A Dual-Structure Analysis of Coordination*

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Abstract

The Coordinate Structure Constraint (CSC) (Ross 1967) blocks extraction of conjuncts unless it is applied in an across-the-board (ATB) fashion. However, non-ATB exceptions to the CSC have been identified (Goldsmith 1985; Lakoff 1986). Following Kitada's (2008) Merge-based theory of coordination, this paper takes inherent temporal-causal dependencies between two conjuncts as its central analytical parameter and proposes a dual-structure analysis of coordination which structurally explains the etiology of the CSC and its systematic exceptions by means of two different independently motivated 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 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 analysis of coordination on various empirical grounds, including number agreement, *do so*-replacement, and the licit sequence of conjuncts.

Keywords: coordination, coordinate structure constraint, dual-structure analysis, multi-dimensional plane, adjunct, temporal-causal dependency

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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.161). 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?

(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 delineated categories: temporal coordination, causal coordination and adversative coordination. While a semantic explanation for these exceptions, which generally invokes temporal-causal relations between multiple conjuncts, has been suggested by seminal works by Goldsmith and Lakoff, no principled structural account has been proposed to explain the specific exemption of the CSC on these and only these coordinate structures.

Against this background, this paper proposes, following Kitada's (2008) Merge-based theory of coordination, that CSC-regular and CSC-exceptional coordinate structures have two different underlying derivations, thus explaining the observed exemption of the CSC in the latter. More specifically, it is proposed that, in the structure for

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CSC-regular coordination, conjuncts float in separate dimensional planes and are connected equidistant to the conjunction *and* (Chomsky 1982; Goodall 1987; Moltmann 1992) while, in the structure for CSC-exceptional coordination, conjuncts are merged on one and the same dimensional plane, in specifier and complement positions of the conjunctive head (Munn 1993; Kayne 1994; Zoerner 1995; Johannessen 1998). This dual-structure analysis of coordination provides a syntactic explanation for 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 principled exceptions to the CSC.

This paper is organized as follows. In section 2, the empirical data that comprise the range of CSC-exceptional coordinate structures are presented and discussed. Section 3 proposes a dual-structure analysis of coordination, followed in section 4 by presentation of three pieces of evidence for this analysis. The case for the dual-structure analysis of coordination is further strengthened in section 5 by discussion of parallel effects observed with adjuncts in the area of *one-/do so*-replacement. Section 6 briefly addresses a remaining issue for our analysis related to selection and linear order. Section 7 is the conclusion of this paper.

2.   Systematic Exceptions to the CSC

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. We will briefly go through these categories below.

Firstly, temporal coordination involves 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).

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(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 is construed as taking place immediately after the event in which he went to the store. Similarly, in (2b), the event of your listening to Sam is immediately preceded by the event of your sitting there.

Secondly, causal coordination refers to conjoining of two events that share a cause-and-effect relation such that the occurrence of one event results in the occurrence of the other 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 in which the child heard the news causes the second event in which he/she broke down in tears. Likewise, the two events in (3b), namely, I set off that firecracker and I scared the neighbors, share a cause-and-effect relationship.

Finally, adversative coordination is conjoining of two events in which the second event is adversative to the first event in such a way that the former violates "normal conventionalized expectations" implied by the latter (Lakoff (1986: 153)). As such, the conjunction *and* in this third category bears meanings 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: 213))

    b. How many courses$_i$ can we expect our graduate students to teach t_i and finish a dissertation on time?

<div align="right">(Goldsmith (1985: 133))</div>

In these examples, the events of staying sober and finishing a dissertation on time violate the conventional expectations normally anticipated by the events of drinking much and teaching many courses, respectively.

All the exceptions to the CSC noted above seem to be ordinary coordinate structures with no hint of why they should be exempt from the constraint. However, they all share a common conceptual semantic feature. That is, there exists between the conjuncts of these coordinate structures some temporal-causal relationship. The events conjoined together in each of these CSC-exceptional cases either occur in close temporal proximity or stand in a cause-effect relationship with each other to the extent that the conjoined events may be conceptualized as constituting a single macro-event rather than realizing two separate events.

