# Control, inner topicalisation, and focus fronting in Mandarin Chinese: modelling in parallel constraint-based grammatical architecture

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## ABSTRACT

This paper proposes a formal analysis of two displacement phenomena in Mandarin Chinese, namely inner topicalisation and focus fronting, capturing their correlational relationships with control and complementation. It examines a range of relevant data, including corpus examples, to derive empirical generalisations. Acceptability-judgment tasks, followed by mixed-effects statistical models, were conducted to provide additional evidence. This paper presents a constraint-based lexicalist proposal that is couched in the framework of Lexical-Functional Grammar (LFG). The lexicon plays an important role in regulating the behaviour of complementation verbs as they participate in the displacement phenomena. Unlike previous analyses that cast inner topicalisation and focus fronting as restructuring phenomena, this lexicalist proposal does not rely on hypothesised clause-size differences. It captures the empirical properties more accurately and accounts for a wider range of empirical patterns. Adopting the formally explicit framework of LFG, this proposal uses constraints that have mathematical precision. The constraints are computationally implemented using the grammar engineering tool Xerox Linguistic Environment, safeguarding their precision.

*Keywords: control, complementation, inner topicalisation, focus fronting, long-distance dependency, restructuring, Chinese, Lexical-Functional Grammar, acceptability-judgment experiments, grammar engineering*

## 1 INTRODUCTION

This paper centres on the syntax of two displacement phenomena in Mandarin Chinese, namely inner topicalisation and focus fronting (Ernst and Wang 1995; Grano 2015; Huang 2018; Paris 1998; Paul 2002, 2005, 2015; Shyu 1995), exploring their interaction with control and complementation.[1] Inner topicalisation, also known as "object preposing", involves an object relation being displaced to a position between the subject and the verb without an additional marker.[2] (1a) is an example of inner topicalisation, where *gugong* 'imperial palace' is the preposed object. (1b) shows the canonical SVO word order without object preposing.[3]

(1) a. women [gugong] qu-guo le
1PL imperial.palace go-PFV SFP
'We have been to the imperial place before.'
(Paul 2002, p. 697)

[1] The paper is based on part of the author's PhD project (Lam 2023). It also contains some revised findings of inner topicalisation previously discussed by Lam (2022) in the *Proceedings of the LFG'22 Conference*. I am very grateful for the guidance of my PhD supervisors, Kersti Börjars and Eva Schultze-Berndt, and for their comments on various drafts. Many thanks to the audiences at the LFG22, SE-LFG31, and NACCL-34 conferences for their comments on early drafts. I also would like to thank all the participants of the acceptability-judgment tasks. I greatly appreciate Ziling Bai's help in offering additional native-speaker judgments on the language data. Last but not least, I would like to thank the anonymous reviewers for their valuable feedback as well as the amazing editorial team at *JLM* for processing my manuscript. Any error is mine.

[2] In Chinese, inner topicalisation is distinguished from external topicalisation, where the preposed object appears before the subject. The constraints discussed in this paper are applicable to inner topicalisation but not to external topicalisation. For a comparison between inner topicalisation and external topicalisation, see, e.g., Paul 2002, 2015.

[3] The following are the abbreviations used in the morpheme-by-morpheme glosses of this paper: CL = classifier, COMP = complementiser, C.SELF = complex reflexive, DE = pre-nominal modification marker, EXP = experiential, PFV = perfective, PL = plural, PRT = particle, SELF = simplex reflexive, SFP = sentence-final particle, SG = singular.

b. women qu-guo [gugong] le
1PL go-PFV imperial.palace SFP
'We have been to the imperial place before.'

As for focus fronting, this paper centres on the type involving the focus marker *lian* 'even', with the fronted *lian* 'even' constituent being an object relation.[4] In (2a), the *lian* 'even' constituent is the object of *renshi* 'know'. Note that a *lian* 'even' constituent cannot remain in situ (i.e., in the canonical object position), as shown by (2b).[5]

(2) a. wo-de pengyou [lian ta] dou renshi
1SG-DE friend even 3SG PRT know
'My friends know even him.'
(Paul 2002, p. 700)

b. *wo-de pengyou dou renshi [lian ta]
1SG-DE friend PRT know even 3SG
'My friends know even him.'

Intriguing patterns emerge in such structures. As observed by Ernst and Wang (1995), Qu (1995), Paul (2002, 2005, 2015), and others, the inner topic or focus-fronting phrase must remain inside the complement clause of a non-control complementation verb (e.g., *shuo* 'say'). In (3a), the displaced object *na-ben xiaoshuo* 'that novel' occupies the post-subject position in the complement clause. In (3b), moving the displaced object into the matrix clause is ungrammatical.

(3) a. wangwu shuo lisi [na-ben xiaoshuo] du-wan-le
Wangwu say Lisi that-CL novel read-finish-PFV
'Wangwu said that Lisi finished reading that novel.'

b. *wangwu [na-ben xiaoshuo] shuo lisi du-wan-le
Wangwu that-CL novel say Lisi read-finish-PFV
'Wangwu said that Lisi finished reading that novel.'
(Ernst and Wang 1995, p. 244)

[4] Another focus-fronting construction discussed in the literature involves fronting a *shenme* 'what' constituent.

[5] In focus-fronting, the particle *dou* is usually needed to make the construction well-formed. Although some references e.g., Huang *et al.* (2009) translate *dou* as 'all', it does not preserve much (if any) of the meaning of "all".

In contrast, for control verbs (e.g., *shefa* 'try'), it has been reported that the inner topic or focused phrase occupies a post-subject position in the matrix clause (Grano 2015; Huang 2018). In (4), the displaced object *zhe-pian baogao* 'this report' appears after the matrix subject *wo* 'I', crossing the control verb *shefa* 'try'.

(4) wo [zhe-pian baogao] hui shefa jinkuai xie-wan
1SG this-CL report will try soon write-finish
'I will try to finish even this report soon.'
(Huang 2018, p. 351)

The displacement phenomena seem to correlate with the (non-)control status of the complementation verb. Further discussion about different types of control will be provided with regard to how they correlate with the displacement phenomena.

This paper aims to model the intricate relationships among control, inner topicalisation, and focus fronting. The formal analysis will be couched in the framework of Lexical-Functional Grammar (LFG; Bresnan 1982; Bresnan *et al.* 2016; Dalrymple *et al.* 2019), which is a formally explicit grammatical theory that uses constraints of mathematical precision. This approach provides a fresh analytical perspective, as most previous studies have been conducted within derivational frameworks (Principles & Parameters; Minimalism). The paper offers detailed empirical data on how the displacement phenomena interact with control and complementation, which can be valuable for researchers of different theoretical orientations.[6]

The paper is organised as follows. Section 2 introduces three classes of complementation verbs – exhaustive-control, partial-control, and non-control – which are relevant to the issues at hand. Section 3 critically reviews a Minimalist proposal, which approaches inner topicalisation and focus fronting as restructuring phenomena. Section 4 presents the relevant empirical patterns. It also reports the results of five acceptability-judgment tasks (AJTs) to provide additional evidence. Section 5 offers a pre-theoretical explanation for the empirical generalisations. Section 6 articulates the LFG grammati-

[6] This paper focuses on syntactic constraints. For a discussion regarding the information-structural properties of inner topicalisation and focus fronting, see, e.g., Ernst and Wang 1995, Paul 2002, Shyu 1995.

cal architecture as background information. Section 7 proposes an LFG formal analysis to capture the correlational relationships among control, inner topicalisation, and focus fronting. Section 8 brings in computational testing for the constraints in the formal analysis, drawing on LFG's computational rigour. Section 9 concludes the paper.

## 2 EXHAUSTIVE-CONTROL VS PARTIAL-CONTROL VS NON-CONTROL VERBS

This paper centres on three classes of complementation verbs in the displacement phenomena: exhaustive-control vs partial control vs non-control verbs. The differences between exhaustive- and partial-control verbs are discussed in the general literature (e.g., Grano 2015; Haug 2013; Landau 2000, 2013). Crucially, an exhaustive-control verb requires strict identity between the controller and controllee, while a partial-control verb allows the entity denoted by the controller to be a subset of the entities denoted by the controllee. To differentiate between them, we use the "collective-word diagnostic", which involves a semantically singular controller and a semantically plural controllee with a collective word (e.g., *yiqi* 'together', *jihe* 'gather') in the complement clause. (5) and (6) illustrate the diagnostic. The controller is the matrix subject *Xiaoming* and the controllee is the embedded subject (notated as "Ø"). The results suggest that while *shefa* 'try', *deyi* 'manage', and *jinli* 'endeavour' are exhaustive-control verbs, *dasuan* 'intend', *xiangyao* 'want', and *jueding* 'decide' license partial control.

(5) xiaoming$_{i}$ shefa/deyi/jinli Ø$_{i/*j}$ #(gen pengyou) ba
Xiaoming try/manage/endeavour Ø with friend eight
dianzhong jihe
o'clock gather
'Xiaoming tries/manage/endeavour to gather #(with friends) at eight o'clock.'

(6) xiaoming$_{i}$ dasuan/xiangyao/jueding Ø$_{i+/*j}$ ba dianzhong
Xiaoming intend/want/decide Ø eight o'clock
jihe
gather
'Xiaoming intends/wants/decides to gather at eight o'clock.'

Note that outside the collective-word context, partial-control verbs allow complete coreference between the controller and controllee.

Chinese is a discourse pro-drop language (Huang 1984, 1989), allowing unexpressed subjects and objects. In a non-control complementation construction, when the embedded subject is unexpressed, the non-control verb (e.g., *shuo* 'say', *xiangxin* 'believe', *renwei* 'think') does not place coreferential constraints on it. The unexpressed embedded subject can refer to the matrix subject or another discourse-salient entity in a way similar to its pronominal counterpart, as shown in (7).

(7) xiaoming$_{i}$ shuo/xiangxin/renwei {Ø$_{i/j}$ | ta$_{i/j}$} jian-guo
Xiaoming say/believe/think {Ø | 3SG} see-EXP
zhangsan le
Zhangsan SFP
'Xiaoming says/believes/thinks (he) has seen Zhangsan.'

Section 4 onwards will demonstrate correlational relationships between these classes of verbs and their patterns in inner topicalisation and focus fronting.

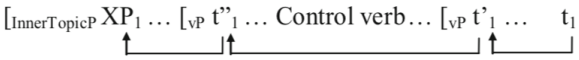
## 3 AGAINST RESTRUCTURING APPROACHES TO INNER TOPICALISATION AND FOCUS FRONTING

In recent years, there has been a trend in the Minimalist tradition to understand inner topicalisation and focus fronting as restructuring (Grano 2015; Huang 2018), explaining the contrast between (3) and (4) based on clause-size differences. Restructuring is, in

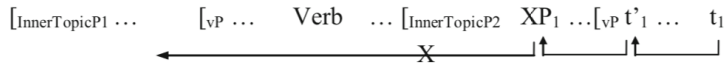
essence, a clause-size-reduction phenomenon (Aissen and Perlmutter 1976; Cinque 2006; Rizzi 1978; Wurmbrand 2001, 2004, 2015). In the derivational tradition, while a control construction is typically characterised as a bi-clausal configuration where the complement clause projects up to CP (or at least TP), a subset of control verbs is said to select for a size-reduced embedded structure (e.g., non-clausal vP). Thus, the construction is said to display behaviour typically attested in a mono-clausal configuration. Several claims have been made regarding inner topicalisation and focus fronting based on restructuring. It has been claimed that whether the displaced object can "cross" the complementation verb is contingent on the size of the embedded complement. Assuming movement, it is posited that a control verb restructures its embedded complement into a non-clausal structure (Grano 2015) or a reduced clausal structure (Huang 2018) such that the displaced object moves across the boundary between the matrix clause and embedded complement, forming (4). On the contrary, a non-control verb forms a bi-clausal configuration with its embedded complement projecting up to a clausal domain, blocking any further movement of the displaced phrase; thus, the displacement is only viable within the embedded clause (Grano 2015; Huang 2018), explaining the patterns in (3).

The above claims are instantiated in Huang's (2018) formal analysis of inner topicalisation, displayed in (8). In his formal system, InnerTopP is a projection in the "operator" domain (comparable to CP in the general literature), signalling a full-fledged clausal structure. After arriving at the InnerTopP position, an inner topic "freezes" due to some feature-checking mechanism. (8a) models inner topicalisation in a control construction. The embedded complement is restructured as a non-clausal vP. Without the CP domain (InnerTopP projection) in the embedded complement, the inner topic undergoes multiple movements, crossing the control verb and arriving at a post-matrix-subject position to satisfy some theory-internal feature-checking mechanism. (8b) models the movement of an inner topic in a non-control construction. Since a non-control construction lacks clausal restructuring, the CP domain (InnerTopP projection) is found in the embedded complement, stopping the inner topic from moving further upward.

(8) a. Inner topicalisation of an embedded-object phrase XP in a control construction




b. Inner topicalisation of an embedded-object phrase XP in a non-control construction




(Huang 2018, p. 361)

Huang (2018) associates the ability of the preposed object to be extracted from the embedded complement with the size of the embedded complement; therefore, one may empirically test the validity of his analysis by examining whether a control verb selects for a size-reduced complement structure, which is a critical factor for the movement proposal. To this end, we first use the *shuo*-complementiser to diagnose the existence of the CP domain. *Shuo* is a Mandarin complementiser diachronically derived from the homophonous verb *shuo* 'say' (see, e.g., Chappell 2008).

(9) a. xiaoming [(lian) zhe-pian lunwen] (dou) xiangbanfa
Xiaoming even this-CL paper PRT try
shuo yao mingtian tijiao
COMP will tomorrow submit
'Xiaoming tries to submit (even) this paper tomorrow.'

b. xiaoming xiangxin (shuo) (ta) [(lian) zhe-pian lunwen]
Xiaoming believe COMP 3SG even this-CL paper
(dou) keyi mingtian tijiao
PRT can tomorrow submit
'Xiaoming believes that (he) can submit (even) this paper tomorrow.'

(9) shows that, in inner topicalisation or focus fronting, the embedded complement of both control (*shefa* 'try') and non-control (*xiangxin* 'believe') verbs can take the *shuo*-complementiser. In other words, their embedded complement projects up to CP. (9) constitutes evidence against the claim that the embedded com-

plement of a control verb is restructured to a non-clausal structure.[7]

We offer one more empirical test – a complex reflexive binding diagnostic – to challenge the claim of restructuring. This diagnostic is based on the observation that the Mandarin complex reflexive *taziji* needs to be locally bound by a subject relation (Charnavel *et al.* 2017; Huang *et al.* 2009; Lam 2021). Part of its binding condition is stated in (10) (see Lam 2021 for further details):

(10) When the complex reflexive *taziji* takes on a non-subject grammatical relation, *taziji* must be locally bound by the subject of the same verb which selects for *taziji*.

The diagnostic is applied to (11):

(11) a. xiaoming [(lian) na-fen liwu] (dou) shefa (zai zuihou
Xiaoming even that-CL gift PRT try at last
guantou) song gei taziji
moment give to C.SELF
'Xiaoming tries to, at the last moment, give (even) that gift to himself.'

[7] Although Huang (2018) noticed the availability of *shuo* after control and non-control verbs, he treats it as a non-complementiser functional head in the inflectional domain. His treatment thus stands in contrast to Chappell's (2008) typological investigation on Chinese languages. However, as admitted by Huang (2018, p. 370) himself, his treatment of *shuo* has a few unresolved issues. Besides having to leave the exact functional category of *shuo* undetermined, he also needs to go against the cross-linguistic observation that SAY verbs (*verbal dicendi*) grammaticalise into complementisers (see, e.g., Chappell 2008) as well as to address a few distributional issues related to the fronting of a constituent before *shuo*. Overall, Huang (2018) does not provide independent empirical evidence to substantiate the claim that the embedded complement of a control verb is smaller than that of a non-control verb in cases of inner topicalisation or focus fronting. As the suggested difference in clause size is used to explain their distinct behaviour in inner topicalisation or focus fronting, attempts to posit this behaviour as evidence for the difference in clause size would amount to circular reasoning.

b. xiaoming xiangxin (ta) [(lian) na-fen liwu] (dou) hui
Xiaoming believe 3SG even that-CL gift PRT will
(zai zuihou guantou) song gei taziji
at last moment give to C.SELF
'Xiaoming believes that (he) will, at the last moment, give (even) that gift to himself.'

Being the oblique object of the embedded verb, *taziji* needs to be locally bound by its subject. The fact that (11a) and (11b) are well-formed suggests that there must be an (unexpressed) subject for the embedded verb *gei* 'give', serving as the antecedent of *taziji* in order to satisfy its binding requirement. The presence of an embedded subject suggests clausal embedding (see Butt 2014). That means both control and non-control constructions in (11) are bi-clausal, contrary to the claim that a control construction is restructured to be mono-clausal in inner topicalisation and focus fronting.

In LFG, clausehood is a multi-level concept (see, e.g., Butt 2014). The *shuo*-complementiser diagnostic signals clausehood at the phrase-structural level (c-structure), whereas the binding diagnostic reveals clausehood at the functional level (f-structure). More information about the two levels will be discussed in Section 6. Together, the diagnostics suggest that control and non-control constructions are bi-clausal at both phrase-structural and functional levels in inner topicalisation and focus fronting. Because there is no independent syntactic evidence to support clause-size differences, Huang's (2018) restructuring analysis is empirically unfavourable.

Another shortcoming of Huang's (2018) restructuring approach is that not all control verbs demonstrate the obligatory extraction pattern of (8a). For example, it is acceptable for the displaced object of a *dasuan* 'intend' construction to appear either at the post-matrix-subject position or inside the complement clause, as exemplified by (12):

(12) a. xiaoming [zhe-xiang gongzuo] dasuan yao yiqi
Xiaoming this-CL task intend will together
wancheng
finish
'Xiaoming intends to finish this task together.'

b. xiaoming dasuan [zhe-xiang gongzuo] yao yiqi
Xiaoming intend this-CL task will together
wancheng
finish
'Xiaoming intends to finish this task together.'

Although several studies (e.g., Hu *et al.* 2001, p. 1142; Huang 2018, p. 364; Zhang 2016, p. 291) have noticed the pattern of (12b), Huang (2018, p. 364) treats it as a (non-standard) variant arising from inter-speaker variation. However, the recurrence of this pattern in different studies leads one to doubt whether this is truly the best treatment for the pattern. In fact, a crucial difference between (11) and (12) lies in the divergent control properties of *shefa* 'try' and *dasuan* 'intend' – the former an exhaustive-control verb while the latter a partial-control one. In other words, whether the displaced object can remain inside the complement clause correlates with the complementation verb's control behaviour. To the best of our knowledge, there is no existing study providing a formal mechanism to model such correlations.

