# A Dual-Structure Analysis of Coordination


## ABSTRACT

The Coordinate Structure Constraint (CSC) (Ross 1967) blocks extraction of conjuncts unless applied in an Across-The-Board (ATB) fashion. However, non-ATB exceptions to the CSC have been identified (Goldsmith 1985; Lakoff 1986). Taking temporal dependency between two conjuncts as its central analytical parameter, this paper proposes a dual-structure analysis of coordination which structurally explains the CSC and its systematic exceptions by positing two different underlying structures for CSC-regular and CSC-exceptional coordination. Specifically, it is argued that conjuncts in CSC-regular coordinate structures float in separate dimensional planes, connected equidistant to the conjunction *and*, while conjuncts in CSC-exceptional coordinate structures are merged into the tree on the same dimensional plane so that they are base-generated in specifier and complement positions of the conjunctive head. The paper supports this dual-structure hypothesis of coordination on various empirical grounds including number agreement, *one/do so* replacement, and the licit sequence of conjuncts.



## KEYWORDS

coordination, coordinate structure constraint, dual-structure hypothesis, multi-dimensional plane, adjunct

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### 1. INTRODUCTION

Ross (1967) famously formulated the Coordinate Structure Constraint (henceforth CSC), which states that "in a coordinate structure, no conjunct may be moved, nor may any element contained in a conjunct be moved out of that conjunct" (pp.98-99). This constraint is illustrated in (1), with (1b) being an example of unacceptable *wh*-movement of one conjunct and (1c) being an example of unacceptable *wh*-movement of an element contained within one conjunct. This constraint is lifted only when extraction out of conjuncts is applied in an Across-The-Board (henceforth ATB) fashion, as illustrated in (1d).

(1) a. Which surgeon$_i$ did Kim date (friends of) $t_i$?

b. *Which surgeon$_i$ did Kim date $t_i$ and a lawyer?

c. *Which surgeon$_i$ did Kim date friends of $t_i$ and a lawyer?

d. Which surgeon$_i$ did Kim date friends of $t_i$ and enemies of $t_i$?

(Ross 1967, as cited in Progovac (1998:5))

However, Goldsmith (1985) and Lakoff (1986) have since then identified systematic exceptions to the CSC that do not involve ATB extraction. These exceptions can generally be classified into three semantically defined categories: temporal coordination, causal coordination, and adversative coordination. While a semantic explanation for these exceptions, which generally invokes temporal-causal relations, has been suggested by seminal works by Goldsmith (1985) and Lakoff (1986), no principled structural account has been proposed to explain the specific exemption of the CSC on these and only these coordinate structures. Against this backdrop, this paper proposes that CSC-regular coordinate structures and CSC-exceptional

coordinate structures have two different underlying structures, thus explaining the observed exemption of the CSC on the latter. More specifically, we propose that, in the structure for CSC-regular coordination, conjuncts float in separate dimensional planes and are connected equidistant to the conjunction *and* while, in the structure for CSC-exceptional coordination, conjuncts are merged into the tree on one and the same dimensional plane, in specifier and complement positions of the conjunction head. This dual-structure analysis of coordination provides a syntactic explanation of the difference between CSC-regular and CSC-exceptional coordinate structures that goes beyond purely semantic descriptions, enabling us to understand, in structural terms, why certain instances of coordination form exceptions to the CSC.

This paper is organized as follows: in section two, the empirical data that comprise the range of CSC-exceptional coordinate structures are presented and discussed. Section three proposes a dual-structure analysis of coordination, followed by the presentation of three pieces of empirical evidence for this analysis in section four. The case for the dual-structure analysis of coordination is further strengthened in section five by the discussion of parallel effects observed in adjuncts in the area of *one/do so* replacement. Finally, section six briefly addresses a remaining issue for our analysis related to selection and linear order. Section seven concludes.

## 2. Exceptions to the Coordinate Structure Constraint

Contrary to the predictions of Ross's (1967) CSC, Goldsmith (1985) and Lakoff (1986) have identified examples of coordinate structures in which only one conjunct, or an element contained within a conjunct, is grammatically extracted out of its original position. These exceptions to the CSC that do not involve ATB extraction can be grouped into three categories: temporal coordination, causal coordination, and adversative coordination.

Temporal coordination involves the conjoining of two events that occur one immediately after the other, such that both events happen in close temporal proximity to each other. This is illustrated in (2).

(2) a. What$_i$ did Harry go to the store and buy $t_i$?

b. Sam$_i$ is not the sort of guy you can just sit there and listen to $t_i$.

(Lakoff 1986:152-153)

In (2a), the event in which Harry bought something takes place immediately right after the event in which Harry went to the store. Similarly, in (2b), the event *listening to Sam* is immediately preceded by the event *sitting there*.

Causal coordination refers to the conjoining of two events that share a cause-and-effect relationship, such that the occurrence of the first event results in the occurrence of the second event. This is illustrated in (3).

(3) a. That's the news$_i$ that the child heard $t_i$ and broke down in tears.