Our observation that the conjoined events in the CSC-exceptional cases may be regarded as single events can be supported by examples as 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 coordination, describe indisputably singular events. Yet, (5a) and (5c) share essentially the same meanings as (5b) and (5d), respectively, despite the fact that they contain coordination. 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

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two separate events. All else being equal, then, it is plausible to conclude that this semantic parameter − 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 with extraction out of adjunct expressions. It has been commonly held since Huang (1982) that adjuncts prohibit *wh*-movement out of them, as illustrated by the ungrammaticality of (6).

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

(Stepanov (2007: 80))

However, Truswell (2007, 2011) has pointed out that this movement constraint is lifted when events denoted by the matrix VP and adjuncts share a strong temporal-causal relationship so that both events jointly contribute to creating a single macro-event. To capture this semantic characterization of environments under which adjuncts are rendered transparent for extraction, Truswell proposes the Single Event Grouping Condition, formulated in (7).

(7) Truswell's (2011:157) 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.

This condition is exemplified in (8).

(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)

In (8a), a cause-effect relationship can be observed between the matrix VP event of working so hard and the adjunct purpose clause *in order to achieve t_i*. In (8b), the matrix VP event of going home and the adjunct manner event of talking to someone occur in close temporal proximity. (8c) provides a case in which the matrix VP event of driving Mary crazy and the adjunct event of whistling occur simultaneously. These versatile 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 suggests that the constructions exhibit two different manifestations of the unique effects of a condition having to do with the notion of temporal-causal dependency rather than two separate unrelated phenomena. However, while the relevant relationship does seem to correctly demarcate the range of CSC-exceptional coordinate structures attested, the level of explanation this observation offers for such principled exceptions remains descriptive in nature. In particular, to the best of our knowledge, no satisfactory theory has yet been proposed in the literature that genuinely explains why they evade the CSC the way they do.

3.   A Dual-Structure Analysis of Coordination

    The challenge of providing a genuine explanation for CSC-exceptional coordination is to explain why it is exempted from the very same condition that applies to almost every other instance of coordination in general. No syntactic mechanism exists that is unique to CSC-exceptional coordinate structures and enables them to evade the CSC. Yet, as the data presented so far demonstrate, those instances of coordination involve true exceptions to the relevant constraint. This section begins with

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 forth as a structural explanation of CSC and its systematic exceptions.

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

Focusing on adversative coordination, Goldsmith (1985) argues that the three types of coordinate structures introduced in section 2 are exempted from the CSC because the conjuncts are semantically competing against each other rather than semantically parallel or symmetrical. According to Goldsmith, 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. For this reason, the symmetric syntax that the CSC typically imposes on coordinate structures does not apply. Goldsmith's position is articulated in (9).

(9) Goldsmith's (1985: 138) on Adversative Coordination and 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.

Let us consider how (9) plays out with (4a), repeated here as (10).

(10) How much$_i$ can you drink t_i and still stay sober? (=(4a))
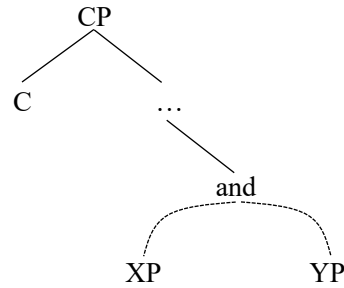
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In (10), the two VP conjuncts *drink t$_i$* and *still stay sober* violate semantic parallelism in the sense of (9) since the truth of each conjunct diminishes the likelihood of the other conjunct. This means that there is no syntactic symmetry induced upon it and therefore, no CSC effect is observed.