Based on the above discussion, a movement-based restructuring approach to inner topicalisation and focus fronting is unsatisfactory. This paper will devise an alternative formal mechanism. Before that, the forthcoming section will clarify the empirical landscape of the two displacement phenomena in relation to control and complementation.

## EMPIRICAL GENERALISATIONS 4

This section presents five empirical generalisations regarding inner topicalisation, focus fronting, control, and complementation by examining qualitative data. Patterns A to D concern complementation constructions without a matrix object, while Pattern E pertains to object-control constructions. The five patterns were tested in acceptability-judgment tasks (AJTs) using a subset of the complementation verbs to provide additional quantitative evidence to supplement the qualitative discussion. Section 5 will provide some pre-theoretical insights into why exhaustive, partial, and non-control verbs behave in the ways described below.

### 4.1 *Pattern A: Exhaustive subject control and inner topicalisation/focus fronting*

If a complementation verb licenses exhaustive subject control, the displaced object must appear in the matrix clause, crossing the complementation verb. This pattern corroborates the judgments of Grano (2015) and Huang (2018). (13) illustrates this pattern with the exhaustive subject-control verbs *shefa* 'try', *xiangbanfu* 'strive', *changshi* 'attempt', *jujue* 'refuse', *deyi* 'manage' and *jinli* 'endeavour'.[8]

(13) a. xiaoming [(lian) zhe-jian shiqing] (dou) shefa/
Xiaoming even this-CL matter PRT try/
xiangbanfu/changshi/jujue/deyi/jinli duzi
strive/attempt/refuse/manage/endeavour alone
chuli
handle
'Xiaoming tries/strives/attempts/refuses/manages/endeavours to handle (even) this matter alone.'

b. *xiaoming shefa/xiangbanfu/changshi/jujue/deyi/jinli
Xiaoming try/strive/attempt/refuse/manage/endeavour
[(lian) zhe-jian shiqing] (dou) duzi chuli
even this-CL matter PRT alone handle
'Xiaoming tries/strives/attempts/refuses/manages/endeavours to handle this matter alone.'

### 4.2 *Pattern B: Partial subject control and inner topicalisation/focus fronting*

Partial subject-control verbs (e.g., *dasuan* 'intend', *zhunbei* 'prepare', *xiang(yao)* 'want', *jueding* 'decide', *kewang* 'desire', *zhiyi* 'insist', and *gan* 'dare') allow the displaced phrase to either cross the complemen-

[8] To see whether there are corpus examples that contradict the reported judgment here, we conducted corpus searches using the large-scale zhTenTen17 corpus via Sketch Engine https://www.sketchengine.eu/zhtenten-chinese-corpus/. Although there is no available keyword for inner topicalisation, we used the focus marker *lian* 'even' to construct CQL queries for the focus fronting of these exhaustive-control verbs. We tested the sequence of [exhaustive-control verb] + [*lian* 'even'] and did not find any valid examples. On the other hand, we did find examples of [*lian* 'even'] + NP + DOU + [exhaustive-control verb].

tation verb or remain inside the complement clause. (14) contains constructed examples. As discussed previously, the pattern of having the displaced object remaining inside the complement clause is not predicted by Huang's (2018) theoretical machinery. Data from the zhTenTen17 corpus (Jakubíček *et al.* 2013) and Google search results are provided below to support the acceptability of this pattern.[9]

(14) a. xiaoming [(lian) na-ge difang] (dou) dasuan/
Xiaoming even that-CL place PRT intend/
zhunbei/xiangyao/jueding/kewang/zhiyi mingtian
prepare/want/decide/desire/insist tomorrow
(yao) yiqi qu
will together visit
'Xiaoming intends/prepares/wants/decides/insists to visit (even) that place tomorrow together.'

b. xiaoming dasuan/zhunbei/xiangyao/juejing/kewang/
Xiaoming intend/prepare/want/decide/desire/
zhiyi [(lian) na-ge difang] mingtian (dou) yao
insist even that-CL place tomorrow PRT will
yiqi qu
together visit
'Xiaoming intends/prepares/wants/decides/insists to visit (even) that place tomorrow together.'

(15) wo zhunbei jinhou [zhe-lei shu] duo kan yidian
1SG prepare from.now this-kind book more read more
'I prepare to read more of this kind of book from now on.'
(Hu *et al.* 2001, p. 364)

(16) pingguo shenzhi xiang [lian zuihou yi-ge shiti anjian]
Apple even want even last one-CL physical button
dou yao qudiao
PRT will get.rid
'Apple wanted to get rid of even the last physical button.'
(zhTenTen17 corpus)

[9] The corpus data centre on focus fronting, as the focus marker *lian* 'even' lends itself to CQL queries; there is no similar keyword for inner topicalisation.

(17) yamaxun jueding [lian zhe-ge liwai] dou buzai
Amazon decide even this-CL exception PRT no.longer
baoliu
keep
'Amazon decided not to keep even this exception.'
(zhTenTen17 corpus)

(18) duifang zhiyi [lian yunfei] dou buyao wo chu
other.party insist even shipping.fee PRT need.not 1SG pay
'The other party insisted on not needing me to pay for the shipping fee.'
(A Weibo post)[10]

(19) ni jingran gan [lian ni shifu-de hua] dou bu
you how.come dare even you master-DE word PRT not
zuncong
obey
'How dare you do not obey even your master's words?'
(zhTenTen17 corpus)

### 4.3 *Pattern C: Subject expression of partial control and inner topicalisation/focus fronting*

While partial-control verbs (e.g., *dasuan* 'intend', *zhunbei* 'prepare') usually require their embedded subject to be unexpressed, some verbs such as *jueding* 'decide' and *kewang* 'desire' allow it to be optionally expressed. When the embedded subject is expressed as an overt pronoun, its reference follows its binding condition, unlike its unexpressed counterpart, whose reference is constrained to include the matrix subject. This observation is exemplified in (20), (21), and (22).[11]

[10] https://weibo.com/1540060353/M2b7r7YOg. Accessed on 10 Jan 2023.

[11] The co-indexation in (21) and (22) was added based on the contextual information of the corpus examples.

(20) xiaoming$_{i}$ jueding/kewang {Ø$_{i+/*j}$ | tamen$_{i+/j}$} mingtian
Xiaoming decide/desire {Ø | 3PL} tomorrow
yiqi wancheng zhe-xiang gongzuo
together finish this-CL task
'Xiaoming decides/desires to finish this task together tomorrow.'/ 'Xiaoming decides/desires that they will finish this task together tomorrow.'

(21) shengwei$_{i}$ jueding ta$_{j}$ dao weinan ren
provincial.committee decide 3SG go Weinan serve
shiwei shuji
municipal.committee secretary
'The provincial party committee decided that he should go to Weinan to serve as the secretary of the municipal party committee.'
(zhTenTen17 corpus)

(22) dang ta$_{i}$ jueding ta$_{i}$ xiang hui zhengfu gongzuo shi,
when he decide he want return government work time
men dou changkai-zhe
door all open-DUR
'When he decides that he wants to return to work in the government, the door will be open.'
(zhTenTen17 corpus)

This kind of partial-control verb is subject to an additional constraint. If the displaced phrase crosses the complementation verb, its embedded subject must be unexpressed. On the other hand, if the displaced phrase remains inside the complement clause, it is acceptable for the embedded subject to be either overt or unexpressed. This is illustrated in (23).

(23) a. xiaoming [(lian) zhe-xiang gongzuo] (dou)
Xiaoming even this-CL task PRT
jueding/kewang (*tamen) dei mingtian yiqi
decide/desire they should tomorrow together
wancheng
finish
'Xiaoming decides/desires to finish (even) this task together tomorrow.'

b. xiaoming jueding/kewang (tamen) [(lian) zhe-xiang
Xiaoming decide/desire they even this-CL
gongzuo] (dou) dei mingtian yiqi wancheng
task PRT should tomorrow together finish
'Xiaoming decides/desires to finish (even) this task together tomorrow.'

Although there is a difference between the sentence pair in (23) with regard to embedded-subject expression, we are not aware of any existing study documenting this observation.

## 4.4 *Pattern D: Non-control complementation and inner topicalisation/focus fronting*

Non-control complementation verbs require their displaced phrase to reside in the complement clause, regardless of whether the embedded subject is overt or unexpressed (i.e., discourse pro-drop). This judgment has been reported in a number of studies (e.g., Ernst and Wang 1995; Grano 2015; Huang 2018; Paul 2002, 2005, 2015). (24) contains relevant examples with the non-control verbs *shuo* 'say', *xiangxin* 'believe', *renwei* 'think', *xiwang* 'hope', and *guji* 'predict'.

(24) a. *xiaoming [(lian) zhe-ben shu] (dou) shuo/xiangxin/
Xiaoming even this-CL book PRT say/believe/
renwei/xiwang/guji {$Ø_{i/j}$ | $ta_{i/j}$} hui jinkuai
think/hope/predict {Ø | 3SG} will soon
wancheng
complete
'Xiaoming says/believes/thinks/hopes/predicts he will complete (even) this book soon.'

b. xiaoming shuo/xiangxin/renwei/xiwang/guji [(lian)
Xiaoming say/believe/think/hope/predict even
zhe-ben shu] {$Ø_{i/j}$ | $ta_{i/j}$} (dou) hui jinkuai
this-CL book {Ø | 3SG} PRT will soon
wancheng
complete
'Xiaoming says/believes/thinks/hopes/predicts he will complete (even) this book soon.'

## 4.5 *Pattern E: Object control and inner topicalisation/focus fronting*

Patterns A–D apply to complementation verbs which do not select for an object, while Pattern E pertains to object-control verbs. For numerous object-control constructions, regardless of whether the verb licenses exhaustive control or partial control, it is not possible for the displaced phrase to cross the object controller and the phrase must remain inside the complement clause.[12] This pattern is exemplified in (25) and (26), which are constructed examples of inner topicalisation.

(25) a. *xiaoming [zhe-pian yanjiu baogao] pizhun/
Xiaoming this-CL research report permit/
quan/shuifu/guli/jiao/bi
try.to.persuade/persuade/encourage/ask/force
zhangsan tiqian san tian tijiao
Zhangsan in.advance three day submit
'Xiaoming permits/tries to persuade/persuades/ encourages/asks/forces Zhangsan to submit this research report three days in advance.'

b. xiaoming pizhun/quan/shuifu/guli/
Xiaoming permit/try.to.persuade/persuade/encourage/
jiao/bi zhangsan [zhe-pian yanjiu baogao]
ask/force Zhangsan this-CL research report
tiqian san tian tijiao
in.advance three day submit
'Xiaoming permits/tries to persuade/persuades/ encourages/asks/forces Zhangsan to submit this research report three days in advance.'

[12] We have noted that object-raising verbs (e.g., *xiangyao* 'want' and *rang* 'let') as well as certain object-control verbs (e.g., *pai* 'send', *yaoqing* 'invite') appear to allow the displaced phrase to be positioned in the matrix clause. See Paul 2002 for some data regarding *rang* 'let' and *pai* 'send'. Although we leave the explanation for future research, because this paper adopts a lexicalist approach to inner topicalisation and focus fronting, it is still feasible to independently formulate the relevant constraints for these individual verbs in their lexical entries to license their distinctive displacement behaviour (see Section 7).

(26) a. *xiaoming [zhe-pian yanjiu baogao] yuanliang/guai/
Xiaoming this-CL research report forgive/blame/
jinzhi zhangsan chichi bu tijiao
forbid Zhangsan delay not submit
'Xiaoming forgives/blames/forbids Zhangsan for/from delaying submitting this research report.'

b. xiaoming yuanliang/guai/jinzhi zhangsan [zhe-pian
Xiaoming forgive/blame/forbid Zhangsan this-CL
yanjiu baogao] chichi bu tijiao
research report delay not submit
'Xiaoming forgives/blames/forbids Zhangsan for/from delaying submitting this research report.'

Examples (27)–(30) are corpus examples of focus fronting, demonstrating the acceptability of having the displaced phrase inside the complement clause.[13] Among these exemplified object-control verbs, *pizhun* 'permit', *jinzhi* 'forbid', *yuanliang* 'forgive', and *guai* 'blame' exhibit exhaustive control; whereas *quan* 'try to persuade', *shuifu* 'persuade', *guli* 'encourage', *jiao* 'ask', and *bi* 'force' exhibit partial control.[14]

(27) tongcunren dou quan ta [lian shishou]
fellow.villagers all try.to.persuade 3SG even dead.body
dou bu bi yanmai
PRT not need bury
'The fellow villagers all tried to persuade him not to bury even the dead body.'
(zhTenTen17 corpus)

(28) nimen... bi wo [lian wo ge] dou bu qu jiu
2PL force 1SG even 1SG brother PRT not go save
'You all forced me not to go to save even my brother.'
(zhTenTen17 corpus)

[13] We also tried to look for counterexamples in the zhTenTen17 corpus with the displaced phrase appearing in the matrix clause for these object-control verbs, but we were not able to find relevant examples.

[14] In the general literature, control verbs such as *yuanliang* 'forgive' and *guai* 'blame' are semantically classified as factive verbs. See Landau 2000, pp. 45–46 for some cross-linguistic examples of factive verbs.

(29) ta zhouwei-de ren... guai ta [lian yi-ge ren]
3SG around-DE people blame 3SG even one-CL person
dou shoushi buliao
PRT defeat not.able.to
'The people around him blamed him for not being able to defeat even one person.'
(zhTenTen17 corpus)

(30) qing yuanliang wo [lian mingzi] dou jibuzhu
please forgive 1SG even name PRT cannot.remember
'Please forgive me for not remembering even the name.'
(zhTenTen17 corpus)

## *Additional evidence from acceptability-judgment tasks* 4.6

The above section discussed five empirical generalisations (Patterns A–E). Besides cross-checking our reported judgments with corpus data, we also conducted five acceptability-judgment tasks (AJTs) on a subset of the complementation verbs.

### Design of acceptability-judgment tasks 4.6.1

Each AJT tested one of the five generalisations. Each AJT adopted a $2 \times 2$ factorial design, generating 4 conditions, each of which had 4 lexicalisations. Thus, there were 16 ($= 4 \times 4$) test sentences for each task and, in total, 80 ($= 5 \times 16$) test sentences across the five AJTs. The test sentences were distributed across eight lists using a Latin square design for counterbalancing. Lists 1–4 contained sentences for Tasks 1, 4, and 5. Lists 5–8 contained sentences for Tasks 2, 3, and 5. Each participant received one list, containing 4 test sentences for each task ($= 12$ test sentences in total) and 13 fillers. No sentences in a list were variants of each other. The fillers were sentences of comparable syntactic complexity, displaying different degrees of acceptability. Among the fillers are constructions which should be highly acceptable and those which should be highly unacceptable. These "gold-standard" fillers were established based on a pilot run with other speakers beforehand. These fillers helped spot invalid responses to be

Table 1: 2 × 2 factorial design of Task 1 (Exhaustive Control), Task 2 (Partial Control), and Task 4 (Non-control)

| | Crossing $V_m$ | Not crossing $V_m$ |
|---|---|---|
| Focus fronting | Crossing $V_m$ + focus fronting (Condition A) | Not crossing $V_m$ + focus fronting (Condition B) |
| Inner topicalisation | Crossing $V_m$ + inner topicalisation (Condition C) | Not crossing $V_m$ + inner topicalisation (Condition D) |

discarded during data analysis.[15] All the sentences were randomised by Qualtrics, which was the survey tool used to distribute the AJTs.

Task 1 tested the generalisation that if a complementation verb licenses exhaustive control, the displaced phrase must precede the complementation verb (Pattern A). Task 2 tested the generalisation that for a partial-control verb, the displaced phrase can either precede the complementation verb or remain in the complement clause (Pattern B). Task 4 tested the generalisation that for a non-control complementation verb, the displaced phrase must remain in the complement clause (Pattern D). Table 1 presents the four testing conditions in each of the above-mentioned AJTs (Tasks 1, 2, and 4), with the displacement phenomena and positions of the displaced phrase as the independent variables. "$V_m$" stands for complementation verb.

The four conditions are exemplified in Appendix A. The conditions for Task 1 were lexicalised by the exhaustive-control verb *shefa* 'try'; those for Task 2 by the partial-control verb *xiangyao* 'want'; and those for Task 4 by the non-control verb *shuo* 'say'. These are typical verbs used in the literature to illustrate the respective (non-)control properties, making them ideal candidates for testing the hypothesised (non)-control-related displacement patterns.

Task 3 tested the generalisation that when the displaced phrase precedes a partial-control verb, the embedded subject must be unexpressed (Pattern C). Table 2 illustrates the four conditions, with the displacement phenomena and embedded-subject expression as the independent variables. The conditions are lexicalised using the partial-control verb *jueding* 'decide' (see Appendix A). All the conditions

[15] In total, the responses of 18 out of 106 participants were discarded. That means the responses of 88 participants were deemed valid responses for the subsequent data analysis.

| | SUBJ unexpressed | SUBJ expressed |
|---|---|---|
| Focus fronting | SUBJ unexpressed + focus fronting (Condition A) | SUBJ expressed + focus fronting (Condition B) |
| Inner topicalisation | SUBJ unexpressed + inner topicalisation (Condition C) | SUBJ expressed + inner topicalisation (Condition D) |

Table 2: 2×2 factorial design of Task 3 (Partial control – embedded SUBJ expression)

involved the configuration where the displaced phrase precedes the partial-control verb.

Task 5 tested the generalisation that for an object-control verb, the displaced phrase must not cross the object controller (Pattern E). Table 3 illustrates the four conditions, with the displacement phenomena and displacement positions as the independent variables. The conditions are lexicalised in Appendix A using the object-control verb *shuifu* 'persuade'.

| | Crossing OBJ controller | Not crossing OBJ controller |
|---|---|---|
| Focus fronting | Crossing OBJ controller + focus fronting (Condition A) | Not crossing OBJ controller + focus fronting (Condition B) |
| Inner topicalisation | Crossing OBJ controller + inner topicalisation (Condition C) | Not crossing OBJ controller + inner topicalisation (Condition D) |

Table 3: 2×2 factorial design of Task 5 (OBJ controller)

#### Participants and apparatus 4.6.2

The AJTs were designed as questionnaires using Qualtrics and distributed online to native Mandarin Chinese speakers. All 88 participants took part in Task 5, which was the only AJT found across Lists 1–8. Of the 88 participants, 48 of them also took part in Tasks 1 and 4, and 40 also participated in Tasks 2 and 3.[16] The participants were asked about their language background, for example, how old they

[16] We maintained a sample size of at least 37 participants per task to achieve 80% statistical power, following the calculation by Sprouse and Almeida (2012, p. 26) for medium-sized effect Likert-scale judgment tasks.

were when they started acquiring Mandarin Chinese, a self-report regarding their competence of the language, etc.[17] Participants were instructed to rate sentences on a 7-point Likert scale, accompanied by a plausible context. Clear instructions and examples were given before rating. A score of 1 indicated a completely unacceptable sentence, while a score of 7 indicated a perfectly natural sentence.