(Goldsmith 1985:135)

b. That's the kind of firecracker$_i$ that I set off $t_i$ and scared the neighbors.

(Lakoff 1986:156)

In (3a), the first event *the child heard the news* causes the second event *the child broke down in tears*. Likewise, the two events in (3b), namely *I set off that firecracker* and *I scared the neighbors*, share a causal relationship.

The third category of exceptions to the CSC, adversative coordination, is the conjoining of two events in which the second event is adversative to the first event, such that

the second event violates “normal conventionalized expectations” implied by the first event (Lakoff 1986:153). Consequently, the conjunction *and* in this third category bears the meaning approximating “despite” or “nonetheless” (Goldsmith 1985), as shown in (4).

(4) a. How much$_i$ can you drink $t_i$ and still stay sober?

(Goldsmith 1985, as cited in Lakoff (1986:152))

b. How many courses$_i$ can we expect our graduate students to teach $t_i$ and finish a dissertation on time? (Goldsmith 1985:133)

As can be observed in (4), the events *staying sober* in (4a) and *finishing a dissertation on time* in (4b) violate the conventional expectations anticipated by the events *drinking much* and *teaching many courses*, respectively.

Crucially, these data themselves seem to be ordinary coordinate structures with no hint of why they should be exempted from the CSC. However, they all share a common feature –that is, there exists between the conjuncts of these coordinate structures some form of temporal-causal relationship. The events conjoined together in each of these CSC-exceptional cases occur either in temporal simultaneity or close temporal proximity with each other, to the extent that the conjoined events may be conceptualized as a single macro-event, rather than two separate, distinct events. The fact that the conjoined events in the CSC-exceptional cases may be regarded as single events can be convincingly observed in (5).

(5) a. What$_i$ did Harry go to the store and buy $t_i$? (=2a)

b. What$_i$ did Harry go to the store to buy $t_i$?

c. How much$_i$ can you drink $t_i$ and still stay sober? (=4a)

d. How much$_i$ can you drink $t_i$ while still staying sober?

(5b) and (5d), which do not contain coordinate structures, describe indisputably singular events. Yet, (5a) and (5c) share essentially the same meanings as (5b) and (5d), respectively, despite the fact that they contain coordinate structures. The semantic equivalence between (5a) and (5b) as well as that between (5c) and (5d) thus demonstrates that the conjuncts of CSC-exceptional cases constitute a single macro-event rather than distinctly separate ones. All else being equal, then, it is plausible to conclude that this semantic feature – the single macro-event interpretation – must be responsible for the special status of these coordinate structures with respect to the CSC.

In fact, recent studies have shown that a parallel phenomenon is observed in adjuncts. It has been commonly assumed that adjuncts prohibit *wh*-movement out of them (Huang 1982). This condition is illustrated in (6), in which the extraction out of the adjunct is prohibited.

(6) *Who$_i$ did Mary cry [after Peter hit $t_i$]? (Stepanov 2007:80)

However, Truswell (2007, 2011) have recently showed that this constraint is lifted when events denoted by the matrix VP and adjuncts share a strong temporal-causal relationship, such that both constitute a single macro-event. More precisely, to capture this semantic characterization of environments under which adjuncts are transparent, Truswell proposes the Single Event Grouping Condition, formulated in (7). This condition, in turn, is exemplified by the data in (8).

(7) *Truswell's (2011:41) Single Event Grouping Condition*:

An instance of *wh*-movement is legitimate only if the minimal constituent containing the head and the foot of the chain can be construed as describing a single event grouping.

(8) a. What$_i$ are you working so hard [in order to achieve $t_i$]?

b. Who$_i$ did John go home [after talking to $t_i$]?

c. What$_i$ did John drive Mary crazy [whistling $t_i$]? (Truswell 2007:5)

(8) demonstrates that *wh*-movement out of adjuncts is permitted when both the matrix VP (i.e., the head of the chain) and the adjunct (i.e., the foot of the chain) co-describe a single macro-event. In (8a), a cause-effect relationship can be observed between the matrix VP *working so hard* and the adjunct *in order to achieve* $t_i$. In (8b), the matrix VP event *go home* and the adjunct event *talking to* $t_i$ occur in close temporal proximity. (8c) provides an example in which the matrix VP event *drive Mary crazy* and the adjunct event *whistling* $t_i$ occur simultaneously. These relations allow us to interpret the matrix VP event and adjunct event as co-describing a single macro-event, thereby fulfilling the Single Event Grouping Condition and allowing *wh*-extraction out of adjunct islands.

The commonality observed above between CSC-exceptional coordinate structures and transparent adjuncts strongly suggests that the constructions exhibit two different manifestations of the unique effects of a condition that is governed by the notion of temporal-dependency, rather than two separate unrelated phenomena. However, while the relevant relationship does seem to correctly demarcate the range of CSC-exceptional coordinate structures actually attested, the level of explanation it provides us with for CSC-exceptions remains semantic and descriptive in nature. In particular, to the best of our knowledge, no satisfactory structural account has yet been successfully proposed in the literature that explains why they evade the CSC the way they do.