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 particular coordinate structures from the relevant constraint. The account 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. What Goldsmith reveals is thus limited to the observation that CSC effects do not apply on coordinate structures that are not semantically symmetrical. A genuine account of CSC-exceptions is therefore clearly needed.
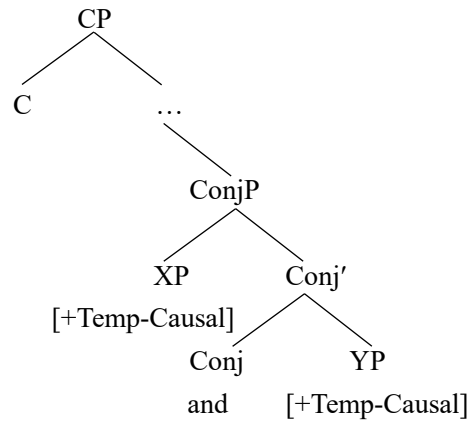
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Given that both the restrictive effect of the CSC as well as exceptions to it are real, we will argue that two different underlying structures are available for coordination, one for CSC-regular coordinate structures and the other for CSC-exceptional coordinate structures. We will show that the fact that they possess two different structures 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.

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(11)   CSC-Regular Structure

```
              CP
            /    \
          C       …
                   \
                  and
                 /      \
               XP        YP
```

(12)   CSC-Exceptional Structure

```
              CP
            /    \
          C       …
                   \
                  ConjP
                 /      \
               XP       Conj′
         [+Temp-Causal]  /  \
                      Conj   YP
                      and   [+Temp-Causal]
```

Our analysis follows in the footsteps of Kitada's (2008) Merge-based theory of coordination which maintains two types of coordinate structures, one derived through External Merge with a hierarchical asymmetric relation between conjuncts and the other derived through Parallel Merge (Citko 2005) with a flat symmetric relation between them. Kitada supports this theory based on divergent syntactic and interpretive behavior between the two types of coordination with respect to extraction, ATB-movement, right-node-raising, symmetric predicates and distributive interpretations. Our structures posited in (11) and (12) are intended to correspond to Kitada's versions of the symmetric structure and asymmetric structure for coordination, respectively.

Let us now zoom into fine technical details of the two structures for

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coordination. (11) represents the structure of CSC-regular coordination. This structure is fundamentally different from standardly postulated asymmetric X′-structures of coordination 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 dotted lines in (11) and symmetrically connected to the coordination head *and*. The reason 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 that triggers event restructuring which has the effect of collapsing the two conjuncts into one dimensional plane, unlike the conjuncts in the CSC-exceptional structure in (12), a structure to which we will return shortly.
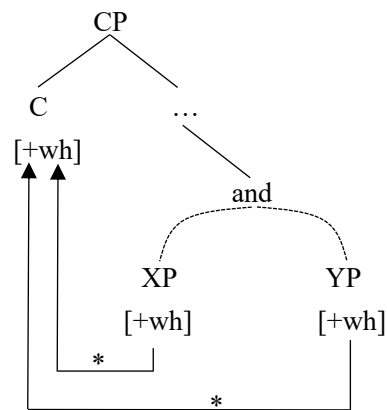
Significantly, (11) explains the standard effects of the CSC as well as its etiology behind ATB extraction. As mentioned in the introduction, in CSC-regular coordination, the CSC rules out *wh*-movement of only one conjunct, ass illustrated in (13a). However, *wh*-movement in an ATB fashion, as shown in (13b), is grammatical.

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

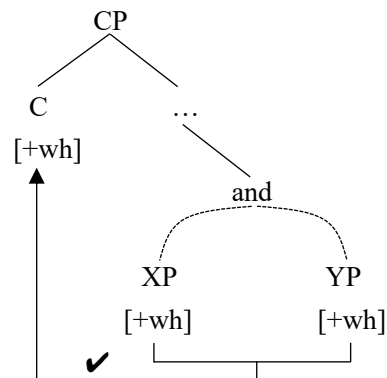   b.   Which surgeon$_i$ did Kim date friends of t_i and enemies of t_i?(=(1d))

(11) maintains that XP and YP are floating in two separate dimensions equidistant to the interrogative C head. This means that syntactic operations must treat both XP and YP equally since they are hierarchically equal. Consequently, extraction 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 in the tree. Since XP and YP are equitant to the head, the latter ends up identifying both as equally matching goals 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 deduced: if the probe extracts

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from one conjunct, it must extract from the other conjunct as well, since both are equidistant to the probe, as depicted in (15).