#### 4.6.3 Results and preliminary trends

The results of the five AJTs are presented in Figures 1–5 in boxplots, created by the tool BoxPlotR (Spitzer *et al.* 2014). The notches represent the 95% confidence intervals of the medians. The black crosses indicate mean ratings. The grey areas around the crosses represent the 95% confidence intervals of the means. "FF" stands for focus fronting, and "IT" for inner topicalisation.

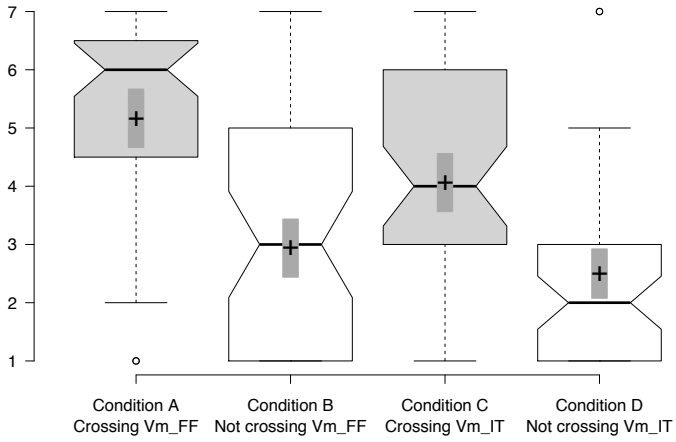



Figure 1: Results of Acceptability Judgment Task 1 (Exhaustive Control)

Based on visual inspection, the overall trends supported Patterns A to E.[18] In addition, inner topicalisation tended to receive

[17] Participants who rated their language competence as "good" and started learning Mandarin Chinese before age six were included in the study. Some studies also administer competence tests to ensure native speaker status (e.g., Huang 2021), while others appear to rely on self-reported competence (e.g., Grano and Lasnik 2018; White and Grano 2014).

[18] As noted by one of the reviewers, the spread of data indicates speaker variation, which is common in any acceptability-judgment design, and it

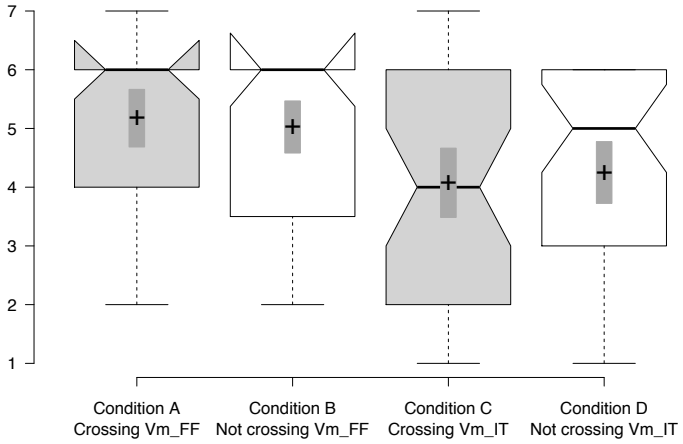



Figure 2: Results of Acceptability Judgment Task 2 (Partial Control)

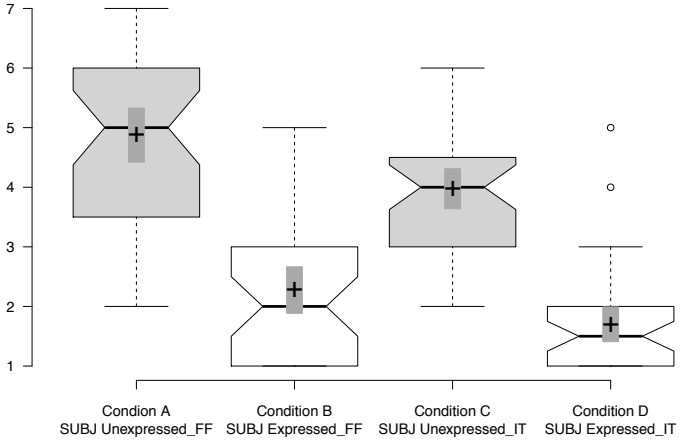



Figure 3: Results of Acceptability Judgment Task 3 (Partial Control - embedded SUBJ expression)

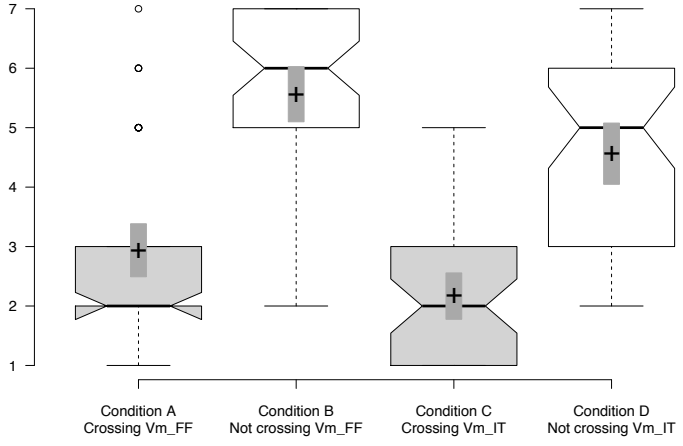



Figure 4: Results of Acceptability Judgment Task 4 (Non-control)

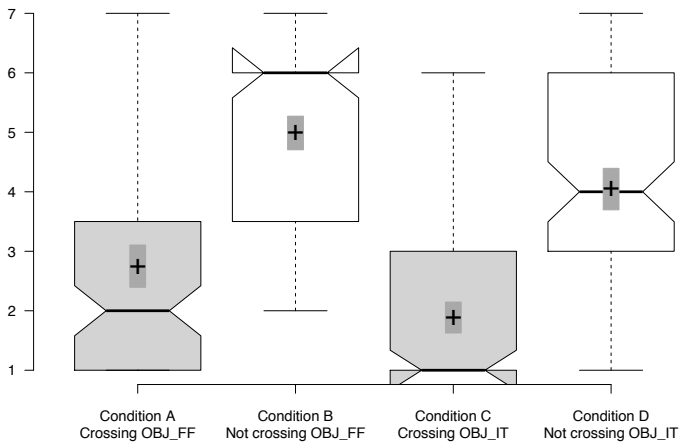



Figure 5: Results of Acceptability Judgment Task 5 (OBJ controller)

lower ratings than focus fronting in all AJTs. This observation has not been hitherto reported. Syntactic literature in general (e.g., Grano 2015; Huang 2018; Paul 2002, 2005) assumes both types to be equally acceptable by native speakers. We believe it is plausible for inner topicalisation to receive lower ratings than focus fronting in AJTs. Unlike focus fronting, inner topicalisation is not signalled by any overt markers, which means it could appear to participants as simply a construction that violates the usual SVO word order of Chinese. The fact that the AJTs were designed as written tasks could also be a reason for inner-topic constructions to be less favourably rated because inner topicalisation appears more often in the spoken form and less so in the written language, unlike focus fronting which is common in both spoken and written Chinese.[19] Despite these factors, it was still informative to compare experimental conditions of the same displacement phenomena.

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is also common to accept that native speakers of the same language can have (slightly) different mental grammars. In what follows, we will employ mixed-effects analyses to identify which factors should be regarded as statistically significant and which should not. The statistical analyses support Patterns A to E, which are accounted for in the formal LFG analysis in Section 7.

[19] As suggested by one of the reviewers, to avoid this issue, future research on inner topicalisation may adopt a speech-based design via recordings.

## 4.7 Summary of statistical analysis

We applied cumulative link mixed-effects models (ordinal regression) to analyse the results using the R package **ordinal** (Christensen 2020).[20] These models, which are also used in e.g., Huang (2021) and Bross (2019) for Likert-scale rating data, incorporated two main fixed effects: displacement positions and displacement phenomena for Tasks 1, 2, 4 and 5; and subject expression and displacement phenomena for Task 3. Random intercepts for participants and test items were included to account for random-variation effects.[21] An analysis of deviance, following Bross (2019), was conducted by fitting in each ordinal model using the R packages **RVAideMemoire** (Hervé 2022) and **car** (Fox and Weisberg 2019). The results, presented in Tables 4–13, are consistent with the predictions of the empirical generalisations (Patterns A–E). The results are consistent with the qualitative evidence examined in Sections 4.1–4.5. Future research may include a larger set of complementation verbs to be tested by AJTs using the same formats as the present study.

For Task 1, sentences with the displaced phrase remaining inside the embedded clause were rated significantly less acceptable than having the displaced phrase crossing the exhaustive-control predicate, in line with Pattern A. The analysis of deviance identified that displacement positions were a significant main effect. For Task 2, there was no significant difference in acceptability ratings between having the displaced phrase preceding vs following a partial-control predicate, although the former was rated slightly more acceptable. This result was in line with Pattern B. The analysis of deviance suggested that displacement positions were not a significant predictor of the ratings. For Task 3, constructions with an unexpressed embedded subject were significantly more acceptable than those with an expressed subject, in

[20] Following Bross (2019), we used z-transformed ratings to remove scale bias among participants. See Bross 2019, pp. 28–27 for a demonstration of how this step may help remove scale bias in a cumulative link mixed-effects model.

[21] Like Huang (2021), we tested and dismissed more complicated models that included random slopes and intercepts because they produced more random effects than data points, resulting in an insufficient number of observations to support the models.

line with Pattern C. An analysis of deviance indicated that embedded subject overtness was a significant main effect. For Task 4, the test sentences where the displaced phrase resides inside the complement clause were rated significantly more acceptable than those with the displaced phrase crossing the complementation verb, in line with Pattern D. An analysis of deviance revealed that displacement positions were a significant main effect. For Task 5, those constructions with the displaced phrase remaining inside the complement clause were rated to be significantly more acceptable than those with the displaced phrase crossing the object controller, in line with Pattern E. An analysis of deviance revealed that displacement positions were a statistically significant predictor.

Table 4: Mixed-effects regression analysis for Task 1 (Exhaustive Control)

*Crossing $V_m$ and focus fronting as reference levels*

| Condition | Estimate | Std error | z | p |
|---|---|---|---|---|
| *Displacement positions* Not crossing $V_m$ | −2.3920 | 0.3033 | −7.886 | 3.11e-15 *** |
| *Displacement phenomena* Inner topicalisation | −0.9706 | 0.2670 | −3.635 | 0.000278 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 5: Analysis of deviance (Type II tests) for Task 1 (Exhaustive Control)

| | LR Chisq | Df | p |
|---|---|---|---|
| *Displacement positions* | 22.1972 | 1 | 2.46e-06 *** |
| *Displacement phenomena* | 7.7119 | 1 | 0.005486 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 6: Mixed-effects regression analysis for Task 2 (Partial Control)

*Crossing $V_m$ and focus fronting as reference levels*

| Condition | Estimate | Std error | z | p |
|---|---|---|---|---|
| *Displacement positions* Not crossing $V_m$ | −0.009257 | 0.2791 | −0.033 | 0.974 |
| *Displacement phenomena* Inner topicalisation | −1.143342 | 0.2908 | −3.931 | 8.46e-05 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

| | LR Chisq | Df | p |
|---|---|---|---|
| *Displacement positions* | 0.0014 | 1 | 0.969894 |
| *Displacement phenomena* | 9.4589 | 1 | 0.002101 ** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 7: Analysis of deviance (Type II tests) for Task 2 (Partial Control)

*SUBJ expressed and focus fronting as reference levels*

| Condition | Estimate | Std error | z | p |
|---|---|---|---|---|
| *SUBJ expression* SUBJ unexpressed | 4.3567 | 0.4470 | 9.746 | < 2e-16 *** |
| *Displacement phenomena* Inner topicalisation | −1.3669 | 0.2943 | −4.645 | 3.41e-06 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 8: Mixed-effects regression analysis for Task 3 (Partial Control – SUBJ expression)

| | LR Chisq | Df | p |
|---|---|---|---|
| *SUBJ expression* | 32.929 | 1 | 9.56e-09 *** |
| *Displacement phenomena* | 10.497 | 1 | 0.001196 ** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 9: Analysis of deviance (Type II tests) for Task 3 (Partial Control – SUBJ expression)

*Crossing $V_m$ and focus fronting as reference levels*

| Condition | Estimate | Std error | z | p |
|---|---|---|---|---|
| *Displacement positions* Not crossing $V_m$ | 3.3942 | 0.3572 | 9.503 | < 2e-16 *** |
| *Displacement phenomena* Inner topicalisation | −1.2781 | 0.2680 | −4.768 | 1.86e-06 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 10: Mixed-effects regression analysis for Task 4 (Non-control)

| | LR Chisq | Df | p |
|---|---|---|---|
| *Displacement positions* | 43.718 | 1 | 3.793e-11 *** |
| *Displacement phenomena* | 12.961 | 1 | 0.000318 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 11: Analysis of deviance (Type II tests) for Task 4 (Non-control)

Table 12: Mixed-effects regression analysis for Task 5 (OBJ controller)

*Crossing OBJ controller and focus fronting as reference levels*

| Condition | Estimate | Std error | z | p |
|---|---|---|---|---|
| *Displacement positions* Not crossing OBJ controller | 2.7767 | 0.3604 | 7.704 | 1.32e-14 *** |
| *Displacement phenomena* Inner topicalisation | −1.1447 | 0.2508 | −4.564 | 5.03e-06 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

Table 13: Analysis of deviance (Type II tests) for Task 5 (OBJ controller)

| | LR Chisq | Df | p |
|---|---|---|---|
| *Displacement positions* | 42.627 | 1 | 6.624e-11 *** |
| *Displacement phenomena* | 14.491 | 1 | 0.0001408 *** |

*Significance level: '***' 0.001 '**' 0.01 '*' 0.05*

# 5 PRE-THEORETICAL INSIGHTS OF ICH SIGNATURE AND A LEXICALIST APPROACH TO BRIDGE VERBS

Wurmbrand and Lohninger (2019) identify three types of complementation that are cross-linguistically available, namely, Proposition (*claim*-type), Situation (*decide*-type) and Event (*try*-type). Proposition complements typically involve speech and epistemic contexts; Situation complements are typically related to emotive and irrealis contexts; and Event complements typically involve implicative and strong attempt contexts. These three types of complementation form the Implicational Complementation Hierarchy (ICH). The Proposition complement is ranked as the most independent/least transparent among the three, whereas the Event complement is regarded as the least independent/most transparent. According to Wurmbrand and Lohninger (2019, pp. 5–6), "independence" is manifested by properties such as the interpretation and overtness of an embedded subject, while "transparency" is signalled by the permeability for dependency relations.

ICH relates to control relations: Event-complements often involve exhaustive-control verbs (e.g., *try*, *manage*); Situation-complements

often involve partial-control verbs (e.g., *decide*, *want*); and Proposition-complements often involve non-control verbs (e.g., *claim*, *say*). Applying ICH's characteristic of "independence" to control relations, exhaustive control exhibits the lowest degree of independence by enforcing strict coreference between the controller and controllee. Also, cross-linguistically, exhaustive-control verbs often require the embedded subject to be unexpressed (see, e.g., Stiebels 2007). Non-control relation signals the highest degree of independence by allowing the embedded subject to be freely interpretable. Partial control occupies the middle ground, with the controller and controllee forming a subset relation. Applying ICH's notion of "transparency" to inner topicalisation and focus fronting, obligatory displacement of inner topic/focused phrase into the matrix clause manifests the highest degree of permeability of displacement-dependency relation across the clausal boundary, while obligatory retainment of inner topic/focused phrase in the complement clause signals the lowest degree of permeability.

Wurmbrand and Lohninger (2019) discusses the ICH Signature, which governs the distribution of a property across the three complementation types. According to the ICH Signature, when a property (P) distinguishes among the three types of complements, the Proposition complement and Event complement illustrate opposite values, whereas the Situation complement either allows both values or sides with one of them. By examining a range of cross-linguistic patterns pertinent to complementation (e.g., finiteness, clitic climbing, complementiser distribution), Wurmbrand and Lohninger (2019) conclude that there are important universal hierarchical effects: in a given language, if the Situation complement possesses a transparency property, the Event complement will also possess it; if the Proposition complement possesses a transparency property, both Situation complement and Event complement will also possess it. Placing inner topicalisation and focus fronting in the wider picture of ICH, our observed empirical patterns (Patterns A, B and D) align with the predictions of the ICH Signature. Focusing on subject control, Table 14 illustrates the alignment patterns, with "P" standing for a transparency property.

Patterns A to E essentially suggest that inner topicalisation and focus fronting correlate with complement control – a lexically determined phenomenon from the perspective of LFG (Bresnan 1982; Bres-

Table 14: ICH Signature (Wurmbrand and Lohninger 2019), control relations, and Chinese inner topicalisation / focus fronting

| | Proposition (*claim*-type) | Situation (*decide*-type) | Event (*try*-type) |
|---|---|---|---|
| | most independent ⟷ least independent<br>least transparent ⟷ most transparent | | |
| ICH Signature | −P | ±P | +P |
| Control relation | Non-control | Partial control | Exhaustive control |
| Inner Top. / Focus Front. | Not crossing $V_m$ | Crossing $V_m$ or not crossing $V_m$ | Crossing $V_m$ |

nan *et al.* 2016; Dalrymple *et al.* 2019). Another displacement phenomenon – the "bridge-verb effect" (Erteschik 1973) – is also known to be lexically determined in the LFG literature. This phenomenon sheds light on the issues at hand. In English, bridge verbs (e.g., *say*, *think*, *report*, *announce*) are said to allow extraction out of their clausal complement in contrast to non-bridge verbs (e.g., *whisper*, *stammer*, *dictate*, *snarl*), whose complement clause forms an island impermeable to extraction, as exemplified in (31):

(31) a. Thomas, we said/thought that Sarah saw.
b. *Thomas, we whispered/stammered that Sarah saw.

