$ are deleted at the SM interface.

Thus, the identity reading facts of the ATB *wh*[-θ]-questions like (39, 40, 41, 42, 43) follow from this derivation. Note that from the derivation (41), there is no way to derive an ATB *wh*[-θ]-question with a non-identity reading.

On the other hand, the derivation of an ATB *wh*[-θ]-question under CP-coordination is schematically represented as follows.

(45) Derivation of an ATB *wh*[-θ]-question under CP-coordination



For the same reason as (44), wh_1 and wh_4 in (45) are not put in a box in each conjunct, as indicated by wh_2 and wh_5. Just like the difference between (36) and (37) we noted above, (45) differs from (44) in that CPs are coordinated in (42), and therefore, C_Q is introduced at the matrix position in each conjunct. The SPEC of C_Q in the second conjunct is filled with the SO wh_3, and the SPEC of C_Q in the first conjunct is filled with the SO wh_6. Given the SOs of wh_6 and wh_3, $wh_{6,5,4}$ and $wh_{3,2,1}$ are in a cc-configuration. Consequently, $wh_{6,5,4}$ and $wh_{3,2,1}$ are each interpreted as identical copies at the CI interface, and the lower copies $wh_{5\sim4}$ and $wh_{2\sim1}$ are deleted at the SM interface.

What is essential here is that, as in the case of (45), since the chain of $wh_{6,5,4}$, *i.e.*, $<wh_6, wh_5, wh_4>$, and the chain of $wh_{3,2,1}$, *i.e.*, $<wh_3, wh_2, wh_1>$, are not in a cc-configuration, they are not interpreted as identical copies, nor can deletion be applied to wh_6 and wh_3. Thus in

this case, too, wh_6 and wh_3 are spelled-out in the matrix SPEC-CP in each conjunct. This derives non-ATB *wh*-questions with a non-identity reading like (46) (cf. (38)).

(46) **Where** did Mary vacation and **where** did Bill decide to live?

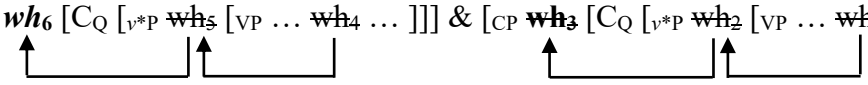
Essentially following Salzmann (2012a, b), we argue that *where* in the second conjunct (and more precisely, *did*, too) undergoes *ellipsis* to derive the ATB *wh*-question from (46). But to make this analysis works, we need to ensure that ellipsis of a *wh*-element can only apply to (46), but, crucially, not to (38). Otherwise, the device that could be convenient to derive (46) would be allowed to apply to (38) as well, and then an ATB *wh*-question of a Case-marked *wh*[+θ]-element that allows a non-identical reading would be derived, contrary to fact. Here, it is important to notice that the C_Q areas of the derivations in (37) and (45) are composed differently. While the C_Qs of (37) consist of feature instructions obtained through access ("wh_6" and "wh_3"), those of (45) consist of the SOs generated by IM (wh_6 and wh_3). This makes a significant difference with respect to the applicability of ellipsis. In the box system, it is assumed that the lower copies identical with the higher element composed of features can undergo deletion if they are in a cc-configuration (see the discussion around (26)). Although such a cc-configuration condition is not imposed on ellipsis, ellipsis can only apply to *identical* SOs generated by Merge. As illustrated by cases of sluicing, gapping, and VP ellipsis in (47a-c), the SOs generated by Merge in the second conjuncts, *i.e.*, *he ordered*, *ordered*, and *like spaghetti*, can be elided, although they are not in a cc-configuration with their identical counterparts marked by italics in the first conjunct:

(47) a. *He ordered* something, but I don't know what ~~he ordered~~. (sluicing)
b. John *ordered* pizza, and Mary ~~ordered~~ spaghetti. (gapping)
c. John may *like spaghetti*, and Mary may ~~like spaghetti~~, too. (VP ellipsis)

This consideration allows us to proceed the derivation (45) further as in (48).