(14)* Extraction of One Conjunct in CSC-regular structure

```
                    CP
                 ╱      ╲
              C            …
            [+wh]            ╲
             ▲▲               and
                          ╱⌢⌢⌢⌢╲
                       XP          YP
                      [+wh]       [+wh]
                        *
                            *
```

(15) ATB-Extraction in CSC-Regular Structure

```
                    CP
                 ╱      ╲
              C            …
            [+wh]            ╲
             ▲                and
                          ╱⌢⌢⌢⌢╲
                       XP          YP
                      [+wh]       [+wh]
                        ✔
```

Let us now turn our attention to (12). Despite being the "exceptional" case of coordination, it looks structurally more familiar than (11), with *and* serving as the head of the phrase of which XP and YP occupy specifier and complement positions, respectively (Munn 1993; Kayne 1994; Zoerner 1995; Johannessen 1998, among others). Since the conjuncts in CSC-exceptional coordination share a temporal-

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causal relationship with each other, we 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 speaking, this means that the two conjuncts XP and YP in (12) 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 in structural terms by the fact that both conjuncts are merged to form a single phrase, the ConjP. Since both conjuncts are merged on the same plane in (12), it follows that the ConjP behaves like a normal phrase. Consequently, no special condition exists that prohibits extraction of one conjunct without the other just as no special condition exists that prohibits extraction of the specifier or complement of a regular phrase. In conclusion, the CSC does not apply to the structure in (12); both XP and YP, or their constituent parts, can be extracted without targeting the other.

4.   Three Arguments for the Dual-Structure Account of Coordination

Admittedly, 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 3 that the postulation of two structures for coordination is necessary due to the existence of CSC-exceptional coordination and argued that only a dual-structure coordination analysis of coordination is capable of providing a satisfactory syntactic explanation for CSC and ATB effects. In this section, we proceed to present three independent arguments for this dual-structure analysis from agreement (section 4.1), *do so*-replacement (section 4.2), and the acceptable sequence of conjuncts (section 4.3).

4.1. Number Agreement under the Two Types of Coordination

Our first argument for the dual-structure approach to coordination outlined in the previous section comes from singular vs. plural agreement under coordination.

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Given our current hypothesis that both conjuncts are merged into a single conjunctive phrase in the CSC-exceptional coordinate structure due to their nature as co-descriptors of a single macro-event, both conjuncts should be treated as parts of a single event for the purposes of syntactic operations such as agreement. In the proposed structure for CSC-regular coordinate structure, on the other hand, the two conjuncts are on separate dimensional planes and thus should both remain visible for syntactic computation as two separate events. Thus, our dual-structure approach predicts that CSC-exceptional coordinate structures should exhibit singular agreement whereas CSC-regular coordinate structures should exhibit plural agreement. This prediction is indeed borne out by McCloskey's (1991) observation, summarized in (16), and exemplified in (17) and (18).

(16) McCloskey (1991: 564-565) 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-types), then singular agreement is preferred or required.

(17) 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)

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

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b.   That the shares are overvalued and that a decline is in order {is/??are} widely believed on Wall St.

(McCloskey 1991: 565)

(17a, b) are examples of CSC-regular coordinate structures, in which both conjuncts represent events that are distinct and separate. Both examples exhibit plural agreement, while singular agreement is marked as ill-formed. This is predicted by the structure in (11), since both conjuncts are on separate dimensional planes and need to be treated as separate entities for the purposes of syntactic computation. This is to be contrasted with (18a, b), which illustrate CSC-exceptional coordinate structures, because both conjuncts together constitute a single macro-event. Notably, singular agreement is preferred to plural agreement in these examples. Once again, this observation confirms the prediction made by our proposed structure for CSC-exceptional coordination in (12), in which both conjuncts are merged on the same dimensional plane and form a single syntactic constituent, ConjP. Syntactic computation thus treats both conjuncts as a singular entity in calculating subject-verb agreement.

Our dual-structure analysis of coordination correctly predicts the contrasting agreement pattern between (17) and (18). Without positing two different structures for CSC-regular and CSC-exceptional coordinate structures, it would be unclear whether any satisfactory explanation would be available for the contrast in question.