The bridge-verb effect has been analysed in different ways: some approach it from the perspective of information structure (e.g., Ambridge and Goldberg 2008), and some from the perspective of verb frequency (e.g., Liu *et al.* 2022), etc.[22] In LFG, the bridge-verb effect has been analysed syntactically using a lexicalist mechanism (Butt *et al.* 1999; Dalrymple *et al.* 2019). Dalrymple *et al.* (2019, pp. 226–227) propose that the distinction between bridge and non-bridge verbs should not be reflected in the grammatical function of their complement clause; instead, some additional feature is lexically imposed by the non-bridge verb on its functional structure. The feature interacts with a mathematically well-defined extraction formula encoded on a phrase-structural rule to render its complement clause an unextractable island. While more will be said about the LFG formalism,

[22] See Huang *et al.* (2022) for an experimental evaluation of some of these non-syntactic approaches.

what is important to note here is that LFG's approach to the bridge-verb effect is a lexicalist proposal which does not hypothesise any clause-size differences in the complement clause; rather, the effect is directly regulated by the verb. This captures the basic insight that the differences between (31a) and (31b) lie in the differences of the complementation verbs, rather than the size of their complement clause.

LFG's approach to the bridge-verb effect has offered insights into how we can model the interaction between complement control and inner topicalisation/focus fronting. Section 7 will demonstrate how LFG's bridge-verb mechanism can be incorporated into the modelling of inner topicalisation/focus fronting, enabling the complementation verb to regulate displacement patterns directly without positing any clause-size distinctions in the complement clause, contra restructuring proposals. Before then, note that we will deal with a tripartite distinction of extraction patterns (rather than a bipartite one): (i) the displaced phrase crossing the matrix predicate; (ii) the displaced phrase remaining in the complement clause; (iii) the displaced phrase either crossing the matrix predicate or remaining in the complement clause. Simply assigning a bridging feature cannot capture the tripartite distinction, so some additional formal mechanism will be needed.

The next section will briefly introduce the LFG formalism as well as how LFG handles control. Section 7 will devise a formal LFG mechanism to model inner topicalisation and focus fronting.

## 6 LFG: FORMALISM, CONTROL, AND BRIDGE-VERB MECHANISM

LFG is a constraint-based formal grammatical theory, first developed by Joan Bresnan and Ronald Kaplan in the 1970s (Kaplan and Bresnan 1982). This formalism is presented in detail by e.g., Bresnan *et al.* 2016 and Dalrymple *et al.* 2019. Of crucial importance is the idea of a parallel architecture, where different types of linguistic information are represented as distinct formal structures with their own notations, interrelated by projection functions.

This paper focuses on two formal structures: the constituent structure (c-structure) and functional structure (f-structure), which are syntactic structures. The c-structure takes the form of a labelled tree to encode constituency, dominance, and linear order. A c-structure is formed by phrase-structure rules, which loosely observe a version of the X'-theory (Jackendoff 1977; see also Bresnan *et al.* 2016, pp. 101–111).[23] The f-structure takes the form of an attribute-value matrix, encoding grammatical functions (e.g., subject SUBJ, object OBJ, adjunct ADJ) and features (e.g., person, number, tense, aspect). The c- and f-structures are related by a projection function, mapping c-structural nodes to their corresponding f-structures. The f-structure is built up using the functional information encoded in annotated c-structural rules and lexical entries. See, e.g., Bresnan *et al.* (2016, pp. 54–58) for the solution algorithm for building up the f-structure, which we will skip here. The f-structure is the locus of explanation for control relations.

Since Bresnan 1982, LFG has assumed two main model-theoretic control mechanisms, namely functional control and anaphoric control (see also Andrews 1982; Bresnan *et al.* 2016, pp. 286–323; Dalrymple *et al.* 2019, pp. 545–601; Mohanan 1983). Functional control involves f-structural identity such that the controller and controllee share the same f-structure; on the other hand, in anaphoric control, the controllee is represented as a pronominal entity which is syntactically independent of the controller. A number of LFG studies represent exhaustive control as functional control (e.g., Asudeh 2005; Bresnan 1982; Bresnan *et al.* 2016), where the complete identity between the controller and controllee is attributed to a structure-sharing mechanism. We will follow this approach in this paper (see Section 7).[24] Regarding partial control, past research differs on whether partial control should be represented as functional control (Asudeh 2005) or a subtype of anaphoric control known as "quasi-obligatory anaphoric

[23] See also Lowe and Lovestrand (2020) for an alternative LFG phrase-structure theory that incorporates insights from Bare Phrase Structure. This paper will stick to the version of X'-theory commonly found in LFG studies.

[24] An alternative view is that exhaustive control involves obligatory anaphoric control (Dalrymple *et al.* 2019, pp. 545–601), where the enforced identity between the controller and controllee is attributed to a semantic constraint.

control" (Haug 2013, 2014). Both proposals involve some semantic constraints for modelling partial coreference. Asudeh (2005, p. 504) incorporates a subsumption operator in the predicate-logic side of a partial-control verb's meaning constructor to capture the relation between the controller and controllee, specifying that the controller is either semantically the same as or part of the controllee. Haug (2013) posits a semantic locality constraint, capturing the nature of control as a logophoric-binding relation between the controller (logocentre) and controllee (logophor). Haug's (2013) proposal has been adopted by Dalrymple *et al.* (2019).[25] In this paper, we will adopt an anaphoric-control approach to model partial control, aligning us more with Haug (2013). However, because this paper focuses on syntactic structures, we will skip semantic constraints in the analysis. As will be shown in Section 7.3, our anaphoric approach to partial control includes two attribute-value pairs, <P_CONTROL, CONTROLLER> and <P_CONTROL, CONTROLLEE>, in the f-structure to clearly indicate which grammatical function serves as the controller and which serves as the controllee. Note that while these attribute-value pairs are useful indicators of partial control, the actual modelling of the partial conference (where the entity denoted by the controller is a subset of the entities denoted by the controllee) takes place in the semantics as discussed by Haug (2013), from which we have abstracted away due to the syntactic focus of this paper.[26]

[25] Since Dalrymple *et al.* (2019) also treat exhaustive control as a type of anaphoric control, they regard both exhaustive control and partial control as anaphoric in the f-structure but differ significantly in the formal semantics to capture the different empirical properties embodied by these two control types. In other words, in LFG, it is theoretically possible to treat both control types uniformly in the syntax and model their differences in the semantics. That being said, Lam (2023) draws on in-depth empirical data and argues that, even within the exhaustive-control class in Chinese, not all of the verbs can be said to behave the same syntactically; while some involve functional control, others are best analysed as involving anaphoric control. This paper will not go into such details.

[26] In Section 7, the P_CONTROL attribute will be useful in stating implicational constraints for partial control scenarios when we devise a template for all Chinese complementation verbs.

As was mentioned previously, our proposal assimilates LFG's bridge-verb mechanism. In Dalrymple *et al.* 2019, pp. 226–228, non-bridge verbs specify that their complement clause contains the attribute-value pair $<\textsc{ldd}, ->$ (where LDD stands for "long-distance dependency"). The extraction formula for long-distance dependency, which is encoded on a phrase-structure rule, imposes a condition on the extraction path such that the path must not contain $<\textsc{ldd}, ->$. Example (33) contains the lexical entry of the non-bridge verb *stammer*, an ill-formed sentence of *stammer*, and its invalid f-structure. DIS is the displacement function and its value is a set, whose member is related to the embedded OBJ inside the complement-clause function COMP (both notated by the same boxed number); as such, the f-structure models the topicalisation of the embedded OBJ *Thomas* to the matrix-clause level.[27] Example (32) shows the extraction path ($f$ COMP OBJ) for the topicalisation of *Thomas* in (33), where $f$ is the outermost f-structure, relating the topicalised phrase to the embedded OBJ function.

(32) The extraction path for (33) with an off-path constraint is
$(f \underset{(\rightarrow \textsc{ldd}) \neq -}{\textsc{comp}}\ \textsc{obj})$

(33) **Thomas, we stammered that Sarah saw.*
The lexical entry of *stammer* is:

*stammer* V $(\uparrow \textsc{pred}) = \text{`}\textsc{stammer}<\textsc{subj}, \textsc{comp}>\text{'}$
$(\uparrow \textsc{comp}\ \textsc{ldd}) = -$

Its invalid f-structure is:

$$f\begin{bmatrix} \textsc{dis} & \left\{\boxed{1}\begin{bmatrix}\textsc{pred} & \text{`}\textsc{thomas}\text{'}\end{bmatrix}\right\} \\ \textsc{pred} & \text{`}\textsc{stammer}<\textsc{subj}, \textsc{comp}>\text{'} \\ \textsc{subj} & \begin{bmatrix}\textsc{pred} & \text{`}\textsc{pro}\text{'}\end{bmatrix} \\ \textsc{comp} & \begin{bmatrix} \textsc{pred} & \text{`}\textsc{see}<\textsc{subj}, \textsc{obj}>\text{'} \\ \textsc{subj} & [\textsc{pred}\ \text{`}\textsc{sarah}\text{'}] \\ \textsc{obj} & \boxed{1} \\ \textsc{ldd} & - \end{bmatrix} \end{bmatrix}$$

[27] There are two clausal functions in LFG. COMP is a closed clausal function used in anaphoric control. XCOMP is an open clausal function associated with functional control (Section 7.2).

Encoded beneath the extraction path is the negative off-path constraint $(\rightarrow \text{LDD}) \neq -$, whose right arrow stands for the value of the attribute COMP.[28] The off-path constraint forbids COMP from containing $<\text{LDD}, ->$. The f-structure in (33) cannot satisfy this off-path constraint since its COMP contains $<\text{LDD}, ->$, specified by the lexical entry of *stammer* in (33).

In the next section, we will see how the bridge-verb mechanism can be incorporated to model the interaction among control, inner topicalisation, and focus fronting.

## 7 LFG FORMAL ANALYSIS OF INNER TOPICALISATION AND FOCUS FRONTING

This section will provide a formal LFG analysis of inner topicalisation and focus fronting, capturing their interaction with control and complementation. It is a non-movement and lexicalist analysis, placing emphasis on the role of the lexicon in governing the patterns. This is in contrast to past restructuring proposals, which rely on clause-sized differences that are not supported by independent syntactic evidence. The analysis assimilates LFG's bridge-verb mechanism (Section 6) and involves the lexicon introducing the feature PS_LDD (acronym for "Post-Subject (position) Long-Distance Dependency"), which is reminiscent of Dalrymple *et al.*'s (2019) LDD bridging feature. The interaction between the PS_LDD bridging feature and an annotated phrase-structural rule provides the formal means for the embedded object to appear in the matrix clause while keeping the clausal boundary intact in both c- and f-structures. Additional formal devices will be employed to obtain the tripartite distinction discussed in Section 5.[29]

[28] See Dalrymple *et al.* e.g., 2019, pp. 225–230 and Börjars *et al.* 2019, p. 145 for more information on how to use off-path constraints.

[29] Our constraint-based model characterises a binary distinction between "grammatical" and "ungrammatical" structures, similar to many theoretical linguistic analyses, rather than a gradient distinction that may be more closely matched with the gradient ratings gathered from the native speakers in the acceptability-judgment tasks. In fact, it remains a debatable issue in the field of

## 7.1 *Phrase-structural rules with functional annotations*

Our formal grammar contains, among others, several phrase-structural rule sets listed in (34) to (37) that are particularly relevant to modelling inner topicalisation and focus fronting. These rules are annotated with functional constraints.[30]

(34) **IP and I′ rules**

$$\text{IP} \rightarrow \left( \begin{array}{c} \text{DP} \\ (\uparrow \textsc{subj}) = \downarrow \end{array} \right) \begin{array}{c} \text{I}' \\ \uparrow = \downarrow \end{array}$$

$$\text{I}' \rightarrow \left\{ \begin{array}{ccc} \text{DP} & & \\ \downarrow \in (\uparrow \textsc{dis}) & \text{I}' & \\ \textsc{ps\_ldd-path} & \uparrow = \downarrow & \end{array} \;\middle|\; \left( \begin{array}{c} \text{I} \\ \uparrow = \downarrow \end{array} \right) \begin{array}{c} \text{VP} \\ \uparrow = \downarrow \end{array} \right\}$$

$$\textsc{ps\_ldd-path} \equiv \underset{(\rightarrow \textsc{ps\_ldd}) =_{\mathbf{c}} +}{(\uparrow (\{\textsc{xcomp}|\textsc{comp}\}\{\textsc{xcomp}|\textsc{comp}\}^{*}) \textsc{obj}) = \downarrow}$$

(35) **Complex-category $\text{IP}_{[-\text{PS\_LDD}]}$ and $\text{I}'_{[-\text{PS\_LDD}]}$ rules**

$$\text{IP}_{[-\text{PS\_LDD}]} \rightarrow \begin{array}{c} \text{I}'_{[-\text{PS\_LDD}]} \\ \uparrow = \downarrow \end{array}$$

$$\text{I}'_{[-\text{PS\_LDD}]} \rightarrow \left( \begin{array}{c} \text{I} \\ \uparrow = \downarrow \end{array} \right) \begin{array}{c} \text{VP} \\ \uparrow = \downarrow \end{array}$$

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experimental syntax whether recognising acceptability judgment as a gradient factor in empirical experiments entails accepting grammaticality as a gradient notion in formal language modelling. See, e.g., Goodall 2021a. From the perspective of Bader and Häussler (2010, p. 276), while it is one thing to accept the gradience of acceptability judgments, it is another thing to accept the notion of gradient grammaticality. That being said, in our acceptability-judgment tasks, we employed experimental paradigms that enabled us to measure whether a potential governing factor is statistically significant or not based on p-values. Such decisions of statistical significance are also binary in nature. Another oft-mentioned issue in experimental syntax is the difference between "grammaticality" and "acceptability". A discussion about this issue can be found in Goodall 2021b.

[30] We follow the approach in Dalrymple *et al.* 2019, where the constituents on the right-hand side of a phrase-structural rule are not by default optional and any optionality of constituents is marked by parentheses (…). Curly brackets indicate a disjunction of phrase-structure categories with the possibilities separated by a vertical bar {…|…}.

(36) **VP and V′ rules**[31]

$$\begin{aligned}
\text{VP} \quad &\rightarrow \quad \begin{matrix}\text{V}'\\ \uparrow{=}\downarrow\end{matrix}\\
\text{V}' \quad &\rightarrow \quad \left\{\left\{\begin{matrix}\text{PRT}\\ \uparrow{=}\downarrow\end{matrix} \;\middle|\; \begin{matrix}\text{AdvP}\\ \downarrow\in(\uparrow \text{ADJ})\end{matrix}\right\} \begin{matrix}\text{V}'\\ \uparrow{=}\downarrow\end{matrix}\right.\\
&\left.\middle|\; \begin{matrix}\text{V}\\ \uparrow{=}\downarrow\end{matrix} \left(\begin{matrix}\text{DP}\\ (\uparrow \text{OBJ})=\downarrow\end{matrix}\right)\left(\left\{\begin{matrix}\text{IP}\\ (\uparrow \{\text{XCOMP}|\text{COMP}\})=\downarrow\end{matrix} \;\middle|\; \begin{matrix}\text{IP}_{[-\text{PS_LDD}]}\\ (\uparrow \text{XCOMP})=\downarrow\end{matrix}\right\}\right)\right.
\end{aligned}$$

(37) **DP-adjoining rule**

$$\text{DP} \quad \rightarrow \quad \begin{matrix}\text{AdvP} & \text{DP}\\ (\uparrow \text{SPEC})=\downarrow & \uparrow{=}\downarrow\end{matrix}$$

Rule set (34) contains an I′-adjoining rule licensing the structural position where an inner topic or focused phrase (bearing the DP category) surfaces.[32] Chinese SUBJ in general occupies a pre-verbal position (see e.g., Li and Thompson 1989). With SUBJ being associated with the Spec-IP position (see e.g., Che and Bodomo 2018; Her 2009), an inner topic or focused phrase (lower than matrix subject but above the matrix predicate) is adjoined to I′. Although external topicalisation is not the issue here, further evidence that a Chinese inner topic or focused phrase occupies a position within the IP domain (rather than the CP domain) can be adduced from the structural position of external topicalisation inside a complement clause. According to Bresnan *et al.* (2016, pp. 16–17) and Dalrymple *et al.* (2019, p. 659), an English (external) topic inside the complement clause is adjoined to IP as is derived from the pattern in (38a), where the topic *Chris* appears after the complementiser *that* and before the embedded subject *we* rather than preceding the complementiser; thus, motivating an IP-adjoining position rather than the Spec-CP position.

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[31] The V′ rule contains both disjunctive and optional phrase-structure categories. As such, V′ is capable of branching into one of the following: (i) PRT V′; (ii) AdvP V′; (iii) V; (iv) V DP; (v) V IP; (vi) V $\text{IP}_{[-\text{PS\_LDD}]}$; (vii) V DP IP; (viii) V DP $\text{IP}_{[-\text{PS\_LDD}]}$.

[32] In this paper, we assume that Chinese nominal phrases are DPs rather than NPs. See Börjars *et al.* 2018 and Her 2012 for further discussion on the internal structure of Chinese nominal phrases from LFG perspectives.

(38) a. Matty thinks that [Chris] we like.
(Dalrymple *et al.* 2019, p. 659)

b. xiaoming renwei shuo [zhe-ben shu] ta hui xihuan
Xiaoming think COMP this-CL book 3SG will like
'Xiaoming thinks that he will like this book.'

c. xiaoming renwei shuo ta [zhe-ben shu] hui xihuan
Xiaoming think COMP 3SG this-CL book will like
'Xiaoming thinks that he will like this book.'

Likewise, as shown in (38b), a Chinese external topic inside the complement clause appears after the complementiser *shuo* and before the embedded subject *ta* 'he' rather than preceding the complementiser. Thus, the Chinese external topic should also be placed in an IP-adjoining position rather than the Spec-CP position. As the external-topic position is associated with the IP domain, this in turn suggests that a Chinese inner topic (or focused phrase) should not be analysed as belonging to the higher CP domain.[33] Assuming that a modal auxiliary occupies the I position, given that the inner topic in (38c) precedes the future modal *hui* 'will', it must occur in the IP domain (above I) rather than the lower VP domain.[34] Therefore, in our treatment, Chinese external topic, subject, inner topic and focused phrase are all constituents of the IP domain.

Encoded below DP of the I′-adjoining rule in (34) are two lines of functional annotation. The first line states that the f-structure corresponding to DP maps onto a member of the DIS set in the f-structure. DIS is adopted from Dalrymple *et al.* 2019, p. 37 as a function of long-distance dependency borne by a fronted phrase. Any member of DIS must be integrated into an f-structure built up around a predicate via f-structural sharing (or anaphoric binding), establishing a dependency relationship between a member of DIS and a within-clause function. This formal setup is governed by a well-formedness principle – the

[33] Our approach differs from Paul's (2002; 2005) regarding the functional projections for hosting topic and focused phrases. Working in a different analytic framework, Paul's (2002; 2005) phrase-structural treatment is different from the LFG phrase-structure theory adopted in our paper.