## 3. A DUAL-STRUCTURE ANALYSIS OF COORDINATION

The challenge of providing a structural account of CSC-exceptional coordination is, of course, to explain why it is exempted from the very same rule that applies to almost every other instance of coordination in general. Seemingly, no syntactic mechanism exists that is unique to CSC-

exceptional coordinate structures and enables them to evade the CSC. Yet, as the data presented in section two clearly demonstrate, those instances of coordination do indeed form true exceptions to the CSC. This section begins with a discussion of a previous account of CSC-exceptional coordinate structures proposed by Goldsmith (1985) as well as its explanatory limitations due to the fact that it is primarily semantic in nature. A dual-structure analysis of coordination will then be put forward as a structural explanation of CSC and its exceptions.

### 3.1 *Goldsmith's (1985) Account of CSC-Exceptional Coordination*

Focusing on adversative coordination, Goldsmith (1985) asserts that these types of coordinate structures are exempted from the CSC because the conjuncts are semantically competing against each other rather than semantically parallel or symmetrical. According to Goldsmith (1985), the CSC "is a symmetry condition on conjuncts that is induced as a reflection of the symmetric semantics that we normally and typically find when elements are conjoined" (p.139). In adversative coordination, however, conjuncts no longer are semantically symmetrical because they violate the conventional expectations produced by each other. Therefore, since adversative coordination does not reflect symmetric semantics, the symmetric syntax that the CSC typically imposes on coordinate structures does not apply. Goldsmith's position is best summarized in (9):

(9) *Goldsmith (1985) on Adversative Coordination as Exception to the CSC:*

> "Thus the Coordinate Structure Constraint, it appears, is one that requires syntactic parallelism just in case the semantics also presents its own semantic parallelism, at least within reasonable limits. When those reasonable limits are transgressed, and syntactic coordination is used in a context when the semantics is highly asymmetrical, then no Coordinate Structure [Constraint] effect is to be found." (Goldsmith 1985:138)

Let us now consider how (9) makes sense of the CSC-exception case shown in (4a), repeated here as (10).

(10) How much$_i$ can you drink $t_i$ and still stay sober? (=4a)

In (10), the conjuncts *drink* and *still stay sober* violate the semantic parallelism in the sense of (9) since the truth of each conjunct diminishes the likelihood of the other conjunct. According to Goldsmith's (1985) analysis, then, the semantic asymmetry observed in (10) means that there is no syntactic symmetry induced upon it and, therefore, no CSC effect observed on it.

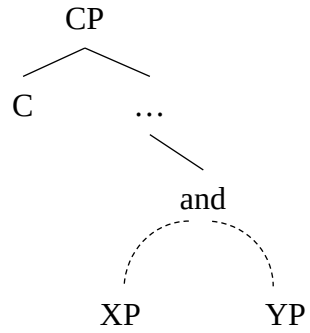
Such a semantic account, however, is unsatisfactory as it merely describes a characteristic semantic feature of CSC-exceptional coordination – namely, that it is semantically asymmetrical - rather than explain the syntactic mechanisms that exempt these coordinate structures from the CSC. It also assumes that the CSC is a symmetry condition that is triggered by a particular semantic condition on conjuncts instead of providing a syntactic account that explains CSC effects structurally. What Goldsmith (1985) reveals is thus limited to the observation that CSC effects do not apply on coordinate structures that are not semantically symmetrical. A structural account of CSC-exceptions is therefore clearly needed.

### 3.2 *A Dual-Structure Account of CSC-Regular and CSC-Exceptional Coordination*

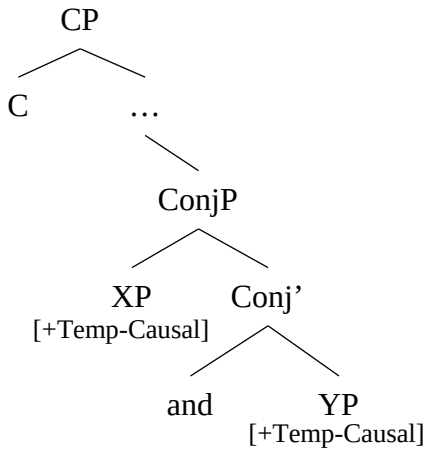
Given that both the restrictive effect of the CSC as well as exceptions to it have been observed and are real, we will argue that two different underlying structures exist for coordination: one for CSC-regular coordinate structures and the other for CSC-exceptional coordinate structures. We will show that the fact that they possess two different underlying structures from each other explains why the CSC, which applies generally to most coordinate structures, is not observed

in CSC-exceptional cases. The two structures we assign to the CSC-regular and CSC-exceptional coordination are shown in (11) and (12), respectively.

