

# Subject Movement and the Problem of Determinacy

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## 1. Introduction

This paper considers Determinacy in syntax. Chomsky (2019a) discusses the seven desiderata that any computational operations for language should meet and proposes Determinacy as one of them. According to this desideratum, syntax is deterministic in the sense that no ambiguous situation is allowed for subsequent rule application. To see how Determinacy works, consider (1):

- (1) MERGE maps Workspace (WS) = [X, Y] onto WS' = [{X, Y}], reducing its complexity and avoiding indeterminate rule application. (Chomsky 2019a, Chomsky et al. 2019)

Chomsky reformulates Merge as capital Merge (i.e., MERGE), saying that MERGE should be an operation on the workspace, changing the workspace into a new workspace. Workspace represents the stage of the derivation at any given point. Given Determinacy, MERGE maps the workspace as shown in (1). Suppose that MERGE maps the workspace as illustrated in (2), adding {X, Y} to WS:

- (2) MERGE: WS = [X, Y] into WS' = [X, Y, {X, Y}]

In this case, it will not ensure deterministic rule application as any rule applying to X or Y would ambiguously refer to the individual objects X, Y or to the terms of K. Determinacy can be considered a property attributable to efficiency principles, which as shown in (3) syntax is subject to: an ambiguous or indeterministic situation will not warrant efficient computation:

- (3) Principles of UG operate in accord with language-independent conditions of computational efficiency (or “third factor” principles). (Chomsky 2017: 296)

The purpose of the present paper is to consider Determinacy in syntactic derivation and propose more deterministic syntax in terms of phase. I argue that the proposed Determinacy is theoretically and empirically more favorable than Chomsky’s formulation of Determinacy.

The organization of this paper is as follows: in section 2, I discuss problems with

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Determinacy. In section 3, I propose phase-based Determinacy. In section 4, I consider two consequences of the proposed Determinacy. In section 5, I present the summary and conclusion of the paper.

## 2. Determinacy in syntax

In this section, I first discuss theoretical and empirical problems with Determinacy. Let us start with a theoretical problem. As pointed out in Goto and Ishii (2019), Determinacy as it is involves look-ahead. For instance, Chomsky et al. (2019) say that  $WS' = [X, Y, \{X, Y\}]$  would not ensure that subsequent operations can apply in a deterministic fashion. This suggests that syntax somehow knows that (2) is ambiguous to subsequent rule application at the output of MERGE. The question, however, is, “How does syntax know that at the stage when the  $WS'$  is created, that is, before a subsequent rule actually applies?” Look-ahead increases computational complexity and is not favorable under the assumption that UG is subject to (3).

Next, consider an empirical problem, which is that subject *wh*-movement will be ruled out by Determinacy. To see this, consider the derivation (4):<sup>1</sup>

- (4)
- a. [ ... XP ... ]
  - b. [ XP [ ... [ ... XP ... ] ] ]
  - c. \* [ CP [ ... [ XP [ ... [ ... XP ... ] ] ] ] ]

Suppose that XP moves to the underlined position and that (4b) is generated as a workspace. This derivational output has two occurrences of XP, to which a movement rule or Internal MERGE applying to XP will ambiguously refer, and the rule cannot apply in an unambiguous fashion in the subsequent derivation. Consequently, a Determinacy violation occurs at (4b) and XP cannot move to the underlined position in (4c).

Notice that the derivation (4) is exactly what we find in the derivation of subject *wh*-movement. Consider a typical example (5) and its derivation (6):

- (5) Who will give a talk at the conference?
- (6)
- a. [<sub>VP</sub> who [<sub>V</sub> [ ... ] ] ]
  - b. [<sub>TP</sub> who [<sub>T</sub> [<sub>VP</sub> who [<sub>V</sub> [ ... ] ] ] ] ] → Determinacy violation
  - c. \* [ CP [ C [ TP who [ T [ VP who [ V [ ... ] ] ] ] ] ] ] ]

It has been assumed that in subject *wh*-movement, the subject *wh*-phrase moves to Spec,CP by way of Spec,TP but this creates (6b), the workspace which has two occurrences of the *wh*-phrase and Internal MERGE will refer ambiguously to these occurrences in the subsequent derivation. Determinacy is violated at (6b) and the *wh*-phrase cannot move onto Spec,CP.