The argument made above for the two types of coordinate structure hinges on the assumption that the number of events contained within each structure determines the resulting agreement: CSC-regular coordination with two events yields plural agreement, as shown in (17), whereas CSC-exceptional coordination with a single event yields singular agreement, as shown in (18). A question then naturally arises regarding the fixed agreement pattern with a coordination of two DPs. Consider (19).

(19) a.   Mary and Bill {*is/are} a good team.   [collective; one event]

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    b.   Mary and Bill {*makes/make} a good couple. [collective; one event]

    c.   Mary and Bill {*is/are} sleeping.   [distributive; two events]

    d.   Mary and Bill {*is/are} lifting up a table.   [collective or distributive]

The examples here show that the T head always exhibits plural agreement regardless of whether the sentences denote a singular event, as in (19a, b), or a plural event, as in (19c, d), unlike in (17-18), where the number of events contained in a coordinate structure consisting of clausal subjects transparently determines number agreement. This discrepancy between the two types of data seems puzzling if we subscribe to the Neo-Davidsonian event semantic framework whereby (Higginbotham 1985, 2000; Parsons 1990, 2000; Chierchia 1995, among others) not only predicates but also arguments are paired up with an event position, as shown in the semantic representation given in (20b) for (20a).

  (20) a.   Lisa read the book.

         b. $\exists e$ [read(e) & Agent(e, Lisa) & Theme(e, the book)]

We believe that the uniform plural agreement pattern in (19a-d) is consistent with our present analysis. In the Neo-Davidsonian system, arguments of a verb are associated with it via θ-role labels such as Agent and Theme. Note that the (number of) event notation attached to the arguments does not represent the actual number of an event described by the whole sentence. (20a) thus represents a single event of Lisa reading the book some time in the past despite the fact that the Agent and Theme arguments are both paired up with an extra implicit event argument. We can only venture at this point that there is a computational preference for Ts to agree with DP subjects so that they are valued by the number of those DPs, not the number of events involved. As such, when the probe searches for a matching goal, all it can see is the plural DP subject in the case of DP-level coordination, as in (19). By contrast, when

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CPs are coordinated, as in (17, 18), there is no such DP available for T-probing, and hence T-agreement relies instead on the number of actual events denoted. This may reflect the intuition that in English, nominal subjects must exhibit φ-agreement, but clausal subjects may do so only optionally. We leave the matter open here. [1,2]

4.2. *Do So*-Replacement under the Two Types of Coordination

Do so-replacement provides our second argument for two different structures for coordination. According to the structure for CSC-regular coordination in (11), both conjuncts need to be treated equally since they are floating on two separate dimensions, equidistant to all other syntactic objects in the derivation. Therefore, (11) predicts that any syntactic relation that holds between a conjunct and another syntactic object outside the coordinate structure must apply in an ATB fashion across both conjuncts. Recall that the same reasoning was behind our analysis of 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, such conjuncts need not be treated in an equal manner. As such, (12) predicts that syntactic relations may hold between a syntactic object outside the coordinate structure and one conjunct without the other in CSC-exceptional coordinate structures. The predictions above are indeed validated with *do so*-replacement facts illustrated in (21-23).

(21) 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.

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(22) 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.

(23) 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 (21a), (22a) and (23a), which feature CSC-exceptional coordinate structures, *do so*-replacement of only the second conjunct is grammatical. For example, the *do so* anaphor in (21a) replaces only the second VP conjunct *swims* without also replacing the first VP conjunct *goes to a public pool*. Note that it is grammatical to have both conjuncts replaced by the anaphor, as shown by the grammaticality of (21b). The permissibility for the anaphor to take only one conjunct as its antecedent in these examples is consistent with the asymmetrical structure we postulated for two conjuncts in the CSC-exceptional pattern.

In contrast, in (21c), (22c) and (23c), which feature CSC-regular coordinate structures, *do so*-replacement of only the second conjunct results in ungrammaticality. In (21c), for instance, the *do so* anaphor replaces only the second VP conjunct

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jogs. In order to confirm that no other factors are responsible for the ungrammaticality of (21c), (21d) is included above to demonstrate that *do so*-replacement of both VP conjuncts is non-problematic. The fact that the *do so* anaphor cannot replace only one conjunct without the other in the (c)-examples, therefore, supports the symmetric nature of conjuncts in the CSC-regular structure.