(11) *CSC-Regular Structure:*




(12) *CSC-Exceptional Structure:*




(11) represents the structure of CSC-regular coordination. This proposed structure is fundamentally different from standardly postulated asymmetric X-bar structures of coordination (Munn 1993) because it hypothesizes that two conjuncts – XP and YP – are merged into the tree on hierarchically equal, but separate floating dimensional planes, as represented visually by the use of dotted lines in (11), and symmetrically connected to the conjunction *and*. The reason why we suggest that the two conjuncts here are in two separate dimensional planes is because they crucially do not share the matching [+temporal-causal] feature which triggers event restructuring which has the effect of collapsing the two conjuncts into one dimensional plane, unlike the conjuncts in the CSC-exceptional structure illustrated in (12), which will be explained later.

Significantly, the CSC-regular structure in (11) enables us to explain the standard effects of the CSC as well as the etiology behind ATB extraction. As mentioned in the introduction, in CSC-regular coordination, the CSC rules out *wh*-movement of only one

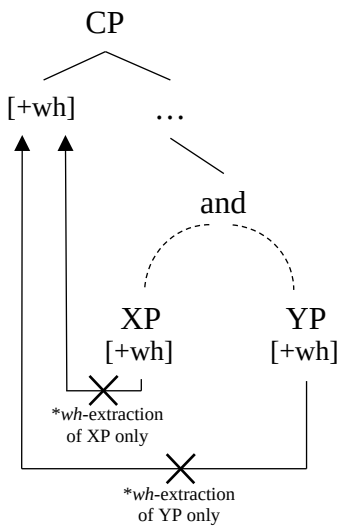
conjunct, as illustrated in (13a). However, *wh*-movement in an ATB fashion, as shown in (13b), is grammatical.

(13) a. *Which surgeon$_i$ did Kim date friends of $t_i$ and a lawyer? (=1c)

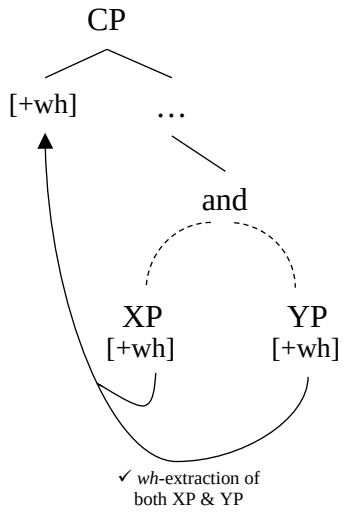
b. Which surgeon$_i$ did Kim date friends of $t_i$ and enemies of $t_i$? (=1d)

How, then, does the CSC-regular structure in (11) explain the pattern in (13)? Notably, the proposed structure in (11) necessarily implies that XP and YP do not precede or asymmetrically c-command each other but rather are floating in separate dimensions equidistant to the interrogative C head. This means that, under general circumstances, syntactic operations must treat both XP and YP equally since they are hierarchically equal. Consequently, extraction operations cannot take place on one conjunct without necessarily affecting the other. During attempted *wh*-movement, the [+wh] feature on the C head probes for a matching [+wh] feature down the tree. Since XP and YP are equidistant to the head, the latter ends up identifying both as equally matching and is required to treat them equally. Extraction from XP without YP or vice versa is thus prohibited, in the manner schematically represented in (14). This explains why there is a constraint such as CSC in natural language syntax. At the same time, ATB extraction is explained by the fact that if the probe extracts from one conjunct, it must extract from the other as well, since both are visible and equidistant to C. This is illustrated in (15).

(14) **Extraction of one conjunct in CSC-Regular Structure:*

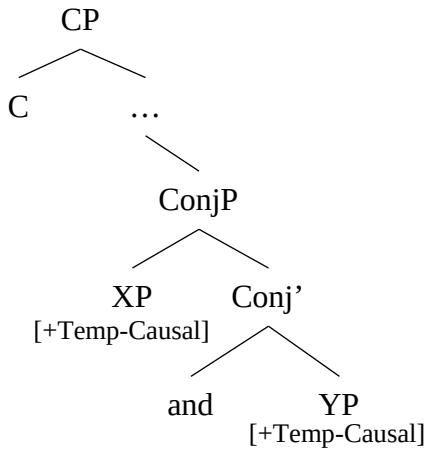



(15) *ATB Extraction in CSC-Regular Structure:*




On the other hand, (12), repeated here as (16), is our hypothesized structure for CSC-exceptional coordination. Despite being the "exceptional" case of coordination, it looks structurally more familiar to us than (11), with *and* serving as the head of the phrase wherein XP and YP occupy specifier and complement positions, respectively.

(16) *CSC-Exceptional Structure*: (=12)



Since the conjuncts in CSC-exceptional coordination share a close temporal-causal relationship with each other, I posit that XP and YP share a matching feature, [+temporal-causal], which denotes this relationship and triggers event restructuring, thus collapsing two events into one macro-event. Structurally, this means that the two conjuncts XP and YP in (16) are merged into the tree on a single dimensional plane, unlike the conjuncts in CSC-regular coordination. Moreover, the semantic interpretation of both conjuncts as constituents of a single macro-event is also reflected structurally by the fact that both conjuncts merge to form one phrase: the ConjP. Since both conjuncts are merged into the tree on the same plane in (16), the ConjP behaves like a normal phrase; no special condition exists that prohibits extraction of one conjunct without the other just as no special condition exists that prohibits extraction of either the specifier or complement of a regular phrase. Therefore, the CSC does not apply to the structure in (16); both XP or YP, or their constituent parts, can be extracted without targeting the other.