Notice that this problem persists under the revised notion of Determinacy proposed by

<sup>1</sup> As discussed, MERGE operates on the workspace. Keeping this in mind, for the purpose of simplicity, I use traditional representations for illustration in this paper.

Goto and Ishii (2019). They argue that a Determinacy violation occurs when there is an ambiguous rule application at the *input* of MERGE, that is, when a rule actually applies in the subsequent derivation or at (4c), and not at the output like (4b). Under this approach, unlike Chomsky's, producing (4b) and (6b) does not violate Determinacy and a look-ahead problem does not arise. However, Internal MERGE will ambiguously refer to the occurrences of the *wh*-phrase in (6c) and a Determinacy violation will occur when Internal MERGE applies.

In summary, I have pointed out two problems posed by Determinacy. These problems are nontrivial to syntax given computational efficiency and under-generation of subject *wh*-movement.

### 3. Determinacy from phase

#### 3.1. Proposal

In this section, I argue for another approach to Determinacy and propose that Determinacy follows from phase.

The basic assumption in minimalist syntax is that language is optimally or perfectly designed, one consequence of which is that an indeterministic situation (or more generally, ambiguity) is not allowed for syntax. Based on this assumption, I explore the hypothesis that syntax is deterministic by nature, claiming that it is designed in such a way as to avoid indeterminacy from the beginning and that indeterministic situations like (4b) and (6b) will never emerge. The key ingredient of the proposal is phase, which is one of the elements of efficient computation. Following Chomsky (2007, 2008, 2013), I propose that operations are strictly phase-based: that is, all operations except External MERGE apply at the phase level. This proposal, I argue, does not incur indeterministic derivations. To see this, consider (5) once again under the proposal. The derivation is illustrated in (7):

- (7) **Phase 1 (=  $\nu$ P)**  
 a. [ $\nu$ P who [ $\nu$  [ ... ]]]  
**Phase 2 (= CP)**  
 b. [ $\text{TP T}$  [ $\nu$ P who [ $\nu$  [ ... ]]]]  
 c. [ $\text{CP } \_\_\_$  [ $\text{C}$  [ $\text{TP T}$  [ $\nu$ P who [ $\nu$  [ ... ]]]]]]]

In (5), there are two phases:  $\nu$ P and CP. Given this strictly phase-based derivation, the subject *wh*-phrase does not move when TP is created. Consequently, as shown in (7b), when CP is generated, there is only one occurrence of *who* in the CP phase: that is, *who* in the Spec of  $\nu$ P and Internal MERGE can apply unambiguously to this occurrence. An indeterministic situation like (6b) will not emerge, and (5) can be generated in a deterministic manner.

The proposed derivation, however, is faced with a problem. In (7), Spec,TP is not created and the derivation cannot satisfy the Spec requirement, which is descriptively stated as (8):

- (8) **The Spec Requirement:** Finite T must have a Spec (e.g., EPP – Chomsky 1981, 1982; label weakness – Chomsky 2015; externalization – Mizuguchi 2019b; contiguity – Richards 2016).

Notice that movement to Spec,TP at the phase level cannot be operated as it is counter-cyclic and violates the No-Tampering Condition (NTC) (Chomsky 2008: 138), one of the conditions

that follow from efficiency principles. I argue that the relevant problem can be solved by MERGE.<sup>2</sup>

Mizuguchi (2019a,b) claims that MERGE, which applies freely, can generate (9a) and (9b):

- (9) a.  $\{\chi, \{\alpha, \beta\}\}$   
 b.  $\{\alpha, \{\alpha, \beta\}\}$

In (9a),  $\alpha$  and  $\beta$  are merged to form a set, with which  $\chi$  is merged to form another set; on the other hand, in (9b), MERGE embeds the set formed out of  $\alpha$  and  $\beta$  under  $\alpha$  by recursively (or internally) merging  $\alpha$  with the set. I propose that in the derivation of (5), C and T are merged in the way illustrated in (9b), which produces (10), in which C forms a composite head with T:

- (10)  $\{C, \{C, T\}\}$

Now consider (5) under the proposal, which is illustrated in (11):

- (11) **Phase 1 (= vP)**  
 a.  $[_{vP} \boxed{\text{who}} [_v [ \dots ]]]$   
**Phase 2 (=  $\delta$ )**  
 b.  $[\{C, \{C, T\}\} [_{vP} \boxed{\text{who}} [_v [ \dots ]]]]$   
 c.  $[_{\delta} \boxed{\text{who}} [\{C, \{C, T\}\} [_{vP} t [_v [ \dots ]]]]]]$

In the derivation, the Spec requirement problem can be solved. In (11c), an independent T-headed set (or “TP”) is not produced and there is no empty Spec,TP in the derivation.<sup>3</sup>

Moreover, *wh*-movement in (11) applies at the phase level. Notice that (10) has the properties of C, not T, which is because C and T are put in an asymmetric relation due to C embedding the  $\{C, T\}$  set, hence T: minimal search will locate C as the label of (10), which hence has the properties of C. Provided that phasehood is one of the properties of C, (10) works as a phase head just like C, with *who* moving at the phase level.

### 3.2. The *that*-trace effect

In this section, I show that the proposed analysis can also take care of the *that*-trace effect, which Goto and Ishii (2019) argue falls under a Determinacy explanation. The *that*-trace effect is illustrated in (12):

<sup>2</sup> For subject raising to Spec,TP under the phase-based Determinacy, the reader is referred to Mizuguchi (2019b), who argues that the movement can be operated in phase syntax without violating the NTC.

<sup>3</sup> Given that MERGE applies freely,  $\{C, \{C, T\}\}$  can be produced in (i), predicting the absence of (8):

- (i) \*Seems that John is well.

As regards this, Mizuguchi (2019b) argues that (8) or the EPP is explained not only by labeling but also by externalization: the Spec of  $\phi$ P is required for realization of  $\phi$  at the SM level. (i) will be ruled out even if  $\{C, \{C, T\}\}$  is yielded, since the  $\phi$  on  $\{C, \{C, T\}\}$  cannot be externalized for lack of the Spec of  $\{C, \{C, T\}\}$ . See section 4.1 for the argument that  $\{C, \{C, T\}\}$  has  $\phi$ -features.

- (12) a. Which student does the professor think [will come to the conference]?  
 b. \*Which student does the professor think [that will come to the conference]?

As shown, subject extraction out of the embedded clause is blocked when the complementizer is overt but it is not barred when it is covert. I argue that in (12a), Determinacy (as well as the Spec requirement) is not violated thanks to the derivation (11). In the embedded clause of (12a), (13) is generated:

- (13) [<sub>δ</sub> which student] [{C, {C, T}}] [<sub>vP</sub> t [<sub>v</sub> [ ... ]]]]

In (13), as in (11), the subject *wh*-phrase moves to the embedded Spec,CP (more precisely, the Spec of (10) under my proposal) and there is only one occurrence of it at the phase level (i.e., *who* in the Spec of *vP*) when Internal MERGE applies; recall that (10) is on a par with C as C embeds T, functioning as a phase head. Also, (8) is not violated since T is part of C by MERGE and no empty Spec,TP is created.