[34] We differ from Ernst and Wang's (1995) proposal where an inner topic is adjoined to VP.

"Extended Coherence condition" (Zaenen 1980; see also Bresnan *et al.* 2016, pp. 62–63; Dalrymple *et al.* 2019, p. 653). The second line contains an extraction formula PS_LDD-PATH, which presides over a set of possible paths through the f-structure to the within-clause function (OBJ) of the displaced phrase. The asterisk * in the path is a Kleene star operator, indicating that there can be zero to infinite instances of XCOMP or COMP. Here, functional uncertainty is invoked to capture the different possibilities. The formal definition of functional uncertainty is cited from Kaplan and Zaenen 1989, p. 147:

(39) Functional uncertainty
Suppose $\alpha$ is a (possibly infinite) set of strings. $(f\,\alpha) = v$ holds if and only if $((f\,s)\,\mathrm{Suff}(s, \alpha)) = v$ for some symbol $s$, where $\mathrm{Suff}(s, \alpha)$ is a set of suffix strings $y$ such that $sy \in \alpha$.

Applying this definition to PS_LDD-PATH, a possible extraction path is one of the potentially infinite elements in the set {OBJ, XCOMP OBJ, COMP OBJ, XCOMP COMP OBJ, COMP XCOMP OBJ, XCOMP COMP XCOMP OBJ…}, where each of the possible paths must end with OBJ – the within-clause function borne by the displaced phrase. Note that if the path starts with a clausal function (either XCOMP or COMP), the f-structure of this function must contain the attribute-value pair <PS_LDD, +>, which is the bridging attribute-value pair for licensing the extraction of an inner topic or focused phrase into the matrix clause. This requirement is imposed via an off-path constraint $(\rightarrow \text{PS\_LDD}) =_c +$ on the beginning clausal function of the extraction formula PS_LDD-PATH but does not apply to any subsequent clausal functions. From Section 7.2 onwards, we will see how the extraction formula works with language examples.

Note that there is a competing version of PS_LDD-PATH as shown in (40), where each of the clausal functions (if any) has to satisfy the off-path equation $(\rightarrow \text{PS\_LDD}) =_c +$. Based on the data from Section 7.2 to Section 7.5, it is not possible to reject this competing version. However, when we proceed to complex-level embedding in Section 7.7, there is evidence to adjudicate that the extraction formula in (34) is the correct one.

(40) A competing (but incorrect) version of PS_LDD-PATH

$$\text{PS\_LDD-PATH} \quad \equiv \quad (\uparrow \{\text{XCOMP}|\text{COMP}\}^* \text{ OBJ}) =\downarrow \quad (\rightarrow \text{PS\_LDD}) =_c +$$

Rule set (35) contains the complex category $IP_{[-PS\_LDD]}$ and a set of its associated c-structural rules.[35] There is no I′-adjoining rule available inside the set of $IP_{[-PS\_LDD]}$-associated rules. Because an I′-adjoining rule is essential for licencing the structural position of an inner topic or focused phrase, the absence of this rule would render the formal grammar incapable of parsing a sentence where the inner topic or focused phrase appears inside the $IP_{[-PS\_LDD]}$ domain; thus, such a sentence is flagged as ungrammatical. As will be discussed in Section 7.2, the $IP_{[-PS\_LDD]}$-associated rules are essential for the displacement patterns of exhaustive subject control verbs.

In focus fronting, because a focused phrase is introduced by a focus marker such as *lian* 'even', there needs to be an additional AdvP node for the marker, whose structural position is licensed by the DP-adjoining rule in (37). Given the functional annotation (↑ SPEC) =↓ on the AdvP node, the f-structure associated with its parent's node DP contains the feature SPEC. In LFG, a SPEC feature is reserved for elements in a nominal phrase which carry "specifying" properties rather than serving modifying purposes (Dalrymple *et al.* 2019, pp. 83–84). The focus marker *lian* 'even' serves the purpose of specifying that a phrase is a focused phrase in addition to any modifying meaning it may add.

## 7.2 *Exhaustive subject control (Pattern A)*

As an illustration, (41) displays the lexical entry of the exhaustive-control verb *shefa* 'try', instantiating functional control. (↑ SUBJ) = (↑ XCOMP SUBJ) is the functional-control equation, stating that the matrix subject and the subject in the complement clause XCOMP share the same f-structure. The lexical entry contains some crucial constraints responsible for the verb's behaviour in inner topicalisation and focus fronting. *Shefa* 'try' assigns the bridging attribute-value pair <PS_LDD, +> such that it is possible to extract the displaced phrase into the matrix clause. It is important to prevent the displaced phrase from residing in the complement clause. CAT((↑ XCOMP), $\{IP_{[-PS\_LDD]}\}$) achieves this. To understand this constraint, note that, in LFG, subcategorisation requirements are stated

[35] Complex categories are detailed in e.g., Dalrymple *et al.* 2019, p. 250.

in f-structural terms (e.g., a verb subcategorising for SUBJ, OBJ, etc.). That being said, it is possible to impose c-structural categorical requirements on the f-structure of a grammatical function. For example, *shefa* 'try' subcategorises for XCOMP as its complement clause. The constraint CAT((↑ XCOMP), {$\text{IP}_{[-\text{PS\_LDD}]}$}) uses the CAT predicate to impose a categorical requirement on the f-structure of this XCOMP such that the category of one of the nodes is constrained to be $\text{IP}_{[-\text{PS\_LDD}]}$. The formal definition of the CAT predicate is cited from Dalrymple *et al.* 2019, p. 250 (see also Crouch *et al.* 2011), using LFG's projection architecture:

(41) Lexical entry of *shefa* 'try':
*shefa* 'try' V (↑ PRED) = 'TRY < SUBJ, XCOMP > '
(↑ SUBJ) = (↑ XCOMP SUBJ)
(↑ XCOMP PS_LDD) = +
CAT((↑ XCOMP), {$\text{IP}_{[-\text{PS\_LDD}]}$})

(42) CAT predicate
CAT($f$, C) if and only if $\exists n \in \phi^{-1}(f)$: $\lambda(n) \in$ C
CAT($f$, C) is true if and only if there is some node $n$ that corresponds to $f$ via the inverse $\phi$ correspondence ($\phi^{-1}$) whose label ($\lambda$) is in the set of categories.

The set of $\text{IP}_{[-\text{PS\_LDD}]}$ rules with the CAT predicate means that *shefa* 'try' is forced to select for a complement clause of the $\text{IP}_{[-\text{PS\_LDD}]}$ category, whose domain cannot host an inner topic or focused phrase. In other words, the only structural position for its inner topic or focused phrase is the I′-adjoining position in the matrix clause.

Sentence (43) is an example of *shefa* 'try'.

(43) $\text{xiaoming}_{\text{i}}$ [zhe-xiang gongzuo] shefa $\text{Ø}_{\text{i}/*\text{j}}$ (jinkuai) wancheng
Xiaoming this-CL task try Ø soon finish
'Xiaoming tries to finish this task soon.'

Parsing this sentence will result in the c-structure in Figure 6 and f-structure (44), where for simplicity we have omitted any adjuncts.

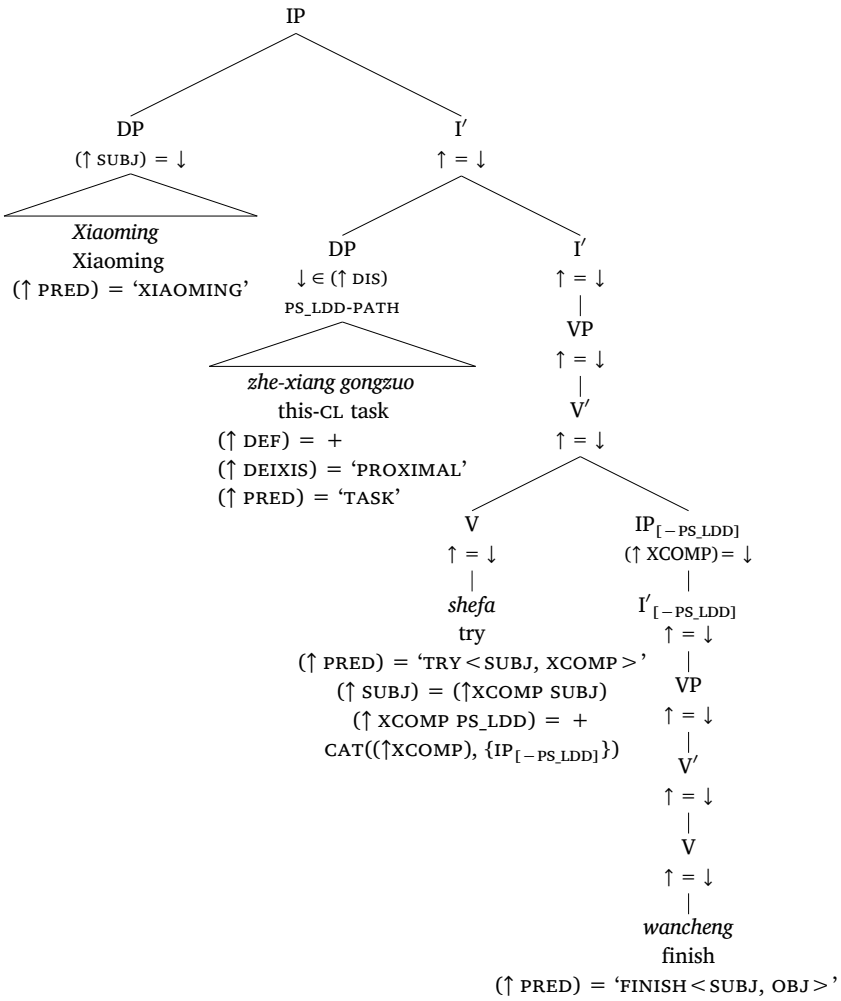


Figure 6: C-structure of sentence (43)

(44)
$$f\left[\begin{array}{ll}\textsc{pred} & \text{`}\textsc{try}<\textsc{subj, xcomp}>\text{'}\\ \textsc{dis} & \left\{\boxed{1}\left[\begin{array}{ll}\textsc{pred} & \text{`}\textsc{task}\text{'}\\ \textsc{def} & +\\ \textsc{deixis} & \textsc{proximal}\end{array}\right]\right\}\\ \textsc{subj} & \boxed{2}\left[\textsc{pred}\quad \text{`}\textsc{xiaoming}\text{'}\right]\\ \textsc{xcomp} & \left[\begin{array}{ll}\textsc{pred} & \text{`}\textsc{finish}<\textsc{subj, obj}>\text{'}\\ \textsc{subj} & \boxed{2}\\ \textsc{obj} & \boxed{1}\\ \textsc{ps\_ldd} & +\end{array}\right]\end{array}\right]$$

In the c-structure (Figure 6), we display the functional information contributed by the lexicon under the leaves of the c-structural tree.[36]

In the c-structure, the inner topic *zhe-xiang gongzuo* 'this task' is adjoined to I′. This structural position is licensed by the I′-adjoining rule in (34). In the f-structure, the inner topic is a member of the DIS set, which is a function at the matrix-clause level, and its extraction path is ($f$ XCOMP OBJ), where $f$ is the f-structure of the matrix clause. There is a dependency relationship between a member of the DIS set and the within-clause function OBJ in the form of f-structural sharing, which is licensed by the long-distance dependency equation PS_LDD-PATH notated on the I′-adjoining rule in (34). XCOMP contains the bridging attribute-value pair <PS_LDD, +>, satisfying the off-path equation ($\rightarrow$ PS_LDD) $=_c$ + in PS_LDD-PATH. This attribute-value pair is specified by the lexical entry of *shefa* 'try' in (41) via the defining equation ($\uparrow$ XCOMP PS_LDD) = +. The f-structure shows structural sharing between the matrix SUBJ and embedded SUBJ due to functional control.

(45) *xiaoming$_i$ shefa Ø$_{i/*j}$ [zhe-xiang gongzuo] wancheng
Xiaoming try Ø this-CL task finish
'Xiaoming tries to finish this task.'

On the other hand, (45) is flagged by the formal grammar as an ill-formed construction, for which no solution can be produced due

[36] From Section 7.3 onwards, we will skip the display of the lexical information in c-structures to reduce notational clutter.

to conflicts of constraints arising from a series of calculations as follows. In (45), the inner topic appears inside the complement clause XCOMP. The lexical entry of *shefa* 'try' in (43) contains the constraint CAT((↑ XCOMP), {$\text{IP}_{[-\text{PS\_LDD}]}$}), which forces XCOMP to be associated with $\text{IP}_{[-\text{PS\_LDD}]}$.[37] As shown in (35), $\text{IP}_{[-\text{PS\_LDD}]}$ does not branch into any I′-adjoining rule which is critical for licensing the inner topic. That means the inner topic cannot be properly hosted by any phrase-structural rules. No formal solution can be produced for (45). As the formal grammar returns (45) as ungrammatical, this is in line with the generalisation about exhaustive subject control predicates, for which the displaced phrase must not appear inside the complement clause.

As a generalisation, the constraints in (46) are posited for the lexical entries of all exhaustive subject-control verbs.

(46) (↑ XCOMP PS_LDD) = +
CAT((↑ XCOMP), {$\text{IP}_{[-\text{PS\_LDD}]}$})

Section 7.6 will discuss how to use a template, which is a formal device allowing commonalities to be represented succinctly, to capture the behaviour across all Chinese complementation verbs.

## 7.3 *Partial subject control (Patterns B and C)*

If a verb licenses partial subject control, the inner topic or focused phrase can either precede the partial-control verb or remain inside the embedded complement (Pattern B). When the displaced phrase precedes the partial-control verb, the embedded subject must be unexpressed (Pattern C). The bridging attribute-value pair < PS_LDD, + > can be used to license the extraction of an inner topic or focused phrase into the matrix clause. However, no CAT predicate constraint is posited to impose any categorical requirement on its complement clause, unlike exhaustive subject control verbs.

The set of IP-associated rules, namely {**IP** → DP I′, I′ → (DP) I′, I′ → (I) VP, VP → ...V...**IP**...} (with their functional annotations omitted here) are potentially recursive. There are two potential places for

[37] More accurately, the CAT predicate forces XCOMP to be associated with a set of nodes, one of which must contain $\text{IP}_{[-\text{PS\_LDD}]}$.

an I′-adjoining position to appear: higher or lower than the node of the matrix predicate (which occupies the V position). In other words, the displaced phrase can be structurally licensed either in the matrix clause or inside the complement clause. However, licensing the two potential structural positions alone is not sufficient. When the displaced phrase precedes the partial-control verb, the embedded subject must be unexpressed, suggesting the need for some additional constraint.

To demonstrate this, the lexical entry of the partial-control verb *jueding* 'decide' is presented in (47). The second line of its lexical entry involves an implicational constraint, which is conditioned by whether the embedded subject is realised in the c-structure. The formal definition of the function REALISED (Asudeh 2009, p. 111) is stated in (48). REALISED($f$) requires c-structural realisation of f-structural elements.

(47) Lexical entry of *jueding* 'decide':

*jueding* 'decide' V $(\uparrow \text{PRED}) = \text{'DECIDE} < \text{SUBJ, COMP} >\text{'}$
$\neg[\text{REALISED}(\uparrow \text{COMP SUBJ})]$
$\Rightarrow [(\uparrow \text{COMP PS\_LDD}) = +$
$\wedge(\uparrow \text{COMP SUBJ PRED}) = \text{'PRO'}$
$\wedge(\uparrow \text{SUBJ P\_CONTROL}) = \text{CONTROLLER}$
$\wedge(\uparrow \text{COMP SUBJ P\_CONTROL}) = \text{CONTROLLEE}]$

(48) REALISED function (Asudeh 2009, p. 111)
For any f-structure $f$, REALISED($f$) is true if and only if $\phi^{-1}(f) \neq \emptyset$.

$\neg$[REALISED($f$)] requires the corresponding c-structural nodes to be unrealised. Only when the embedded subject is unrealised in the c-structure can the verb license partial control and assign the bridging attribute-value pair $<$PS_LDD, $+>$ to its clausal function COMP. The effect of this implicational constraint is manifested in (49).

(49) xiaoming$_i$ [zhe-ge difang] jueding {*tamen | *ta | Ø$_{i+}$}
Xiaoming this-CL place decide { they | 3SG | Ø }
yao yiqi qu
will together go
'Xiaoming decides to go to this place together.'

The required extraction path for the inner topic is (*f* COMP OBJ), where *f* is the f-structure of the matrix clause. The off-path constraint (→ PS_LDD) $=_c$ + imposed on the first clausal function COMP of the extraction path requires it to contain the attribute-value pair <PS_LDD, +> in order for the out-of-complement-clause extraction to occur. However, when the embedded SUBJ is realised as *tamen* 'they' or *ta* 'he/she', the matrix predicate cannot assign the attribute-value pair due to the implicational constraint. Thus, these two configurations are rejected by the formal grammar. On the other hand, when the embedded SUBJ is unrealised, the implicational condition ¬[REALISED(↑ COMP SUBJ)] is satisfied. The attribute-value pair <PS_LDD, +> is assigned to the f-structure of COMP to license the extraction and the verb licenses partial control by assigning: (i) a pronominal value to its embedded subject; (ii) the attribute-value pair <P_CONTROL, CONTROLLER> to the matrix subject; and (iii) the attribute-value pair <P_CONTROL, CONTROLLEE> to the embedded subject (see Section 6). The well-formed c- and f-structure of (49) (with an unexpressed SUBJ) are presented in Figure 7 and in (50). From now on, we will skip the display of lexical information under the leaves of c-structural trees, reducing notational clutter.