## 4. Three Pieces of Evidence for the Dual-Structure Account of Coordination

Admittedly, one may object that positing two different structures for coordination is theoretically undesirable from a minimalist perspective, as it seems to result in greater theoretical complexity and redundancy. However, we have shown in section three that the postulation of two structures for coordination is empirically well-motivated and necessary due to the existence of CSC-exceptional coordination. Only a dual-structure analysis of coordination, we believe, is capable of providing us with a satisfactory syntactic explanation for CSC and ATB effects. In this section, we proceed to present three pieces of independent evidence for this dual-structure analysis of coordination from agreement, *do so* replacement, and the acceptable sequence of conjuncts.

4.1 *Number Agreement under Coordination*

Our first piece of evidence for the dual-structure account of coordination outlined in the previous section comes from singular vs. plural number agreement under coordination. Given our current hypothesis that both conjuncts are merged into a single phrase in the CSC-exceptional coordinate structure due to their nature as co-descriptors of a single event, it is predicted that both conjuncts should be treated as parts of a single entity for the purposes of syntactic computation. In the proposed structure for CSC-regular coordination, on the other hand, the two conjuncts are on separate dimensional planes and thus should both remain visible for syntactic computation and must be treated as two separate entities. Thus, our dual-structure hypothesis of coordination predicts that CSC-exceptional coordinate structures should exhibit singular agreement whereas CSC-regular coordinate structures should exhibit plural agreement. This prediction is borne out by McCloskey's (1991) observation, summarized in (17) and exemplified in (18) and (19).

(17) *McCloskey (1991:564–565) Observation on Number Agreement Under Coordination*

> The semantic condition governing such agreement seems to be that plural agreement is possible just in case the conjoined propositions are contradictory or incompatible, or, more generally, when they specify a plurality of distinct states of affairs or situation-types. When the coordinated clauses denote compatible propositions (that is, when they denote two or more propositions that jointly specify a single complex state of affairs or situation-type), then singular agreement is preferred or required.

(18) a. That the president will be reelected and that he will be impeached *is/are equally likely at this point.

b. That he'll resign and that he'll stay in office *seems/seem at this point equally possible. (McCloskey 1991:564)

(19) a. That UNO will be elected and that sanctions will be lifted is/??are now likely.

b. That the shares are overvalued and a decline is in order is/??are widely believed on Wall St. (McCloskey 1991:565)

(18a) and (18b) are examples of CSC-regular coordinate structures, in which both conjuncts represent events that are distinct and separate. Both sentences exhibit plural agreement, while singular agreement is marked as ill-formed. This is predicted by the structure in (11), since both conjuncts are in separate dimensional planes and need to be treated as separate entities for syntactic computation. This is in contrast with (19a) and (19b), which illustrate CSC-exceptional coordinate structures since both conjuncts together constitute a single event. Notably, singular agreement is preferred to plural agreement here[1]. This once again confirms the prediction made by the proposed structure for CSC-exceptional coordination in (12), in which both conjuncts are merged on the same dimensional plane and form a single constituent. Syntactic computation thus treats both conjuncts as a singular entity in calculating agreement.

The dual-structure account of coordination correctly predicts the contrastive agreement between (18) and (19). Without the positing of two different structures for CSC-regular and CSC-exceptional coordinate structures, it would be unclear to us whether any

[1] Some people may marginally accept plural agreement in (19) simply because there are two conjuncts. However, this does not affect our analysis as singular agreement in (19) is indisputably accepted and even preferred to plural agreement, proving that the two conjuncts in (19) are indeed recognized conceptually as a single macro-event.

satisfactory explanation would be available for the contrast between (18) and (19) that could go beyond a mere description of the semantic conditions under which they take place.

### 4.2 Do So *Replacement under Coordination*

*Do so* replacement provides the second piece of evidence for the existence of two different structures for coordination as proposed in this paper. According to the structure for CSC-regular coordination in (11), both conjuncts need to be treated equally since they are floating in separate dimensions at the same position in the tree, equidistant to all other syntactic objects. Therefore, the CSC-regular structure in (11) predicts that any syntactic relation that holds between a conjunct and another syntactic object outside the coordinate structure must apply in ATB fashion across both conjuncts. The same reason is also behind the ungrammaticality of *wh*-movement out of only one conjunct in CSC-regular coordinate structures. By contrast, since the proposed structure for CSC-exceptional coordination merges conjuncts asymmetrically onto the tree, CSC-exceptional conjuncts need not be treated in an equal manner. The CSC-exceptional structure proposed in this paper thus predicts that syntactic relations can hold between a syntactic object outside the coordinate structure and one conjunct without the other in CSC-exceptional coordinate structures.