Now consider (12b). The example is ill-formed because (8) is violated. I argue that in (12b), (10) cannot be created in the embedded clause, which is indicated by the overt complementizer. Mizuguchi (2018, 2019b) proposes that overt complementizers are realizations of C while covert or zero complementizers are those of (10). Consider (14):

- (14) a.  $C \rightarrow \textit{that}$   
 b.  $\{C, \{C, T\}\} \rightarrow \emptyset$

One argument for this comes from Verb Second (V2) in German and *wh*-movement in Belfast English. Consider (15) and (16):

- (15) a. Er sagt, [daß die Kinder diesen Film gesehen **haben**].  
 he says that the children this film seen have  
 ‘He says that the children saw this film.’  
 b. \*Er sagt, [daß die Kinder **haben** diesen Film gesehen].  
 cf. c. Er sagt, [die Kinder **haben** diesen Film gesehen]. (Vikner 1995)

- (16) a. Who did John claim [that he saw]?  
 b. Who did John claim [did he see]?  
 c. \*Who did John claim [that did he see]? (Henry 1995)

These examples show that head movement is blocked when the complementizer is overt. Suppose that head movement creates (9b) through movement of  $\beta$  (cf. Chomsky 2015):

- (17) Head movement  
 [ $\{\alpha, \{\alpha, \beta\}\}$ ] [ ... [ ...  $t_\beta$  ... ]]]

Assuming (14), the fact that head movement and overt complementizers are in complementary distribution will straightforwardly follow: when overt complementizers are realized, (17), which is behind head movement and produces (9b), does not occur in the derivation. With (14) in place, it follows that in (12b), C and T are merged as independent heads in the embedded clause:

- (18) a.  $[_{CP} \text{ } \underbrace{\text{ } [C [_{TP} T [_{vP} \text{which student} ] [v [ \dots ] ] ] ]}] ]]$   
 b.  $[_{CP} \text{which student} [C [_{TP} T [_{vP} t [v [ \dots ] ] ] ] ] ] \rightarrow *(8)$

In (18), since phase-based Determinacy requires the *wh*-phrase to move at the phase level, Spec,TP will not be created. Under the proposed Determinacy, the *that*-trace effect is due to a violation of the Spec requirement in (8).

Notice that (12a), just like (5) and (12b), will be ruled out in violation of Determinacy under Chomsky (2019a) and Chomsky et al. (2019). Moreover, details put aside in this paper, unlike Goto and Ishii's analysis, the analysis proposed in this paper requires no other assumptions other than MERGE to explain the well-formedness of (12a).

I have argued that the *that*-trace effect is ill-formed as it violates the Spec requirement under the proposed Determinacy. This analysis is empirically endorsed by (19) through (21). Consider the following examples:

- (19) ?Ver hot er moyre [ az [es [vet t kumen]]]? Yiddish  
 who has he fear that Expl will come  
 'Who does he fear will come?' (Diesing 1990)
- (20) Quelles filles crois-tu [qui [vont t acheter ce livre-la]]? French  
 which girls think-you that will buy that book-there  
 'Which girls do you think will buy that book there?' (Taraldsen 2002)
- (21) Hvem tror du, [ at [der [har gjort det]]]? Danish  
 who think you that there has done it  
 'Who do you think has done it?' (Engdahl 1986)

In these examples, ill-formedness is not observed even though the overt complementizer appears in the embedded clause. If the ill-formedness of (12b) is due to a violation of the Spec requirement as I have argued, then it is predicted that the *that*-trace effect will not appear when the requirement is satisfied. In (19) through (21), the movement proceeds as illustrated in (18), respecting Determinacy and at the same time, the Spec requirement is satisfied by the expletive merged as Spec,TP. Notice that the expletive merger can take place as External MERGE at the non-phase level (Bošković 2002). As shown in (22), French *qui* results from the complementizer *que* fused with the expletive upon externalization:

- (22) *qui* = *que* + the expletive *i* (Taraldsen 2002)

As expected, if the expletive is not merged, the examples, just like (12b), will be ill-formed in violation of (8). This is borne out by (23) through (25). Consider the following:

- (23) \*Ver hot er moyre [ az [vet t kumen]]? Yiddish  
 Who has he fear that will come
- (24) \*Quelles filles crois-tu [que [vont t acheter ce livre-la]]? French  
 which girls think-you that will buy that book-there

- (25) \*Hvem tror du [ at [ ofte tager til Paris]]? Danish  
 who think you that often goes to Paris  
 ‘Who do you think often goes to Paris?’ (Vikner 1995)

In summary, I have proposed phase-based Determinacy, arguing that the proposal is free from theoretical and empirical problems discussed in section 2.