(50)
$$f\left[\begin{array}{ll}
\text{PRED} & \text{'DECIDE<SUBJ, COMP>'} \\
\text{DIS} & \left\{\boxed{1}\left[\text{PRED} \quad \text{'PLACE'}\right]\right\} \\
\text{SUBJ} & \left[\begin{array}{ll}\text{PRED} & \text{'XIAOMING'} \\ \text{P_CONTROL} & \text{CONTROLLER}\end{array}\right] \\
\text{COMP} & \left[\begin{array}{ll}
\text{PRED} & \text{'GO<SUBJ, OBJ>'} \\
\text{SUBJ} & \left[\begin{array}{ll}\text{PRED} & \text{'PRO'} \\ \text{P_CONTROL} & \text{CONTROLLEE}\end{array}\right] \\
\text{OBJ} & \boxed{1} \\
\text{ADJ} & \left\{\left[\text{PRED} \quad \text{'TOGETHER'}\right]\right\} \\
\text{PS_LDD} & +
\end{array}\right]
\end{array}\right]$$

Sentence (51) is another construction of *jueding* 'decide' with the inner topic residing in the complement clause. In contrast to 49), it is acceptable for the embedded SUBJ to be overt. Given the extrac-

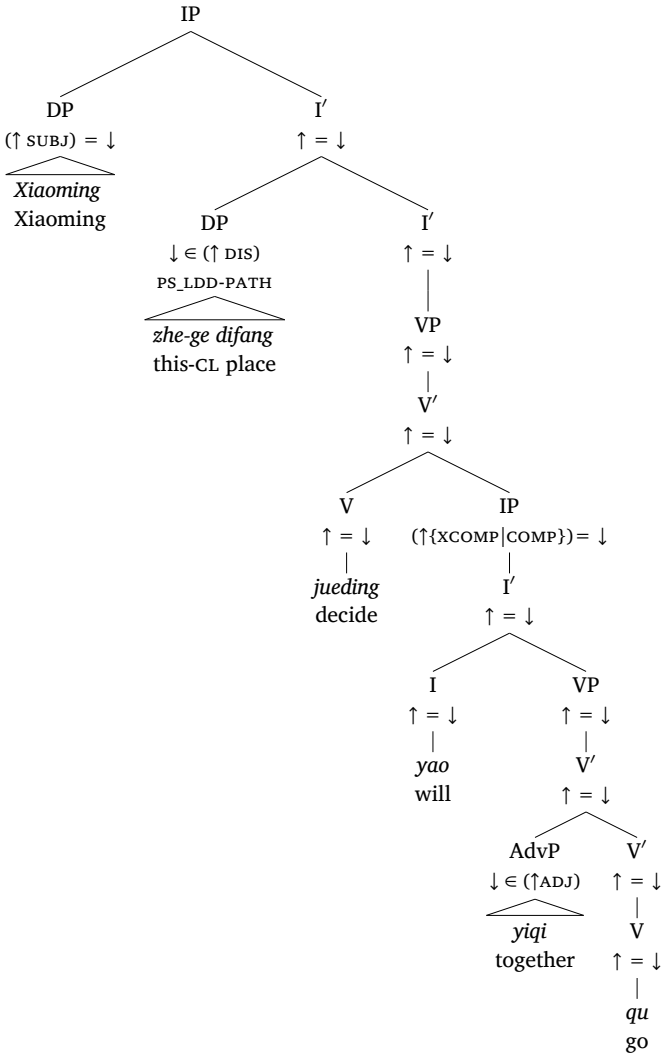


Figure 7: C-structure of (49)

tion path (*g* OBJ), there is no (first) clausal function which needs to be checked for the attribute-value pair <PS_LDD, +>. Without any constraint violation, the formal grammar can successfully parse the construction. (52) shows what its f-structure looks like when its embedded SUBJ is overt and there is no partial control involved.

(51) xiaowu$_{i}$ jueding (tamen$_{i+}$) [zhe-ge difang] yao yiqi qu
Xiaowu decide they this-CL place will together go
'Xiaowu decides that they will/to go to this place together.'

(52)
$$\begin{bmatrix} \text{PRED} & \text{'DECIDE} < \text{SUBJ, COMP} > \text{'} \\ \text{SUBJ} & \left[\text{PRED 'XIAOWU'}\right] \\ \text{COMP} & f\begin{bmatrix} \text{PRED} & \text{'GO} < \text{SUBJ, OBJ} > \text{'} \\ \text{DIS} & \left\{\boxed{1}\left[\text{PRED 'PLACE'}\right]\right\} \\ \text{SUBJ} & \left[\text{PRED 'PRO'}\right] \\ \text{OBJ} & \boxed{1} \\ \text{ADJ} & \left\{\left[\text{PRED 'TOGETHER'}\right]\right\} \end{bmatrix} \end{bmatrix}$$

As a generalisation, it is posited that all partial subject-control verbs contain the implicational constraint (53) in their lexical entries:

(53) $\neg[\text{REALISED}(\uparrow \text{COMP SUBJ})] \Rightarrow (\uparrow \text{COMP PS\_LDD}) = +$

## 7.4 *Non-control complementation (Pattern D)*

For a non-control complementation verb, its inner topic or focused phrase must remain inside the embedded complement. Non-control verbs and exhaustive-control verbs represent two ends of a spectrum regarding the capability of the matrix clause to host an inner topic or focused phrase. Earlier, it was discussed that the formal machinery for exhaustive-control verbs borrows insights from how LFG handles English bridge verbs. The lexically specified $<$PS_LDD, $+>$ was devised as the bridging attribute-value pair to license a long-distance dependency relation that crosses the boundary of the embedded clause. The attribute PS_LDD can be adopted for the f-structure of a non-control construction, but instead of the atomic value "$+$", it is assigned the value "–". The pair $<$PS_LDD, $->$ is lexically specified by a non-control predicate such as *xiangxin* 'believe' in (54). The extraction path PS_LDD-PATH encoded in the I′-adjoining rule in (34) requires the first clausal function (if any) to contain the attribute-value pair $<$PS_LDD, $+>$ via the off-path constraint $(\rightarrow \text{PS\_LDD}) =_{c} +$. Since the value of

PS_LDD is now specified by *xiangxin* 'believe' to be "–", it cannot satisfy the off-path constraining equation $(\rightarrow \text{PS\_LDD}) =_c +$. Therefore, a construction such as (55) is rejected by the formal grammar and its potential f-structure (56) is invalidated:

(54) Lexical entry of *xiangxin* 'believe':

*xiangxin* 'believe' V $(\uparrow \text{PRED}) = \text{'BELIEVE} < \text{SUBJ, COMP} >\text{'}$
$(\uparrow \text{COMP PS\_LDD}) = -$

(55) *xiaoming [na-ben shu] xiangxin (ta) hui jinkuai
Xiaoming that-CL book believe 3SG will soon
wancheng
finish
'Xiaoming believes that he/she will finish that book soon.'

(56) Invalid f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'BELIEVE} < \text{SUBJ, COMP} >\text{'} \\ \text{DIS} & \left\{ \boxed{1} \begin{bmatrix} \text{PRED} & \text{'BOOK'} \end{bmatrix} \right\} \\ \text{SUBJ} & \begin{bmatrix} \text{[PRED]} & \text{'XIAOMING'} \end{bmatrix} \\ \text{COMP} & \begin{bmatrix} \text{PRED} & \text{'FINISH} < \text{SUBJ, OBJ} >\text{'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'PRO'} \end{bmatrix} \\ \text{OBJ} & \boxed{1} \\ \boxed{\text{PS\_LDD}} & - \end{bmatrix} \end{bmatrix}$$

On the other hand, within-complement-clause extraction is permissible with the displaced phrase located in the post-subject position inside the complement clause. An example is given in (57) with its c- and f-structures presented in Figure 8 and in (58). Such a configuration is licensed: first, the off-path constraint $(\rightarrow \text{PS\_LDD}) =_c +$ only applies to the first clausal function ever present; second, the path for within-complement-clause extraction ($g$ OBJ) in (58) does not contain a clausal function. COMP in (58) corresponds to IP in Figure 8, whose set of associated rules includes the I′-adjoining rule for inner topicalisation and focus fronting.

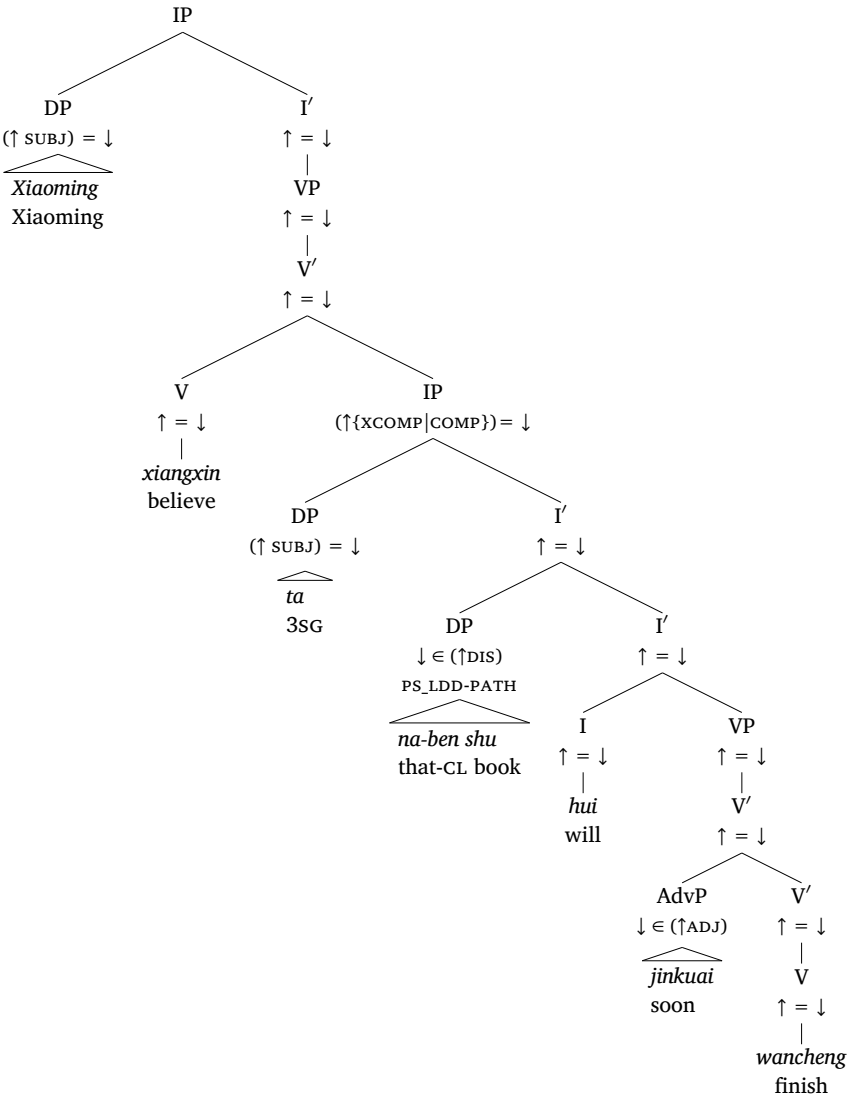


Figure 8: C-structure of (57)

(57) xiaoming xiangxin (ta) [na-ben shu] hui jinkuai
Xiaoming believe 3SG that-CL book will soon
wancheng
finish
'Xiaoming believes that he/she will finish that book soon.'

(58)
$$\begin{bmatrix} \text{PRED} & \text{'BELIEVE} < \text{SUBJ, COMP} > \text{'} \\ \text{SUBJ} & \left[\text{PRED 'XIAOMING'}\right] \\ f & \\ \text{COMP} & g \begin{bmatrix} \text{PRED} & \text{'FINISH} < \text{SUBJ, OBJ} > \text{'} \\ \text{DIS} & \left\{\boxed{1}\left[\text{PRED 'BOOK'}\right]\right\} \\ \text{SUBJ} & \left[\text{PRED 'PRO'}\right] \\ \text{OBJ} & \boxed{1} \\ \text{PS-LDD} & - \end{bmatrix} \end{bmatrix}$$

As a generalisation, it is posited that all non-control verbs contain the constraint (↑ COMP PS_LDD) = – in their lexical entries.

### *Object control (Pattern E)* 7.5

For an object-control verb, the inner topic or focused phrase must not precede the matrix-object controller, regardless of what control pattern the verb displays. Pre-theoretically, the matrix-object controller "blocks" the cross clausal boundary displacement, making the complement clause an unextractable island. While it may be tempting to associate some blocking device directly with the matrix-object controller, we argue that this treatment is dispreferred. For one thing, following the LFG analytical tradition (Section 6), the formal machinery here posits a lexically determined control mechanism. Thus, a grammatical function does not become a controller on its own merits but is accorded a controller status via the licensing constraints of the control verb. From this perspective, if a phenomenon appears to correlate with the identity of the controller, the entity which the phenomenon should ultimately be attributed to is the control verb. Therefore, we posit that for a construction with a matrix-object controller, its clausal function is assigned the attribute-value pair < PS_LDD, – > by the object-control

verb, which is the same mechanism as that proposed for non-control verbs. As such, the lexicon regulates the displacement phenomena.

As an illustration, (59) is the lexical entry of *yuanliang* 'forgive' with a control equation and the constraint (↑ XCOMP PS_LDD) = –. Sentence (60) is ill-formed and (61) is its invalid f-structure. In the extraction path (*f* XCOMP OBJ), the PS_LDD feature in the f-structure of XCOMP has the value "–", which renders the extraction impossible since the off-path constraint (→ PS_LDD) $=_c$ + cannot be satisfied.

(59) Lexical entry of *yuanliang* 'forgive':

| | | |
|---|---|---|
| *yuanliang* 'forgive' | V | (↑ PRED) = 'FORGIVE<SUBJ, OBJ, XCOMP>' |
| | | (↑ OBJ) = (↑ XCOMP SUBJ) |
| | | (↑ XCOMP PS_LDD) = – |

(60) *xiaoming$_i$ [lian zhe-chang bisai] dou yuanliang
Xiaoming even this-CL competition PRT forgive
zhangsanj Ø$_{*i/j}$ fangqi-le
Zhangsan Ø give.up-PFV
'Xiaoming forgives Zhangsan to have given up even this competition.'

(61) Invalid f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'FORGIVE<SUBJ, OBJ, COMP>'} \\ \text{DIS} & \left\{ \boxed{1} \begin{bmatrix} \text{PRED} & \text{'COMPETITION'} \\ \text{SPEC} & \begin{bmatrix} \text{PRED} & \text{'EVEN'} \end{bmatrix} \end{bmatrix} \right\} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'XIAOMING'} \end{bmatrix} \\ \text{OBJ} & \boxed{2} \begin{bmatrix} \text{PRED} & \text{'ZHANGSAN'} \end{bmatrix} \\ \text{XCOMP} & \begin{bmatrix} \text{PRED} & \text{'GIVE.UP<SUBJ, OBJ>'} \\ \text{SUBJ} & \boxed{2} \\ \text{OBJ} & \boxed{1} \\ \boxed{\text{PS\_LDD}} & – \end{bmatrix} \end{bmatrix}$$

Example (62) is a well-formed sentence displaying extraction within the complement clause, Figure 9 shows its c-structure, and (63) is its f-structure. An LFG syntactic tree does not need to obey binary

branching (Dalrymple *et al.* 2019, p. 98). The extraction path (*g* OBJ) is licensed since the off-path constraint (→ PS_LDD) $=_c$ + in PS_LDD-PATH only applies to the first clausal function which is absent in this case.

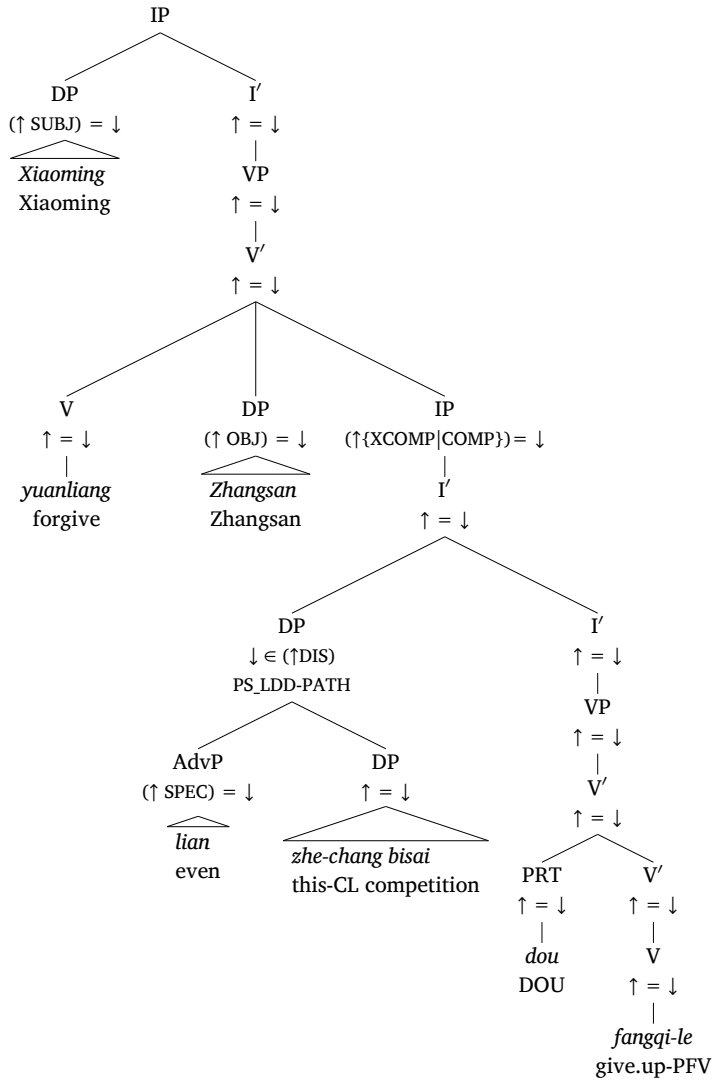


Figure 9: C-structure of (62)

(62) xiaoming$_i$ yuanliang zhangsan$_j$ Ø$_{*i/j}$ [lian zhe-chang bisai] dou fangqi-le
Xiaoming forgive Zhangsan Ø even this-CL competition PRT give.up-PFV
'Xiaoming forgives Zhangsan to have given up even this competition.'