Therefore, if the dual-structure account of coordination put forward in this paper is right, then *do so* replacement of only one conjunct is predicted to be grammatical in CSC-exceptional coordinate structures, but ungrammatical in CSC-regular ones. This prediction is validated in (20), (21) and (22).

(20) a. In the holidays, Harry goes to a public pool and swims$_i$; Mary goes to a private one and [does so]$_i$ too.

b. In the holidays, Harry [goes to a public pool and swims]$_i$; Mary [does so]$_i$ too.

c. *In the holidays, Harry swims and jogs$_i$; Mary dances and [does so]$_i$ too.

d. In the holidays, Harry [swims and jogs]$_i$; Mary [does so]$_i$ too.

(21) a. His son heard the news and [broke down in tears]$_i$; his daughter guessed it and [did so]$_i$ too.

b. His son [heard the news and broke down in tears]$_i$; his daughter [did so]$_i$ too.

c. *His son watched the news and [had dinner]$_i$; his daughter read the newspaper and [did so]$_i$ too.

d. His son [watched the news and had dinner]$_i$; his daughter [did so]$_i$ too.

(22) a. He drank three glasses of wine and [still walked straight]$_i$; I drank four and managed to [do so]$_i$ too.

b. He [drank three glasses of wine and still walked straight]$_i$; I managed to [do so]$_i$ too.

c. *He drank three glasses of wine last night and [ate five chicken wings]$_i$ this morning; I drank a cup of tea last night and [did so]$_i$ this morning too.

d. He [drank three glasses of wine last night and ate five chicken wings]$_i$ this morning; I [did so]$_i$ this morning too.

In (20a), (21a), and (22a), which features CSC-exceptional coordinate structures, *do so* replacement of only the second conjunct is grammatical. For example, *does so* in (20a) replaces only the second conjunct *swims* without also replacing the first conjunct *goes to a public pool*. The permissibility for *do so* to take only one conjunct as its antecedent in (20a) is consistent with the asymmetrical structure postulated for two conjuncts in the CSC-exceptional case. In contrast, in (20c), (21c), and (22c), which features CSC-regular coordinate structures, *do so*

replacement of only the second conjunct results in ungrammaticality. This is seen, for instance, in the ill-formedness of (20c), in which *does so* replaces only the second conjunct *jogs*. In order to prove that no other reasons are responsible for the ungrammaticality of (20c), (20d) is included here to demonstrate that *do so* replacement of the entire coordinate structure *swims and jogs* is non-problematic. The fact that *do so* replacement cannot occur only for one conjunct without the other in CSC-regular coordinate structures, therefore, supports the symmetricity of conjuncts in the CSC-regular structure.

In sum, the dual-structure account of coordination is necessary to explain why *do so* replacement of one conjunct is grammatical only for CSC-exceptional cases, but not for CSC-regular cases. Without acknowledging the existence of two different structures for CSC-exceptional coordination and CSC-regular coordination, this contrast would remain mysterious.

### 4.3 *Sequence of Conjuncts under Coordination*

Our third and final piece of evidence for the dual-structure theory of coordination comes from the variability of the sequence of conjuncts in coordinate structures. Since the CSC-regular structure asserts that conjuncts are floating in different dimensions with no fixed order between them, it naturally follows that the sequence of the conjuncts should be variable. However, in the CSC-exceptional structure, conjuncts are merged into the tree asymmetrically with one of them preceding and asymmetrically c-commanding the other. It follows then that, in CSC-exceptional coordination, the sequence of conjuncts should be fixed and invariant. In (23), (24) and (25), these two predictions are confirmed.

(23) *Temporal Coordination:*

a. Harry went to the store today and bought apples yesterday.

b. Harry bought apples yesterday and went to the store today.

c. What$_i$ did Harry go to the store and buy $t_i$?

d. *What$_i$ did Harry buy $t_i$ and go to the store?

(24) *Causal Coordination:*

a. The child listened to music at times and broke down in tears at other times.

b. The child broke down in tears at times and listened to music at other times.

c. That's the news$_i$ that the child heard $t_i$ and broke down in tears.

d. *That's the news$_i$ that the child broke down in tears and heard $t_i$.

(25) *Adversative Coordination:*

a. We expect our students to take twenty courses in total and stay in hall at least once by the time they graduate.

b. We expect our students to stay in hall at least once and take twenty courses in total by the time they graduate.

c. How many courses$_i$ can you expect our students to take $t_i$ and stay sane?

d. *How many courses$_i$ can you expect our students to stay sane and take $t_i$?

(23a, b), (24a, b), and (25a, b) show that the sequence of conjuncts in CSC-regular coordinate structures can indeed be exchanged. On the other hand, (23c, d), (24c, d), and (25c, d) demonstrate that conjuncts in CSC-exceptional coordinate structures follow a fixed invariant sequence that reflects the logic of the temporal-causal relationship between them. Exchanging the positions of the conjuncts for each other's will render the sentence ill-formed.