#### 4. Consequences

In this section, I discuss two consequences of the proposed Determinacy: anti-locality and successive cyclic movement.

##### 4.1. Anti-locality

The first consequence is that the proposed phase-based Determinacy can derive Spec-to-Spec anti-locality. It has been argued in the literature with various languages that subject movement to Spec,CP cannot proceed via Spec,TP (Bošković 2016, Erlewine 2016, Legate 2011, Ouali 2008 among others):

- (26) \*[<sub>CP</sub> subject [C [<sub>TP</sub> t [T ... [<sub>VP</sub> t ... ]]]]]

One argument for this comes from Kinande given in (27). In this language, subject movement to Spec,CP and subject movement to Spec,TP show distinct agreement patterns. If the operator subject targets Spec,TP and movement to Spec,CP is via Spec,TP, then it is unclear why the two types of movement show different properties. Likewise, in (28), in Kacchikel, Agent Focus (AF) appears on the verb when the subject moves to Spec,CP while a distinct morphology appears on the verb when it moves to Spec,TP. Consider (27) and (28):

- (27) a. iyondi yo u-langira / \*a-langira Marya. Kinande  
 who that ANTI.AGR-saw / AGR-saw Mary  
 ‘Who saw Mary?’  
 b. Kambale a-langira Marya.  
 Kambale AGR-saw Mary  
 ‘Kimbale saw Mary.’ (Schneider-Zioga 2007)
- (28) a. Achike x-ø-u-tj-ö / \*x-ø-u-těj ri wäy? Kacchikel  
 who COM-B3.SG-eat-AF / COM-B3.SG-A3.SG-eat the tortilla  
 ‘Who ate the tortilla?’  
 b. Iwir x-ø-u-těj ri wäy ri a Juan.  
 yesterday COM-B3.SG-A3.SG-eat the tortilla Juan  
 ‘Yesterday Juan ate the tortilla.’ (Erlewine 2016)

A reasonable conclusion that can be drawn from these data is that the subject does not stop over Spec,TP on its way to Spec,CP.

The anti-locality or the ban on Spec,TP-to-Spec,CP movement follows from the proposed Determinacy. As far as syntax is deterministic by nature, the derivation illustrated in (26) is impossible from the beginning since it is the very indeterministic situation that syntax is

designed *not* to generate; movement takes place only at the phase level and the subject can move to the Spec,CP position (or the Spec of (10)) without stopping over any other positions, including Spec,TP. Spec,TP-to-Spec,CP anti-locality is explained as one consequence of the proposed Determinacy.

The deduction of Spec,TP-to-Spec,CP anti-locality under the proposed Determinacy, however, may raise a question of how examples like (29) are explained. Consider the following examples:

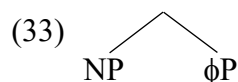
- (29) a. Who appears to himself to be intelligent?  
 b. Who seems to his mother to be intelligent?
- (30) a. The student appears to himself to be intelligent.  
 b. Every boy seems to his mother to be intelligent.
- (31) a. \*Who does it seem to himself that the professor admired?  
 b. ?\*Who does his mother love?

As shown in (29) and (30), subject *wh*-movement does show A-movement properties, just like subject raising to Spec,TP. Compare (30) with (31). In (29a), just as in (30a), the subject *wh*-phrase, when moved, can bind the reflexive in the higher clause and in (29b), just as in (30b), subject *wh*-movement does not induce weak crossover effects. The examples in (29) and (30) argue that subject *wh*-movement and subject raising show the same properties, suggesting that the subject *wh*-phrase moves to the same position or Spec,TP.

A-movement properties in (29) will follow without any problems. I argue that Spec,TP is irrelevant to A-properties. It has been argued in the literature that  $\phi$ -features play a key role in defining A-positions (e.g., Chomsky 2007, Obata and Epstein 2011, van Urk 2015). Building on arguments in the literature, especially van Urk (2015), Mizuguchi (2018, 2019a,b) proposes (32):

- (32) The NP is in an A-position if it is merged with an SO headed by a head bearing  $\phi$ -features; otherwise, it is in an A'-position.