Before closing this section, we point out that there is one loose end that needs to be tied up. Given our proposal, one might wonder whether the impossible *do so*-replacement pattern in the (c)-examples of (21-23) would become grammatical on a par with the (a)-examples of (21-23) if the otherwise two separate events are construed as fitting one of the three temporal-causal relationships introduced in section 2. For example, such a construal may be facilitated by addition of *and-then* between the two conjuncts in (21c). However, the ungrammaticality of (24) shows that this prediction is not borne out.[3]

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

The important issue raised here, then, is under what conditions what appear to be two distinct events may be conceptualized as a single macro-event such that, for example, the event sequence in (21a) is, but that in (24) is not, associated with the CSC-exceptional structure. Intuitively, the event of going to a public pool and the event of swimming there inexorably stand in an inherent cause-effect relationship (recall our discussion around (2-3) in section 2); the latter event would not occur without the former event. No such relationship is felt to exist between the swimming event and the jogging event; it is not the case, for example, that the jogging event would occur subsequently if the swimming event did first. We conjecture that it is this type of inherent temporal-causal dependency between the two events that licenses the generation of the CSC-exceptional configuration, leaving a much more

rigorous formulation of our intuition expressed above for another occasion.

To summarize, our dual-structure analysis of coordination can explain why *do so*-replacement of one conjunct is grammatical for CSC-exceptional cases, but not for CSC-regular cases. This contrast would remain mysterious without acknowledging the existence of two separate structures for the two types of coordination.

4.3. Possible Sequence of Conjuncts under the Two Types of Coordination

Our final argument comes from variability in the sequence of conjuncts in coordinate structures. Since the CSC-regular structure maintains that conjuncts are floating on different dimensions with no fixed order between then, it follows that the sequence of the conjuncts should be variable. By contrast, 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 this type of coordination, the sequence of conjuncts should be fixed and invariant. We can see in (25-27) that these two predictions are indeed confirmed.

(25) a. Harry went to the store 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?

(26) 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.

(27) 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?

The grammaticality of (25a, b), (26a, b) and (27a, b) shows that the sequence of two conjuncts in CSC-regular coordinate structures can be exchanged. With this in mind, the contrast in grammaticality between the (c)- and (d)-examples in (25-27) shows that conjuncts in CSC-exceptional coordinate structures follow a fixed invariant sequence that reflects the logical flow of the temporal-causal relationship between them. Exchanging the positions of the two conjuncts renders the sentence ill-formed.

The fact that CSC-regular and CSC-exceptional coordinate structures impose different requirements on the sequence of conjuncts contained within them supports our hypothesis that they are associated with two different structures. In particular, the freedom of the relative order between two conjuncts in CSC-regular coordinate structures provides compelling evidence for our view that conjuncts in this type of structure are floating on separate dimensional planes, while the invariant sequence of conjuncts in CSC-exceptional coordinate structures suggests that their relative position is structurally fixed within one dimensional coordinate structure.

5.   Parallel Effects in Adjunct Structures: *One-/Do So*-Replacement

In spite of the evidence presented in the previous section for the dual-structure analysis of coordination, our proposal that CSC-regular coordinate structures involve conjuncts attached to the tree on separate floating dimensional planes may 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, then one's skepticism about its psychological plausibility is justified. However, if structures that involve multiple attached floating dimensional planes can be demonstrated to exist in some other types of constructions, the case for the validity of the CSC-regular structure will be strengthened further.

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A natural place to seek evidence for such a structure lies in adjuncts, since it has been observed earlier in section 2 that extraction possibilities for adjuncts are also constrained by the same temporal-causal relations that characterize the distribution of the CSC-exceptional coordinate structures. Indeed, a convincing case for parallelism does exist in the area of adjuncts insofar as *do so*-replacement and *one*-replacement of discontinuous syntactic constituents involving adjuncts suggest that these proforms may be attached to the verbal/nominal head that they modify on separate 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 approaches to adjuncts is necessary. Hornstein and Nunes (2008) propose a label-less theory of adjuncts. Working on the assumption that Merge consists of two sub-processes, concatenation and labeling (Hornstein 2009), Hornstein and Nunes argue that adjuncts are special in that their introduction into the syntactic workspace requires concatenation, but not labeling, unlike arguments which need to be both concatenated and labeling. Since only labeled syntactic objects can be accessed for further concatenations, 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 main syntactic workspace/cascade.