(63)
$$\begin{bmatrix} \text{PRED} & \text{'FORGIVE}<\text{SUBJ, OBJ, XCOMP}>\text{'} \\ \text{SUBJ} & \left[\text{PRED 'XIAOMING'}\right] \\ \text{OBJ} & \boxed{1}\left[\text{PRED 'ZHANGSAN'}\right] \\ f\,\text{XCOMP} & g\begin{bmatrix} \text{PRED} & \text{'GIVE.UP}<\text{SUBJ, OBJ}>\text{'} \\ \text{DIS} & \left\{\boxed{2}\begin{bmatrix} \text{PRED} & \text{'COMPETITION'} \\ \text{SPEC} & \left[\text{PRED 'EVEN'}\right] \end{bmatrix}\right\} \\ \text{SUBJ} & \boxed{1} \\ \text{OBJ} & \boxed{2} \\ \text{PS\_LDD} & - \end{bmatrix} \end{bmatrix}$$

As a generalisation, it is posited that all object-control verbs contain the constraint (64) in their lexical entries:

(64) $(\uparrow \{\text{XCOMP}|\text{COMP}\}\ \text{PS\_LDD}) = -$

## 7.6 *Template for complementation verbs*

In LFG, it is possible to capture commonalities between lexical entries via a formal device known as a "template", which allows "commonalities between lexical entries to be represented succinctly and linguistic generalizations to be encoded in a theoretically motivated manner" (Dalrymple *et al.* 2019, p. 234). We posit that all Chinese complementation verbs share the template VCOMPINTOPFOCFRONT in (65), which encodes correlations among control properties, inner topicalisation, and focus fronting:

(65)
$$
\begin{array}{l}
\textsc{VCompIntopFocFront} \equiv \\
\{\quad \{(\uparrow \textsc{obj}) = (\uparrow \textsc{xcomp subj}) \mid (\uparrow \textsc{obj p\_control}) = \textsc{controller}\} \\
\qquad \Rightarrow (\uparrow \{\textsc{xcomp}|\textsc{comp}\}\ \textsc{ps\_ldd}) = - \\
\mid \quad (\uparrow \textsc{subj}) = (\uparrow \textsc{xcomp subj}) \\
\qquad \Rightarrow (\uparrow \textsc{xcomp ps\_ldd}) = + \wedge \textsc{cat}((\uparrow \textsc{xcomp}), \{\textsc{ip}_{[-\textsc{ps\_ldd}]}\}) \\
\mid \quad (\uparrow \textsc{subj p\_control}) = \textsc{controller} \\
\qquad \Rightarrow (\uparrow \textsc{comp ps\_ldd}) = + \\
\mid \quad \neg (\uparrow \textsc{xcomp}) \wedge \neg(\uparrow \textsc{comp subj p\_control}) \\
\qquad \Rightarrow (\uparrow \textsc{comp ps\_ldd}) = - \\
\}
\end{array}
$$

The template VCompIntopFocFront contains four (broad) disjunctive options. The first option targets object-control verbs, which are featured by possessing either the functional-control equation (↑ OBJ) = (↑ XCOMP SUBJ) or one of the constraints for partial control (↑ OBJ P_CONTROL) = CONTROLLER. The second option targets exhaustive subject-control verbs, which are characterised by the functional-control equation (↑ SUBJ) = (↑ XCOMP SUBJ). The third option targets partial subject-control verbs, which contain the constraint (↑ SUBJ P_CONTROL) = CONTROLLER for encoding its controller function. The fourth option targets non-control complementation verbs, which neither subcategorise for XCOMP nor assign the attribute P_CONTROL to the f-structure of its complement-clause subject. We can rewrite the lexical entries of *shefa* 'try' (exhaustive subject-control), *jueding* 'decide' (partial subject-control), *xiangxin* 'believe' (non-control), and *yuanliang* 'forgive' (object-control) as follows. All of them share the same template VCompIntopFocFront, which interacts with other constraints in the lexical entry to generate the desired displacement patterns:

(66)

| | | |
|---|---|---|
| *shefa* 'try' | V | (↑ PRED) = 'TRY < SUBJ, XCOMP >'<br>(↑ SUBJ) = (↑ XCOMP SUBJ)<br>@VCompIntopFocFront |
| *jueding* 'decide' | V | (↑ PRED) = 'DECIDE < SUBJ, COMP >'<br>¬[REALISED(↑ COMP SUBJ)]<br>⇒ [(↑ COMP SUBJ PRED) = 'PRO'<br>∧(↑ SUBJ P_CONTROL) = CONTROLLER<br>∧(↑ COMP SUBJ P_CONTROL) = CONTROLLEE]<br>@VCompIntopFocFront |

*xiangxin* 'believe' V (↑ PRED) = 'BELIEVE<SUBJ, COMP>'
@VCOMPINTOPFOCFRONT

*yuanliang* 'forgive' V (↑ PRED) = 'FORGIVE<SUBJ, OBJ, XCOMP>'
(↑ OBJ) = (↑ XCOMP SUBJ)
@VCOMPINTOPFOCFRONT

## 7.7 *Complex embedding and extraction paths*

It was mentioned earlier that there is a competing version of the formula PS_LDD-PATH governing possible extraction paths:

(67) a. Correct version of PS_LDD-PATH
$(\uparrow (\{\text{XCOMP}|\text{COMP}\}\{\text{XCOMP}|\text{COMP}\}^{*})\ \text{OBJ}) = \downarrow$
$(\rightarrow \text{PS\_LDD}) =_{c} +$

b. Competing but incorrect version of PS_LDD-PATH
$(\uparrow \{\text{XCOMP}|\text{COMP}\}^{*}\ \text{OBJ}) = \downarrow$
$(\rightarrow \text{PS\_LDD}) =_{c} +$

To understand why (67b) makes wrong predictions, one needs to turn to complex embedding, involving two or more clause-embedding verbs. (68) contains complex-embedding constructions of five clausal levels. The first four levels are headed by complementation predicates – *jueding* 'decide', *quan* 'try to persuade', *xiangbanfa* 'try/strive', and *shou* 'say'. Among them, *jueding* 'decide' and *xiangbanfa* 'try/strive' assign the attribute-value pair <PS_LDD, +> to their respective complement clause, whereas *quan* 'try to persuade' and *shou* 'say' assign <PS_LDD, –>. (68) and Table 15 examine the logically possible places for *zhe-jian shiqing* 'this thing' when it is used as an inner topic. Table 15 has boxed those functions that have received <PS_LDD, +>.[38]

(68) a. xiaoming jueding Ø quan xiaomei Ø
Xiaoming decide Ø try.to.persuade Xiaomei Ø
xiangbanfa Ø gen pengyou shuo Ø [zhe-jian
try Ø to friend say Ø this-CL
shiqing] meiyou zuo-guo
thing not do-EXP
'Xiaoming decides to persuade Xiaomei to try to say to friends that (somebody) has not done this thing.'

[38] In Table 15, ↑ refers to the f-structure immediately enclosing the inner-topic function DIS.

b. *xiaoming jueding Ø quan xiaomei Ø
Xiaoming decide Ø try.to.persuade Xiaomei Ø
xiangbanfa Ø [zhe-jian shiqing] gen pengyou shuo
try Ø this-CL thing to friend say
Ø meiyou zuo-guo
Ø not do-EXP
'Xiaoming decides to persuade Xiaomei to try to say to friends that (somebody) has not done this thing.'

c. xiaoming jueding Ø quan Xiaomei Ø [zhe-jian
Xiaoming decide Ø try.to.persuade Xiaomei Ø this-CL
shiqing] xiangbanfa Ø gen pengyou shuo Ø meiyou
thing try Ø to friend say Ø not
zuo-guo
do-EXP
'Xiaoming decides to persuade Xiaomei to try to say to friends that (somebody) has not done this thing.'

d. *xiaoming jueding Ø [zhe-jian shiqing] quan
Xiaoming decide Ø this-CL thing try.to.persuade
xiaomei Ø xiangbanfa Ø gen pengyou shuo Ø
Xiaomei Ø try Ø to friend say Ø
meiyou zuo-guo
not do-EXP
'Xiaoming decides to persuade Xiaomei to try to say to friends that (somebody) has not done this thing.'

e. xiaoming [zhe-jian shiqing] jueding Ø quan
Xiaoming this-CL thing decide Ø try.to.persuade
xiaomei Ø xiangbanfa Ø gen pengyou shuo Ø
Xiaomei Ø try Ø to friend say Ø
meiyou zuo-guo
not do-EXP
'Xiaoming decides to persuade Xiaomei to try to say to friends that (somebody) has not done this thing.'

Both versions of the PS_LDD-PATH formula in (67a) and (67b) give the correct predictions about the acceptability of (68a) and (68b). However, only (67a) makes correct predictions about the acceptabil-

Table 15: Displacement patterns, extraction paths, and acceptability

| Displacement pattern | Extraction path | Acceptability |
|---|---|---|
| (68a) | (↑ OBJ) | Acceptable |
| (68b) | (↑ COMP OBJ) | Unacceptable |
| (68c) | (↑ $\boxed{\text{COMP}}$ COMP OBJ) | Acceptable |
| (68d) | (↑ XCOMP $\boxed{\text{COMP}}$ COMP OBJ) | Unacceptable |
| (68e) | (↑ $\boxed{\text{COMP}}$ XCOMP $\boxed{\text{COMP}}$ COMP OBJ) | Acceptable |

ity of all the sentences. If an extraction path contains more than one clausal function, only the first clausal function is required to contain $<$PS_LDD, $+>$. From another perspective, whether it is possible for a displaced phrase to be extracted out of a complement clause depends on the licensing properties of the complementation verb that is on the same clausal level (in the f-structure) as the DIS function borne by the displaced phrase.

## 8 COMPUTATIONAL IMPLEMENTATION FOR CONSTRAINT TESTING

Section 7 has presented a theoretical LFG analysis. In order to safeguard the formal accuracy of the constraints and oversee their complex interaction – particularly, the interaction among control, complementation, inner topicalisation and focus fronting – we have computationally implemented the analysis using a grammar-engineering tool – Xerox Linguistic Environment (XLE; Crouch *et al.* 2011).[39] The results of computational testing are included in Appendix B, providing evidence that our proposed constraints are not only theoretically possible but also computationally implementable.[40]

[39] XLE has been used in the Parallel Grammar Project (ParGram; https://pargram.w.uib.no/; Sulger *et al.* 2013) to develop cross-linguistic computational grammars.

[40] For further information about the computational implementation of grammatical formalisms, one may refer to two special issues of the *Journal of Language Modelling*: Volume 10, Number 1, the 2022 issue on the interaction between for-

## CONCLUSION 9

This paper examined the empirical data of inner topicalisation and focus fronting, focusing on their interaction with control and complementation. Our discussion led to five empirical generalisations, which were further tested using acceptability-judgment tasks on a subset of complementation verbs. We have proposed a formal lexicalist analysis to capture the correlational relationships, which differs from existing restructuring analyses. Our non-movement proposal uses LFG's formalism of long-distance dependency, where displacement is not contingent on the size of the embedded clause. We argue that this approach better captures the empirical facts of inner topicalisation and focus fronting than restructuring accounts. Given the computational rigour of LFG, we have implemented our analysis using XLE. The computational implementation provides further evidence about the formal accuracy of our proposed constraints.

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mal and computational linguistics; and Volume 3, Number 1, the 2015 issue on methodologies for grammar engineering. Computationally implemented grammars allow linguists to test analyses and keep track of the interaction between different parts of the grammar, besides any other technological applications for which they can be used. See, e.g., Forst and King 2023, Zamaraeva *et al.* 2022, Bernard and Winterstein 2022, Duchier and Parmentier 2015, Müller 2015, and Bender 2008.

# APPENDICES

## A SAMPLE STIMULI

There were in total five acceptability-judgment tasks. Each acceptability-judgment task contained four conditions. Each condition had four lexicalisations. The test sentences were distributed in a Latin square design for counterbalancing such that no sentences in a list were variants of each other.

For example, in Task 1, there were four conditions, and each condition contained four lexicalisations describing the following scenarios: (i) end-of-term exam, (ii) mathematical question, (iii) Olympic event, (iv) washing dishes. For every scenario, there were four minimal variants distributed across the four conditions. In this Appendix, we will demonstrate one lexicalisation (out of four lexicalisations) for each condition. English glosses are added in this Appendix for illustrative purposes, but the stimuli were presented only in written Chinese to the participants.

### A.1 *Acceptability-judgment task 1*

*Condition A: Crossing $V_m$ + Focus Fronting (Exhaustive Control)*

(1) *Context: Tomorrow is the day of the important end-of-term exam.*
xiaoding [lian ruci zhongyao-de qimo kaoshi] dou
Xiaoding even so important-DE end.of.term exam PRT
shefa zhao jikou bu canjia
try find excuse not take.part
'Xiaoding tries to find an excuse not to take part in even such an important end-of-term exam.'

*Condition B: Not crossing $V_m$ + Focus Fronting (Exhaustive Control)*

(2) *Context: This is a challenging mathematical question.*
xiaohong shefa [lian zhe-dao name shenao-de shuxue
Xiaoding try even this-CL so challenging-DE maths
nanti] dou jiejue
question PRT solve
'Xiaoding tries to solve even such a challenging mathematical question.'

*Condition C: Crossing $V_m$ + Inner Topicalisation (Exhaustive Control)*

(3) *Context: This Olympic event is intense.*
yuehan [zhe-chang bisai] neng shefa shengchu
John this-CL competition able try win
'John tries to win this competition.'

*Condition D: Not crossing $V_m$ + Inner Topicalisation (Exhaustive Control)*

(4) *Context: Washing dishes is not a difficult task.*
keshi lisi shefa [zhe-zhong shiqing] jiao gei bieren qu zuo
but Lisi try this-CL task pass to others go do
'Lisi tries to pass on this task to others.'

*Acceptability-judgment task 2* A.2

*Condition A: Crossing $V_m$ + Focus Fronting (Partial Control)*

(5) *Context: Xiaoli always handles everything himself.*
xiaoli [lian ruci suosui-de shiqing] dou xiangyao ziji
Xiaoli even so trivial-DE matter PRT want SELF
chuli
handle
'Xiaoli wants to handle even such a trivial matter by himself.'

*Condition B: Not crossing $V_m$ + Focus Fronting (Partial Control)*

(6) *Context: This report is especially long.*
xiaoming xiangyao [lian zhe-pian tebie zhang-de
Xiaoming want even this-CL especially long-DE
baogao] dou jinkuai xiewan
report PRT soon finish
'Xiaoming wants to finish even such a long report soon.'

*Condition C: Crossing $V_m$ + Inner Topicalisation (Partial Control)*

(7) *Context: Buddha's Temptation is a highly challenging dish.*
xiaowang [zhe-dao cai] xiangyao shunli zuochu
Xiaowang this-CL dish want successfully make
'Xiaowang wants to make this dish successfully.'

*Condition D: Not crossing $V_m$ + Inner Topicalisation (Partial Control)*

(8) *Context: This movie is very difficult to grasp.*
xiaodong xiangyao [zhe-bu dianying] kandedong
Xiaodong want this-CL movie understand
'Xiaodong wants to understand this movie.'

A.3 *Acceptability-judgment task 3*

*Condition A:* SUBJ *unexpressed + Focus Fronting (Partial Control)*

(9) *Context: The boss is always very efficient.*
lingdao [lian ruci jianju-de renwu] dou jueding yao zai
boss even so difficult-DE task PRT decide need at
mingtian nei wancheng
tomorrow within finish
'The boss decides to finish even such a difficult task by the end of tomorrow.'

*Condition B:* SUBJ *expressed + Focus Fronting (Partial Control)*

(10) *Context: Xiaoming is a very smart student.*
xiaoming [lian name nanzuo-de gongke] dou jueding
Xiaoming even such difficult-DE assignment PRT decide
ta yao zai yitian nei tijiao
3SG need at one.day within submit
'Xiaoming decides to submit even such a difficult assignment within a day.'

*Condition C:* SUBJ *unexpressed + Inner Topicalisation (Partial Control)*

(11) *Context: Xiaoxiu has announced her retirement from the film industry. Will she still take this movie?*
xiaoxiu [zhe-bu dianying] jueding bu hui jie
Xiaoxiu this-CL movie decide not will take
'Xiaoxiu decides not to take this movie.'

*Condition D: SUBJ expressed + Inner Topicalisation (Partial Control)*

(12) *Context: Xiaogang does not like people sending him gifts. Will he accept this gift?*
xiaogang [zhe-fen liwu] jueding ta bu hui shouxia
Xiaogang this-CL gift decide 3SG not will accept
'Xiaogang decides not to accept this gift.'

*Acceptability-judgment task 4* A.4

*Condition A: Crossing $V_m$ + Focus Fronting (Non-control)*

(13) *Context: Xiaowang is good at imitating sounds.*
xiaowang [lian dongwu-de shengyin] dou shuo-guo
Xiaowang even animal-DE sound PRT say-EXP
nengguo mofang
can imitate
'Xiaowang has said (he) can imitate even animal sounds.'

*Condition B: Not crossing $V_m$ + Focus Fronting (Non-control)*

(14) *Context: Xiaojie is an excellent writer.*
xiaojie shuo-guo [lian zhe-ben changpian xiaoshuo] dou
Xiaojie say-EXP even this-CL long novel PRT
neng zai yi-ge yue nei xiewan
can at one-CL month within finish
'Xiaojie has said (he) can finish even such a long novel within a month.'

*Condition C: Crossing $V_m$ + Inner Topicalisation (Non-control)*

(15) *Context: Xiaojian is good at designing computer games.*
xiaojian [zhe-kuan diannao youxi] shuo-guo neng sheji
Xiaojian this-CL computer game say-EXP can design
hao
well
'Xiaojian has said (he) can design this computer game well.'

*Condition D: Not crossing $V_m$ + Inner Topicalisation (Non-control)*

(16) *Context: Does Xiaonan want to visit this country?*
xiaonan shuo-guo [zhe-ge guojia] bu hui qu
Xiaonan say-EXP this-CL country not will go
'Xiaonan has said (he) will not go to this country.'

## A.5 *Acceptability-judgment task 5*

*Condition A: Crossing $OBJ_m$ controller + Focus Fronting*

(17) *Context: This book is very difficult to understand.*
xiaoming [lian zhe-ben ruci shenao-de shu] dou
Xiaoming even this-CL so difficult-DE book PRT
shuifu-le xiaomei yao haohao du
persuade-PFV Xiaomei need.to properly read
'Xiaoming has persuaded Xiaomei to read even such a difficult book properly.'

*Condition B: Not crossing $OBJ_m$ controller + Focus Fronting*

(18) *Context: There will be an important competition tomorrow.*
mama shuifu-le zhangsan [lian zhe-chang ruci
mum persuade-PFV Zhangsan even this-CL so
zhongyao-de bisai] dou dei fangqi
important-DE competition PRT need.to give.up
'Mum has persuaded Zhangsan to give up even such an important competition.'

*Condition C: Crossing $OBJ_m$ controller + Inner Topicalisation*

(19) *Context: This oil painting is very expensive.*
chen xiaojie [zhe-fu youhua] shuofu-le ceng
Chen Miss this-CL oil.painting persuade-PFV Ceng
xiansheng yao goumai
Mr. need.to buy
'Miss Chen has persuaded Mr. Ceng to buy this oil painting.'

*Condition D: Not crossing $OBJ_m$ controller + Inner Topicalisation*

(20) *Context: This traditional musical instrument is very hard to learn.*
didi shuifu-le gege [zhe-jian
young.brother persuade-PFV elder.brother this-CL
chuantong yueqi] yao qu xue
traditional instrument need.to go learn
'The younger brother has persuaded the elder brother to learn this traditional instrument.'