The fact that CSC-regular and CSC-exceptional coordinate structures impose different requirements on the sequence of conjuncts support our hypothesis that they have two different structures. In particular, the freedom of the relative order between two conjuncts in CSC-

regular coordinate structures provides compelling evidence for the analysis that conjuncts in CSC-regular coordination are floating in separate dimensional planes, while the invariant sequence of conjuncts in CSC-exceptional cases suggest that their relative position is structurally fixed within one dimensional coordinate structure configuration.

## 5. PARALLEL EFFECTS OBSERVED IN ADJUNCTS: *ONE/DO SO* REPLACEMENT

In spite of the evidence presented in the previous section for the dual-structure analysis of coordination, the proposal that CSC-regular coordinate structures involve conjuncts that are attached to the tree in separate floating dimensional planes may still strike some as too radical a notion. Indeed, if such a structure appears to be an isolated phenomenon that applies only to certain specific types of coordination, one's skepticism about its psychological plausibility is justified. However, if structures that involve multiple attached floating dimensional planes can be convincingly demonstrated to exist in other types of constructions, the case for the validity of the CSC-regular structure will be further strengthened.

A natural place to seek evidence for such a floating multi-dimensional structure is in adjuncts, since it has been observed earlier in section two that extraction possibilities for adjuncts are also calculated by the same temporal-causal relations which characterize that of the CSC-exceptional coordinate structures. Indeed, a convincing parallel does exist in adjuncts insofar as *do so* replacement and *one* replacement of discontinuous syntactic constituents involving adjuncts suggest that adjuncts may also be attached to the head that they modify in separate floating dimensional planes, much as conjuncts do in CSC-regular coordinate structures.

In order to understand how the structure of adjuncts serves as evidence for a floating multi-dimensional structure, some background on one of the latest approaches to adjuncts is necessary. Hornstein and Nunes (2008) (henceforth H&N) have proposed a label-less theory of adjuncts. Working on the assumption that the *Merge* operation consists of two sub-processes –

concatenation and labeling (Hornstein 2009), H&N (2008) argue that adjuncts are special in that their introduction into the structure requires only concatenation, but not labeling, unlike arguments which need to be both concatenated and labeled. Since only labeled syntactic objects can be accessed for further concatenation, the implication of this theory is that adjuncts may remain invisible to further computations, even though they participate in semantic interpretation; in essence, then, adjuncts are considered as dangling off the syntactic workspace".

This label-less theory of adjuncts is schematically depicted in the skeletal semantic representation shown in (26b) for the sentence (26a), which contains three adjunct PPs.

(26) a. John ate the cake in the yard with a fork in the afternoon.

b. [$_V$ ate ^ the-cake] ^ in-the-afternoon]
^ in-the-yard
^ with-a-fork (H&N 2008:67)

H&N's dangling theory of adjuncts is well-served to explain the otherwise puzzling phenomenon where *do so/one* replacement seemingly targets discontinuous syntactic constituents, as illustrated in (27) and (28), respectively.

(27) a. John [ate the cake]$_i$ in the yard with a fork [in the afternoon]$_i$, but Bill [did so]$_i$ in the kitchen, with a spoon. (H&N 2008:74)

b. Robin [slept]$_i$ for twelve hours [in the bunk bed]$_i$, and Leslie [did so]$_i$ for eight hours.
(Culicover and Jackendoff 2005:455)

(28) a. Jane has a [big]$_i$ black [dog]$_i$ and Jean has a brown one$_i$. (Radford 1988:221)

b. I like that silly [picture of Robin]$_i$ from Mary [that is on the table]$_i$ and this artful one$_i$ from Susan. (Culicover and Jackendoff 2005:137)

In (27) and (28), *do so* and *one* replace discontinuous syntactic constituents involving adjuncts. In (27a), *did so* replaces *ate the cake in the afternoon* to the exclusion of the two intervening PP adjuncts *in the yard* and *with a fork*. Similarly, in (27b), *did so* replaces *slept in the bunk bed* to the exclusion of the durative adjunct *for twelve hours*. Likewise, the anaphoric *one* in (28a) takes *big dog* as its linguistic antecedent, leaving out the intervening adjunct *black*, while *one* in (28b) takes *picture of Robin that is on the table* as its linguistic antecedent, leaving out the intervening adjunct *from Mary*.

This apparently discontinuous *do so/one* replacement phenomenon is elegantly explained by H&N's label-less theory of adjuncts, since adjuncts only require concatenation with the head. When *do so* replacement or *one* replacement applies to what appears to be a "discontinuous" constituent, it actually targets the verbal/nominal head plus any number of adjuncts which do not need to be labeled but just concatenated with the head, in the manner depicted in (26b). In other words, the "intervening" adjuncts in (27–28) are merely concatenated in the syntactic workspace with the desirable result that they are invisible for core syntactic computations, but nonetheless can participate in semantic interpretations.