This label-less theory of adjuncts is schematically depicted in the logical form representation shown in (28b) for the sentence in (28a) which contains three adjuncts.

(28) 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

                               (Hornstein and Nunes (2008: 67))

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Hornstein and Nune's dangling view of adjuncts is well-served to explain the otherwise puzzling phenomenon where *do so-/one*-replacement seemingly targets discontinuous syntactic constituents, as illustrated in (29) and (30), respectively.

(29) 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.

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))

(30) 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 these examples, the two proforms *do so* and *one* replace what appear to be discontinuous syntactic constituents involving adjuncts. In (29a), for instance, *did so* replaces the VP *ate the cake in the afternoon* to the exclusion of the two linearly intervening PP adjuncts *in the yard* and *with a fork*. Likewise, in (30a), *one* takes *big dog* as its antecedent, leaving out the linearly intervening adjunct *black*. This apparently discontinuous *do so-/one*-replacement fact is elegantly explained by Hornstein and Nunes's theory since adjuncts only require concatenation with their heads. When *do so-/one*-replacement applies to a seemingly discontinuous expression, it actually targets the verbal/nominal head plus any number of adjuncts which do not need to be labeled but are just concatenated with the head in the manner depicted in (28b). In other words, the 'intervening' adjuncts in (29-30) are merely concatenated in the syntactic workspace with the desirable result that they are invisible to core syntactic computations, but nonetheless can participate in semantic interpretations.

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The observation that multiple adjuncts can be directly concatenated with the head they modify without labeling presupposes that adjuncts may exist structurally on separate dimensional planes equidistant to the relevant head. This explains why the target head of *do so-/one-*replacement can form an atomic concatenate with any (number of) adjunct attached to it to the exclusion of some other intervening adjuncts. It is crucial to note that this result forms a close parallel with CSC-regular coordinate structures developed earlier, in which conjuncts exist on separate floating dimensional planes, all attached equidistant to the conjunctive head, with no underlying order among them. This result, therefore, lends further credibility to the structure proposed for CSC-regular coordination, for 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 sub-type of coordinate structures.

One might wonder at this point why the "discontinuous" replacement pattern in (29-30) is actually grammatical given our hypothesis above that both adjuncts and CSC-regular coordinate strictures exist on separate dimensional planes. Recall that in the (c)-examples in (21-23), the *do so* anaphor cannot target the second conjunct alone in a CSC-regular coordination structure. The grammaticality of the examples in (29-30) indicates, however, that such option is, in principle, accepted.

The key to the solution to the problem, we believe, is the presence of the overt coordinator *and* in coordination structures and its role in enforcing a completely symmetric structure in syntax. We hypothesized that, in (11), the two conjuncts XP and YP are merged into the tree on hierarchically equal, but separate floating dimensional planes: as such, both objects are equally accessible to syntactic operations triggered by any probe outside the coordinate structure. Such a complete symmetric relationship does not actually obtain with adjunction structures, as in (28b). There is a main derivational workspace/cascade for the VP *ate the cake*, with the three VP-modifiers *in the afternoon*, *in the yard* and *with a fork* being concatenated with the VP on different dimensions. Since adjunction structure does not involve the

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coordinative head *and*, any one of the three modifiers may be targeted for *do so-/one*-replacement, as desired.

6.   A Remaining Question: Selection and Linear Order

We believe that the three arguments presented in section 4 as well as the empirical support from adjuncts mentioned in section 5 cumulatively build a compelling case for our dual-structure analysis of coordination. However, there is one important issue which remains to addressed.