(48) Derivation of an ATB *wh*[-θ]-question under CP-coordination

$[_{CP}\ \boldsymbol{wh_6}\ [C_Q\ [_{v^*P}\ \sout{wh_5}\ [_{VP}\ \ldots\ \sout{wh_4}\ \ldots\ ]]]\ \&\ [_{CP}\ \sout{\boldsymbol{wh_3}}\ [C_Q\ [_{v^*P}\ \sout{wh_2}\ [_{VP}\ \ldots\ \sout{wh_1}\ \ldots\ ]]]$



(deriving the non-identity reading facts in (39, 40, 41, 42, 43))

In (48), since wh_3 in the second conjunct and wh_6 in the first conjunct are identical SOs, wh_3 can undergo ellipsis, without being constrained by a cc-configuration. Thus, given ellipsis that can elide SOs that are not in a cc-configuration, an ATB *wh*[-θ]-question with a non-identity reading can be derived by applying ellipsis to the identical SO in the second conjunct (as in *where did Mary vacation and ~~where~~ did Bill decide to live?*).

Let us finally consider how our proposal can account for the reading facts of the ATB *wh*-questions in (9) (repeated here as (49)) that allow both identity and non-identity readings:

(49) (kinoo-no kenka-nituite) Nan-to John-wa ***e*** sinziteite, Mary-wa ***e*** omoikondeiru no
(yesterday-gen fight-about)what-that J.-top believe, M.-top thinks Q
'(About a fight that happened yesterday) What is it that John believes and Mary thinks?'

a. John-wa [Bill-ga tataita to] sinziteite, Mary-mo [Bill-ga tataita to] omoikondeiru.
J.-top Bill-nom hit that believe, M.-also Bill-nom hit that thinks
'John believes that Bill hit and Mary also thinks that Bill hit.'

b. John-wa [Bill-ga tataita to] sinziteite, Mary-wa [Tim-ga tataita to] omoikondeiru.
J.-top Bill-nom hit that believe, M.-top Tim-nom hit that thinks
'John believes that Bill hit and Mary thinks that Tim hit.'

According to (33), non-Case-marked *wh*[+θ]-elements like *nan-to* 'what-that' in (49) may or may not be boxed. When *nan-to* 'what-that' is boxed, its derivation proceeds in the same way as the derivation (36) of an ATB Cased-marked *wh*[+θ]-question. On the other hand, when *nan-to* 'what-that' is not boxed, its derivations proceed just like those of an ATB *wh*[-θ]-question as shown in (44) and (48). While its identity reading fact follows from derivations (36) and (44), its non-identity reading fact from derivation (48).

In this way, the above empirical findings (Table 1 and (11)) are explained as a natural consequence of the box system, along with the independently motivated ellipsis operation.

Section 3.4. An implication for improper movement

Our proposal (33) provides a new approach to the fact that long-distance scrambling to a sentence-medial position is prohibited in Japanese (Saito 1985); consider (50b):

(50) a. John-ga minna-ni [$_{CP}$ Mary-ga sono hon-o mottei-ru to] it-ta.
John-nom all-to Mary-nom that book-acc have-pres that say-past
'John said to all [that Mary has that book].'

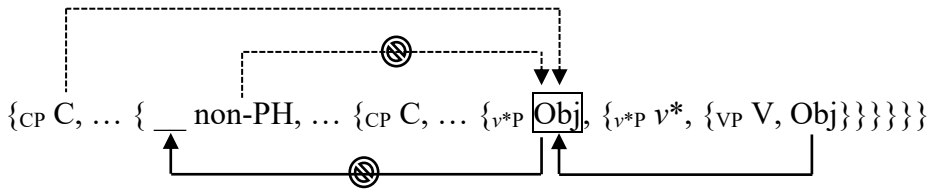
b. ??John-ga **sono hon-o$_i$** minna-ni [$_{CP}$ Mary-ga ***t*$_i$** mottei-ru to] it-ta.

John-nom that book-acc all-to Mary-nom have-pres that say-past
'(Lit.) John, that book, said to all [that Mary has t_i].'

(50b) is derived from (50a) via long-distance scrambling of the embedded object *sono hon-o* 'that book' to a sentence-medial position, and the sentence is marginal. Saito (1985) observes that the sentence-medial position in question is an A-position, arguing that the marginality is due to *improper movement* that bans A'-movement followed by A-movement (*A→A'→A). Under the improper movement approach, the marginality of (50b) is accounted for as follows: *sono hon-o* 'that book-acc' first moves from the object position of *motteiru* 'have', *i.e.*, an A-position to the Spec of C in the embedded clause, *i.e.*, an A'-position, and then to an A-position in the matrix clause, and hence the sentence is ruled out.