The fact that multiple adjuncts can all be directly concatenated with the head they modify under this analysis presupposes that adjuncts may exist structurally on separate dimensional planes equidistant to the head that they are attached to. This explains why the target head of *do so*/*one* replacement can form atomic concatenates with any adjunct attached to it, to the exclusion of some other intervening adjuncts, even if they appear on the surface to be discontinuous syntactic constituents. It is crucial to note that this result forms a close parallel with CSC-regular coordinate structures, in which conjuncts exists in separate floating

dimensional planes and are all attached equidistant to *and*, with no underlying order among them. Unlike in CSC-regular coordination, however, adjuncts need not all be treated equally when it comes to *do so* replacement if the target head forms an atomic concatenate with an adjunct to the exclusion of others. The formation of an atomic concatenate between a head and an adjunct pulls that particular adjunct closer to the head relative to other adjuncts such that *do so/one* replacement can target only that adjunct along with the head, without including other adjuncts.

Therefore, *do so/one* replacement of apparently discontinuous syntactic constituents lend independent support to the idea that adjuncts seem to exist in separate floating dimensional planes that are attached equidistant to the head they modify. This lends further credibility to the structure proposed for CSC-regular coordination by this paper, since the notion of separate, but hierarchically equal, floating dimensional planes finds parallel expression in adjuncts, rather than remain as a phenomenon isolated to a certain group of coordinate structures.

## 6. A Remaining Question: Selection and Linear Order

We believe that the three pieces of evidence presented in section four as well as the support from adjuncts discussed in section five cumulatively build a compelling case for the dual-structure analysis proposed in this paper. However, there is one residual issue which remains to be resolved. In this section, we wish to outline our tentative solution to this issue.

Recall that the CSC-regular structure in (11) posits that conjuncts in CSC-regular coordinate structures are symmetrical in hierarchy since both float in separate dimensional planes equidistant to *and*. This symmetry is evident from the fact that neither conjunct asymmetrically c-command the other. However, Zhang (2009) has observed that there appears to be an *asymmetric* pattern between two conjuncts when it comes to satisfying the categorial requirements imposed on the entire coordinate structure by the head that merges with it. The

issue in essence is that only the first conjunct needs to satisfy such selectional requirements. This asymmetric in selection and linear order in regular coordination is illustrated in (29).

(29) a. You can depend *on* [$_{DP}$ my assistant] and [$_{CP}$ that he will be on time].

b. We talked *about* [$_{DP}$ Mr. Golson's many qualifications] and [$_{CP}$ that he had worked at the White House].

(Zhang 2009:50-51)

In (29a) and (29b), coordinate structures are merged to the prepositions *on* and *about* respectively. In both sentences, the prepositions select DPs as complements, imposing C-selection requirements upon the coordinate structures merged to them – they need to be DPs. Notably, however, it is only the first conjuncts in both sentences – *my assistant* and *Mr. Golson's many qualifications* – that actually satisfies the c-selection requirements of the preposition heads in (29a) and (29b). The second conjuncts, seemingly CPs, are allowed to ignore the categorial requirements imposed on the coordinate structures. This consideration suggests that conjuncts are asymmetrical in regular coordinate configurations, apparently contradicting the symmetrical nature of two conjuncts implied by the proposed CSC-regular structure in (11).

One possible way to reconcile this set of data with the analysis proposed in this paper is to interpret the second conjuncts in (29) as DPs rather than CPs, by assuming, for example, that "that he will be on time" is really "the fact that he will be on time" but has undergone some process of ellipsis. Consequently, both conjuncts can be analyzed as satisfying the C-selectional requirements imposed on the entire coordinate structure, maintaining their syntactic symmetry. We will leave a more in-depth investigation of this direction for another occasion.

## 7. CONCLUSION

This paper has argued for a dual-structure analysis of coordination in which CSC-regular and CSC-exceptional coordinate structures have different underlying syntactic structures. More specifically, in CSC-regular coordinate structures, since conjuncts do not share temporal-causal relations with each other, they exist on separate floating dimensional planes and are attached equidistant to *and*. In contrast, CSC-exceptional coordinate structures follow the familiar X-bar ConjP structure in which conjuncts are merged into the tree as specifier and complement due to their matching [+Temp-Causal] feature, which triggers event restructuring and collapses them into a single dimensional plane. This dual-structure analysis explains in syntactic terms both the mechanism of the CSC as well as the reason for its inapplicability on coordinate structures that form a single macro-event. Evidence has also been provided for this analysis from agreement, *do so* replacement and sequence of conjuncts. Furthermore, we have argued that the empirical plausibility of the floating multi-dimensional structure for CSC-regular coordination is also independently supported by parallel effects observed with adjuncts in the area of "discontinuous" *one/do so* replacement. This dual-structure analysis of coordination provides us with a syntactic account of the CSC and its exceptions, enabling us to move beyond a mere description of their semantic characteristics originally discovered by Goldsmith (1985) and Lakoff (1986).

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