Recall that the CSC-regular structure in (11) posits that conjuncts in such a structure are hierarchically symmetrical since both float in separate dimensional planes equidistance to the conjunction head. However, Zhang (2009) observes that there appears to be an asymmetric pattern between two conjuncts when it comes to categorial requirements imposed on the entire coordinate structure. The issue here is essentially that only the first conjunct needs to satisfy such requirements. This asymmetry in selection and linear order in regular coordination is illustrated in (31).

(31) 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 these examples, coordinate structures are merged to the prepositions *on* and *about*, respectively. In both cases, the prepositions select DPs as complements, imposing C-selectional requirements upon the coordinate structures. Notably, it is only the first conjuncts in both examples − *my assistant* and *Mr. Golson's many qualifications* − that actually satisfy the selectional requirements of the relevant prepositions. The second conjuncts, seemingly CPs, are allowed to ignore the categorial requirements. These examples thus seem to show that conjuncts are actually asymmetrical in

regular coordinate structures, a result that appears to contradict the symmetrical nature of two conjuncts endorsed by the proposed CSC-regular structure shown in (11).

One possible way to reconcile this set of data with our proposed analysis is to analyze the second conjuncts in (31) as DPs rather than CPs, by assuming that "that he will be on time", for example, is underlyingly the CP, something like "the fact that he will be on time", but the DP layer has been peeled off in surface structure. Consequently, both conjuncts may be analyzed as satisfying the selectional requirements imposed on the entire coordinate structure, maintaining their complete symmetry. This suggestion is tentative, and so we will leave a more in-depth investigation of this suggestion for another occasion.

7. Conclusion

This paper has argued for a dual-structure analysis of coordination: CSC-regular and CSC-exceptional coordinate structures have different underlying syntactic structures. More specifically, in CSC-regular coordinate structures, conjuncts do not share temporal-causal relations with each other and exist on separate floating dimensional planes and are attached equidistant to the conjunction head *and*. In contrast, CSC-exceptional coordinate structures obey the familiar X′-style conjunction structure in which conjuncts are merged into the same syntactic workspace as specifier and complement of the conjunctive head *and* due to their matching [+temporal-causal] feature, which we assumed to trigger event restructuring and collapse them into a single dimensional plane. It was argued that this dual-structure analysis explains both the mechanism of the CSC as well as the reason for its inapplicability on coordinate structures that form a single macro-event. Novel evidence has also been provided for this analysis from singular vs. plural agreement under CP-coordination, *do so*-replacement facts and (un-)acceptable sequences of conjuncts. Furthermore, it was argued that the empirical plausibility of the floating multi-dimensional structure for CSC-regular coordinate structures is also independently enhanced by parallel

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effects obtained with adjuncts in the area of "discontinuous" *do so-*/*one*-replacement.

Notes

1)   It has been debated whether statives as in (19a, b) involve an implicit event argument. Whereas Higginbotham (1985, 2000), Parsons (1990, 2000) and Chierchia (1995) assume that statives have an underlying Davidsonian event argument, Maienborn (2003, 2005) argues that stative verbs like *know*, *weight*, and *own* as well as any copula-based predicate do not. If we adopt Maeinborn's view, then examples like (19a, b) in the text do not event count as an event in the Neo-Davidsonian sense.

2)   In fact, the same question arises with examples like (ia, b). These examples have CSC-exceptional coordination in our system because the first event stands in a cause-effect relationship with the second event so that the two events form a single macro-event. Given the asymmetric hierarchical relationship between the two events, how can the T head have

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its third-person singular present/past tense feature checked against the verb in the second conjunct, which appears further to the T-probe than the verb in the first conjunct?

(i) a. Harry goes to the store and buys apples.

b. Harry went to the store and bought apples.

We tentatively suggest that the coordinative head in these examples involves TP-level coordination, as schematically depicted in (ii) for (ia).

(ii) [$_{ConjP}$ [$_{TP}$ Harry T goes to the store] [$_{Conj'}$ Conj [$_{TP}$ ~~Harry~~ T buys apples]]]

Here, the second conjunct in the complement of the head actually contains an independent T head agreeing with the verb, with the subject contained within the conjunct undergoing ellipsis under identity with the subject in the first conjunct.

3) We thank Michael Barrie (personal communication) and Si Kai Lee (personal communication) for their grammaticality judgment on the example in (24).

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