This says that the NP is in an A-position or is interpreted as having A-properties when as shown in (33), it is merged with  $\phi$ P.



Given (32), subject *wh*-movement is to an A-position. Recall that in (29), the Spec requirement on T is solved by (10) and the derivation goes as illustrated in (11). In (11),  $\phi$ -features on C will not be inherited and C keeps the features. Recall that T is embedded under C in (10) and that it does not stand as an independent head; in other words, T is part of C. Since (10) is on a par with C, given (32), which is independently motivated, the Spec of (10) is an A-position and A-movement properties in (29) are explained without any problems. Under the proposed analysis, the Spec of (10) is a mixed position (Diesing 1990, Torrego 1984, Uriagereka 1988, van Urk 2015 for relevant discussion): (10), which is equivalent to C, bears  $\phi$  for under-inheritance in addition to other properties of C.



## 4.2. Successive cyclic movement

The second consequence is that no superfluous successive cyclic movement is allowed; that is, it occurs only at the phase level. The deterministic syntax predicts that successive cyclic movement is to a phase edge and does not take place at the non-phase level since it creates indeterministic situations like (4b) and (6b); if the movement applies at the phase level, such situations will not emerge thanks to cyclic Transfer, which renders lower occurrences invisible and warrants Determinacy. The prediction is supported by (34).

- (34) a. \*[Which picture of himself] did Mary seem to John [to like t]?  
 cf. b. [Which picture of himself] did it seem to John [that Mary liked t]? (Abels 2003)

In (34a), *himself* cannot be bound by *John*. It has been argued that the raising infinitive is non-phasal (Chomsky 1986, Mizuguchi 2017 and Takahashi 2010). In (34a), phase impenetrability via cyclic Transfer does not arise in the absence of phases and the *wh*-phrase moves in a single leap to Spec,CP given the proposed Determinacy. Successive cyclic movement, which creates (35) for (34a) and allows *John* to bind *himself*, will be ruled out:

- (35) ... [seem to *John* [[which picture of *himself*] [Mary [to like t]]]]

In (34b), on the other hand, an indeterministic situation will not arise thanks to cyclic Transfer at the phase level: as shown in (36), a lower occurrence of the *wh*-phrase becomes invisible through Transfer:<sup>4</sup>

- (36) ... [seem to *John* [[which picture of *himself*] [that [Mary liked t]]]]

This consequence from the proposed Determinacy leads to a more general argument that X-YP structure is preferred in language. For instance, Bošković (2019) argues for (37), citing Dadan (2019) as one of the arguments for his claim:

- (37) Maximize Asymmetric Relations (MAR)

According to Bošković, MAR suggests that Specs or XP-YP should be avoided as much as possible; that is, successive cyclic movement should not be free but occurs only when it is forced by phase impenetrability, proceeding only through phase edges. This is exactly what the proposed Determinacy explains: unless movement takes place at the phase level where cyclic Transfer occurs, indeterministic situations will emerge; cyclic Transfer warrants Determinacy in rule application by rendering a portion of the derivation invisible.

In this section, I have discussed two consequences of proposed Determinacy. These consequences are theoretically and empirically upheld.

<sup>4</sup> The discussion here predicts that A-movement will be successive cyclic if phase boundaries intervene in the path of the movement. This is in fact correct. See Mizuguchi (2019a) for relevant discussion. See also Bošković (2002) for evidence for successive cyclic A-movement.

## 5. Conclusion

In this paper, I have claimed that Determinacy follows as a consequence of phase, proposing phase-based Determinacy: with phase-based computation in place, indeterministic situations like (4b) and (6b) will never emerge in syntax. The discussion here argues that phase contributes to computational efficiency not only by being a locus of unvalued features (Chomsky 2008, 2019b) but also by wiping out ambiguous situations for subsequent rule application. The present paper thereby endorses the hypothesis that the Faculty of Language is optimally designed, with UG working in accord with efficiency principles.

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