We can develop a new analysis of (50b) in the box system. According to (33), since Case-marked [+θ]-elements such as *sono hon-o* 'that book-acc' are obligatorily boxed, it can no longer undergo IM. The relevant part of the derivation of (50b) is given in (51) (where Obj = *sono hon-o* 'that book-acc'; V = *motteiru* 'have'):

(51) Box analysis of (50b) (order irrelevant)



Here *sono hon-o* 'that book-acc' (the Case-marked Obj[+θ]) is boxed by IM to the embedded SPEC-*v**P. Since the boxed element is inaccessible to Merge, Obj cannot undergo IM to the relevant A-position in the matrix clause, which is provided by a non-phase head (non-PH). Note that the boxed Obj cannot be externalized in an A-position by access from a non-PH. In the box system, it is only a phase head that provides an A'-position that can access to a boxed element for instructions (see Section 3.1). So in the box system, there is no way to derive (50b); neither IM nor access can apply to the boxed Obj to derive the sentence. Therefore (50b) can be excluded without recourse to the notion of improper movement. Note in passing that in (52) below, the embedded object *sono hon-o* 'that book-acc' undergoes long-distance scrambling to the initial position of the sentence, and the sentence is acceptable. This can be accommodated, given that the phase head C in the matrix clause can access the boxed Obj for externalization, as depicted in (51):

(52) ***Sono hon-o***$_{\mathrm{i}}$ John-ga minna-ni [$_{\mathrm{CP}}$ Mary-ga $\boldsymbol{t}_{\mathrm{i}}$ mottei-ru to] it-ta.
that book-acc John-nom all-to Mary-nom have-pres that say-past
'(Lit.) That book$_{\mathrm{i}}$, John said to all [that Mary has t_{i}].'

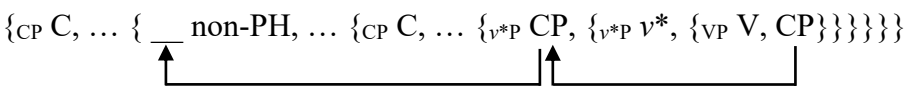
What should be noted here is that our box analysis of (50b) can lead to a prediction that is not available in the analysis based on the notion of improper movement. According to (33), since non-Case-marked [+θ]-elements like *to* 'that'-clause may or may not be boxed, it should be predicted that long-distance scrambling of *to* 'that'-clause to a sentence medial position is possible under the option of unboxing. Remarkably, this prediction seems to be borne out; consider (53b):

(53) a. John-ga minna-ni [$_{\mathrm{CP}}$ Mary-ga [kare-ga muzai da to]
John-nom all-to Mary-nom he-nom innocent is that
omoikondei-ru to] say-past
believe-pres that it-ta.
'John said to all [that Mary believes [that he is innocent]].'

b. John-ga **[kare-ga muzai da to]** minna-ni [$_{\mathrm{CP}}$ Mary-ga $\boldsymbol{t}_{\mathrm{i}}$
John-nom he-nom innocent is that all-to Mary-nom
omoikondei-ru to] say-past
believe-pres that it-ta.
'(Liy.) John, [that he is innocent], said to all [that Mary believes t_{i}].'

(53b) is derived from (53a) via long-distance scrambling of the *to* 'that'-clause to a sentence-medial position. In our judgement, there is a contrast between (50b) and (52b); (52b) is more acceptable than (50b). This fact is surprising under the improper movement analysis, according to which, (53b) should be marginal, on a par with (50b), contrary to fact. Under our box analysis, however, it is not surprising anymore. The acceptability of (53b) can be accounted for as follows: since the *to* 'that'-clause *[kare-ga muzai da to]* 'that he is innocent' may not be boxed, it can undergo IM. The relevant part of the derivation of (53b) is given in (54) (where CP = *kare-ga muzai da to* ' that he is innocent'; V = *omoikondei-ru* 'believe-pres'):

(54) Box analysis of (50b) (order irrelevant)



Here *kare-ga muzai da to* ‘ that he is innocent’ (the non-Case-marked CP[+θ]) is not boxed by IM to the embedded SPEC-*v**P. Since the unboxed element is accessible to Merge, CP can undergo IM to the relevant A-position in the matrix clause. If CP undergoes further IM to the matrix SPEC-CP via the matrix SPEC-*v**P under the Phase-Impenetrability Condition (PIC) that requires that IM must apply phase-by-phase, then the acceptable sentence in (55) is derived.

(55) **[kare-ga muzai da to]** John-ga ***t***$_i$ minna-ni [$_{CP}$ Mary-ga ***t***$_i$
he-nom innocent is that John-nom all-to Mary-nom
omoikondei-ru to] say-past
believe-pres that it-ta.
‘(Liy.) [that he is innocent]$_i$, John said to all [that Mary believes t_i].’

The important thing is that although the contrast between (50b) and (53b) cannot be accounted for under the improper movement analysis, it can be accounted for under the box system that incorporates the proposal (33). Thus, the contrast provides evidence for the proposal (33).

Section 4. Concluding Remarks

In this paper we have examined the English and Japanese ATB *wh*-questions in detail. On the basis of novel data from Japanese, we have proposed that *wh*-elements, which are θ- and Case-marked, allow only an identity reading. Pointing out that the major approaches to ATB *wh*-questions would have difficulty explaining our empirical findings, we have provided a “genuine explanation” for them in terms of the box system in Chomsky (2023). Elaborating Chomsky’s box system, we have argued that a *wh*[+θ]-element is boxed by IM to a phase edge and licensed through access by C_Q, while a *wh*[-θ]-element is not boxed and licensed through IM to the Spec of C_Q. We have proposed that not only θ-marking but also Case-marking contributes to boxing of a *wh*-element. More specifically, we have claimed that boxing is obligatory for Case-marked *wh*[+θ]-elements, but optional for non-Case-marked *wh*[+θ]-elements. Under this proposal, we have argued that the reading facts of the ATB *wh*-questions are explained as a natural consequence of the box system, along with the independently motivated ellipsis operation, which can apply to identical SOs, without being constrained by a cc-configuration. We have also shown that Case-marked [+θ]-elements and non-Case-marked [+θ]-elements behave differently with respect to the possibility of long-distance scrambling to a sentence medial position, suggesting that the contrast, which cannot be accounted for under the improper movement analysis, lends further support for our proposal.

Before concluding this paper, we would like to go back to the remaining question: why [±Case] affects boxing of *wh*[+θ]. A scenario we are currently envisioning as a possible solution to this problem is the following.

(56) Scenario for boxing

Suppose that Case is related to φ-agreement, or more relevantly, <φ, φ> Labeling, that takes place at SPEC-VP (Chomsky 2013, 2015), and that SPEC-VP can be a θ-position for the external argument (Chomsky 2023: 8, fn. 7). Then, it follows that a Case-marked *wh*[+θ]-element must be boxed in SPEC-VP. If it were not boxed there, Θ-Theory would be violated, since the *wh*-element would receive two θ-roles, *i.e.*, one assigned by V at the object position and the other assigned by V-complement at SPEC-VP.

Under this scenario, an "open question" of why a boxed element does not raise a labeling problem may be accounted for without stipulating that "it's inaccessible to labeling." (Chomsky personal communication). That is, if a Case-marked *wh*[+θ]-element is boxed by IM in SPEC-VP, where <φ, φ> Labeling takes place, there is no labeling issue, because the boxed element itself participates in labeling. This solution is compatible with the box theory that assumes that the boxed element is inaccessible to Merge. If the boxed element responsible for <φ, φ> underwent further IM from SPEC-VP, then it would "de-label" <φ, φ>, resulting in a violation of Labeling Theory (cf. Chomsky 2013, 2015). Therefore, for <φ, φ> to stay labeled, the Case-marked *wh*[+θ]-element must stay at SPEC-VP by being put in a box by IM, so as not to undergo further IM, as required by the theory.

Under this scenario, what would happen in the case of non-Case-marked [+θ]-elements, which may or may not be boxed? We suggest that when boxing takes place, it is boxed by IM in SPEC-VP, a θ-position, being inaccessible to further Merge, but when boxing does not take place, it is IM-ed to SPEC-*v**P, a non-θ-position under the current scenario, being accessible to further IM. Given that VP is a phase here, one might wonder how IM under consideration can observe the Phase-Impenetrability Condition (PIC) that requires that IM must apply phase-by-phase. In this case, we assume that the relevant phase is not VP, but *v**P. This assumption is plausible, given that phasehood of the *v**-V area originates in *v**, and its inheritance to V is coupled with φ-feature-inheritance (see Chomsky 2015). If Case is related to φ-agreement, and phasehood-inheritance is linked with φ-feature-inheritance, then it follows that when a non-Case-marked [+θ]-element is involved, neither φ-feature-inheritance nor phasehood-inheritance is unnecessary, so therefore, phasehood stays in *v**. Thus, even if

a non-Case-marked [+θ]-element undergoes IM to SPEC-*v**P without stopping by SPEC-VP, no PIC violation occurs.

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