# B COMPUTATIONAL IMPLEMENTATION AND GRAMMAR TESTING ON XLE

To safeguard the formal accuracy of our constraints and oversee their complex interaction, we have computationally tested our theoretical analysis by implementing it on the grammar-engineering tool Xerox Linguistic Environment (XLE; Crouch *et al.* 2011).[41] We present some important constraints in our computational grammar, which has incorporated those constraints discussed in Sections 7.1–7.5. Here, the constraints are stated in a way that follows XLE's computational requirements. For more information, please refer to the XLE documentation (Crouch *et al.* 2011). The following are c-structural rules,

[41] As pointed out by Bender (2008, p. 16): "Grammar engineering is the process of creating machine-readable implementations of formal grammars... Computerized implementations of their grammars allow linguists to more efficiently and effectively test hypotheses... Languages are made up of many subsystems with complex interactions. Linguists generally focus on just one subsystem at a time, yet the predictions of any particular analysis cannot be calculated independently of the interacting subsystems. With implemented grammars, the computer can track the effects of all aspects of the implementation while the linguist focuses on developing just one."

lexical entries, and templates.[42] As a recap, *shefa* 'try' is an exhaustive-control verb. Both *dasuan* 'intend' and *jueding* 'decide' are partial-control verbs; *jueding* 'decide' allows its embedded subject to be optionally expressed but *dasuan* 'intend' does not. *Xiangxin* 'believe' is a non-control verb and *yuanliang* 'forgive' is an object-control verb. Note that we have defined the if-then logical operation using a parametrised template and we have used the CAT predicate to help define relations involving the inverse correspondence $\phi^{-1}$. The epsilon e is used on XLE to designate an empty string, which will not be displayed in the c-structure.

B.1 *C-structural rules (XLE)*

```
IP --> (DP: (^ SUBJ)=!)
        I': ^=!.

I' --> {DP: ! $ (^DIS)
            @(PS_LDD-PATH);
        I': ^=!
       |(I)
        VP: ^=!
       }.

VP -->  V': ^=!.

V' -->  {PRT: ^=!;
         V':  ^=!
        |AdvP: !$(^ADJUNCT);
         V': ^=!
        |V: ^=!;
         (DP: (^OBJ)=!)
         ({IP: (^{XCOMP|COMP})=!
          |IP[-PS_LDD]: (^XCOMP)=!
          })
        }.
```

[42] Since the internal structure of Chinese noun phrases is not our focus, our computational grammar tends to simplify it. For example, *zhe-xiang* 'this-CL' is represented as one demonstrative in the c-structure.

```
IP[-PS_LDD] --> I'[-PS_LDD]: ^=!.

I'[-PS_LDD] --> (I)
                VP: ^=!.

DP --> {(D)
        AP*: ! $ (^ADJUNCT);
        N: ^=!;
       |AdvP: (^SPEC)=!;
        DP: ^=!
       }.
```

*(Parametrised) templates (XLE)* B.2

```
PS_LDD-PATH =(^({XCOMP:(->PS_LDD)=c+;
               |COMP:(->PS_LDD)=c+;}{XCOMP|COMP}*)OBJ)=!.

EC-SUBJ(P) = (^PRED) = 'P<(^SUBJ)(^XCOMP)>'
             (^SUBJ) = (^XCOMP SUBJ).

EC-OBJ(P) = (^PRED) = 'P<(^SUBJ)(^OBJ)(^XCOMP)>'
            (^OBJ) = (^XCOMP SUBJ).

PC-SUBJ(P) = (^PRED) = 'P<(^SUBJ)(^COMP)>'
             (^COMP SUBJ PRED) = 'PRO'
             (^SUBJ P_CONTROL) = CONTROLLER
             (^COMP SUBJ P_CONTROL) = CONTROLLEE.

PC-optional-SUBJ(P) = (^PRED) = 'P<(^SUBJ)(^COMP)>'
    @(IF @(CAT(^COMP SUBJ PRED) e) @PC-PS_LDD-optional).

PC-PS_LDD-optional =  @(PC-PS_LDD)
           (^COMP SUBJ PRED) = 'PRO'
           (^SUBJ P_CONTROL) = CONTROLLER
           (^COMP SUBJ P_CONTROL) = CONTROLLEE.

VCOMP(P) =  (^PRED) = 'P<(^SUBJ)(^COMP)>'.

IF(P Q) = {~P |~~P Q}.
```

```
EC-PS_LDD = (^XCOMP PS_LDD) = +
            @(CAT (^XCOMP) IP[-PS_LDD]).

PC-PS_LDD = (^COMP PS_LDD) = +.

OBJ-PS_LDD =(^{XCOMP|COMP} PS_LDD) = -.

NC-PS_LDD = (^COMP PS_LDD) = -.
```

### B.3 *Lexical entries (XLE)*

```
shefa V * @(EC-SUBJ try)
          @(EC-PS_LDD).

dasuan V * @(PC-SUBJ intend)
           @(PC-PS_LDD).

jueding V * @(PC-optional-SUBJ decide).

yuanliang  V * @(EC-OBJ forgive)
               @(OBJ-PS_LDD).

xiangxin V * @(VCOMP believe)
             @(NC-PS_LDD).
```

### B.4 *Test cases*

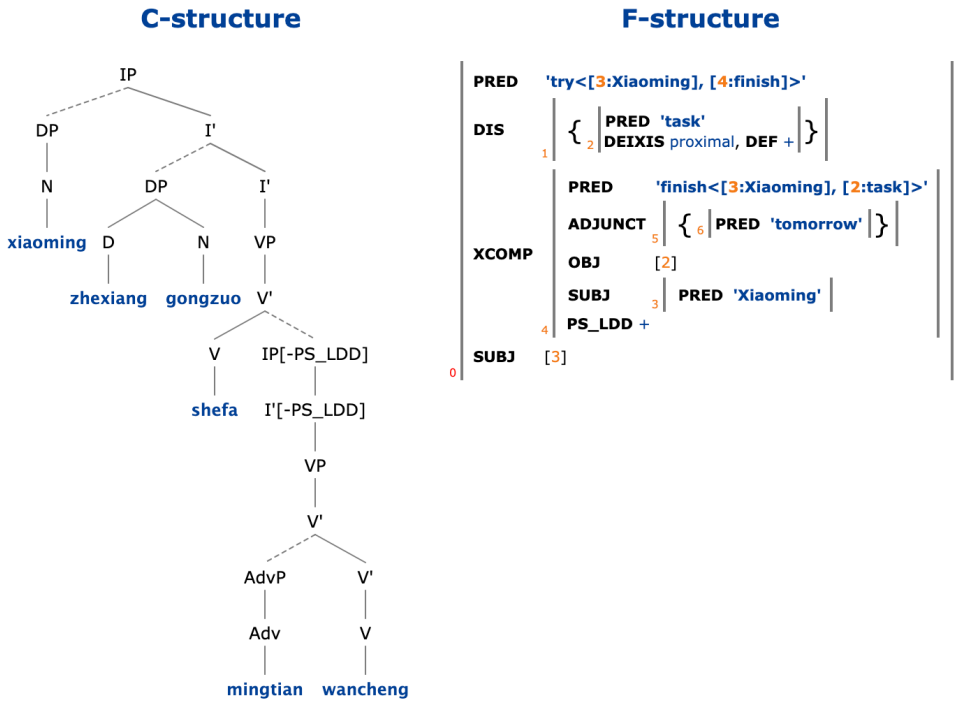
We now turn to the test suite, which contains a series of sentences fed to the computational grammar for constraint testing. All parsing results are in line with our predictions discussed in Section 7. In what follows, we will illustrate a set of test cases.[43] For brevity, we will only present inner topicalisation in this Appendix. The same results

[43] Our grammar fragment was loaded to the XLE-web interface developed at the University of Konstanz (`https://ling.sprachwiss.uni-konstanz.de/pages/xle/iness.html`), which is based on the XLE Web interface on INESS (Rosén *et al.* 2012).

have been obtained for focus fronting with regard to the position of the displaced phrase. We will also present some complex-embedding test cases.

**Test case 1: Exhaustive subject control with the inner topic crossing the control verb**

(1) xiaoming zhexiang gongzuo shefa mingtian wancheng
xiaoming this-CL task try tomorrow finish
'Xiaoming tries to finish this task tomorrow.'




**Test case 2: Exhaustive subject control with the inner topic residing in the complement clause**

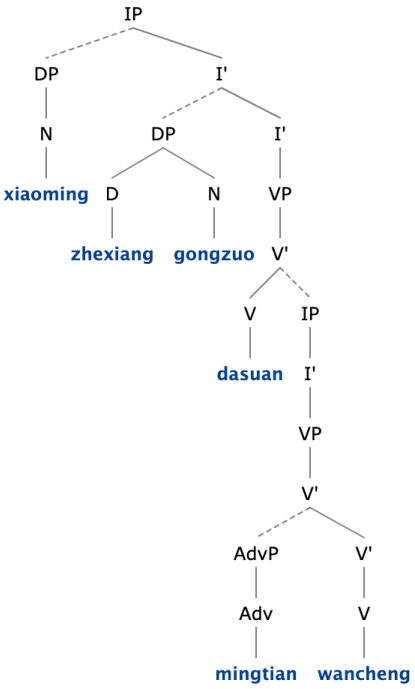
(2) xiaoming shefa zhe-xiang gongzuo mingtian wancheng
Xiaoming try this-CL task tomorrow finish
'Xiaoming tries to finish this task tomorrow.'

No formal solution could be produced by our grammar fragment for test case 2.

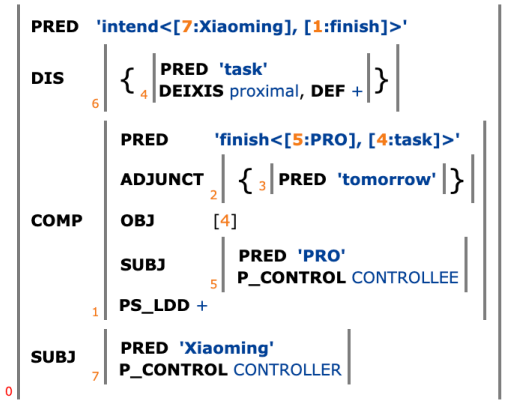
**Test cases 3–4: Partial subject control with the inner topic crossing the control verb (unexpressed embedded subj)**

(3) xiaoming zhe-xiang gongzuo dasuan mingtian wancheng
Xiaoming this-CL task intend tomorrow finish
'Xiaoming intends to finish this task tomorrow.'

**C-structure**

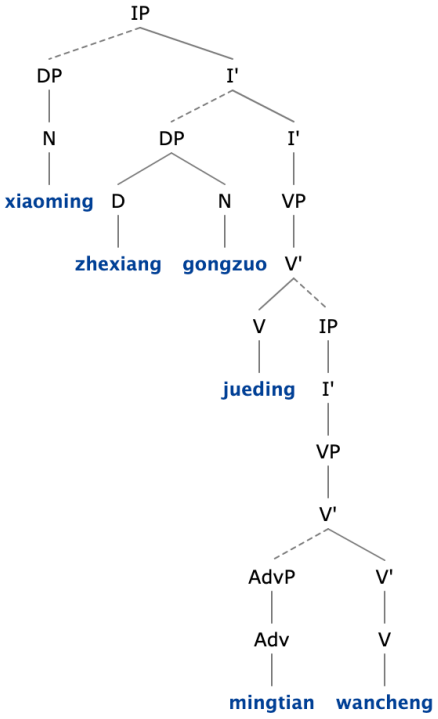



**F-structure**

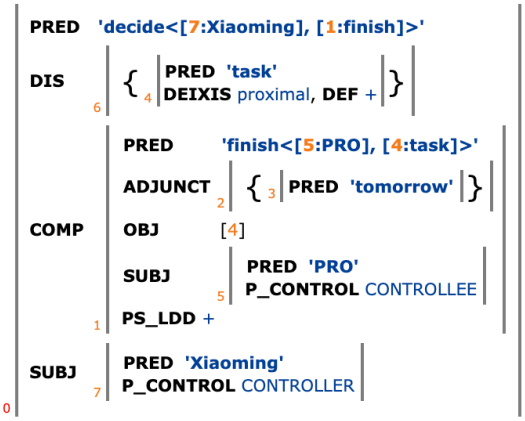


(4) xiaoming zhe-xiang gongzuo jueding mingtian wancheng
Xiaoming this-CL task decide tomorrow finish
'Xiaoming decides to finish this task tomorrow.'

**C-structure**



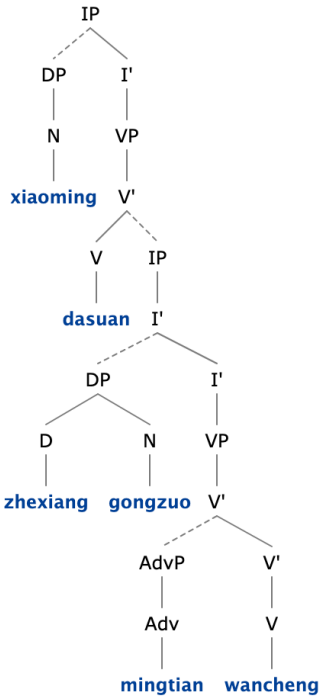

**F-structure**



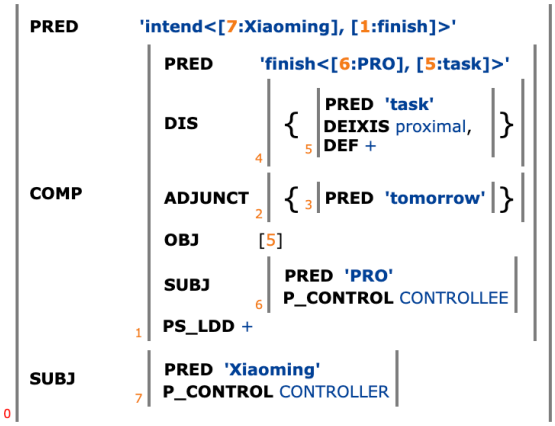
**Test cases 5–6: Partial subject control with the inner topic residing in the complement clause (unexpressed embedded subject)**

(5) xiaoming dasuan zhe-xiang gongzuo mingtian wancheng
Xiaoming intend this-CL task tomorrow finish
'Xiaoming intends to finish this task tomorrow.'

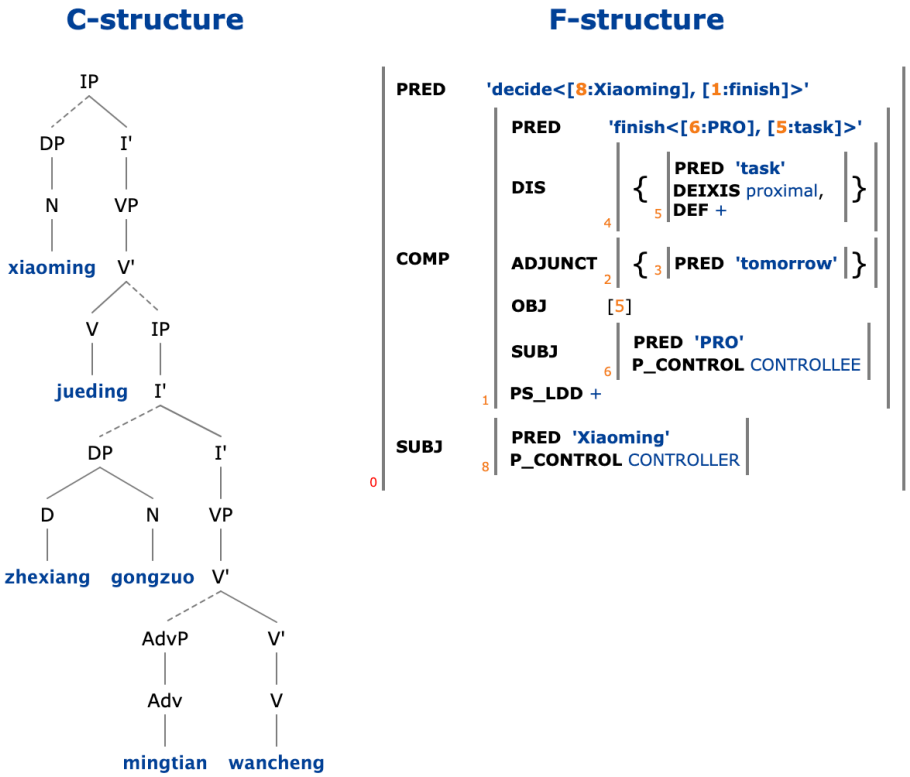
**C-structure**




**F-structure**



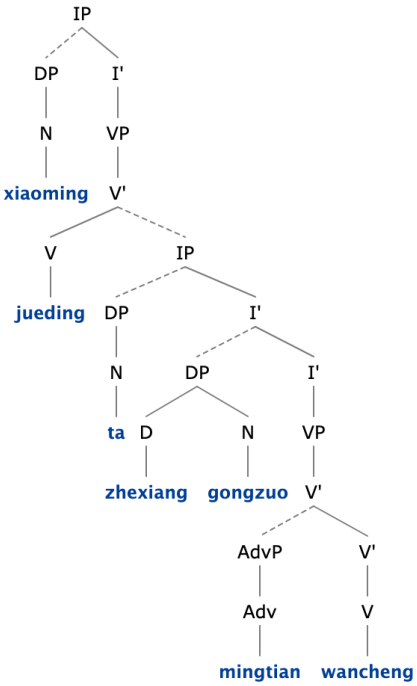
(6) xiaoming jueding zhe-xiang gongzuo mingtian wancheng
Xiaoming decide this-CL task tomorrow finish
'Xiaoming decides to finish this task tomorrow.'



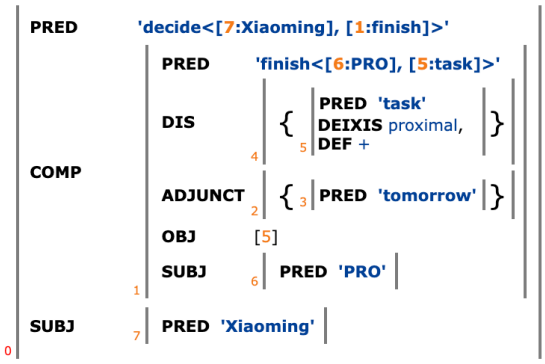

**Test case 7: Partial subject control with the inner topic residing in the complement clause (expressed embedded subject)**

(7) xiaoming jueding ta zhe-xiang gongzuo mingtian
Xiaoming decide 3SG this-CL task tomorrow
wancheng
finish
'Xiaoming decides that he will finish this task tomorrow.'

**C-structure**




**F-structure**



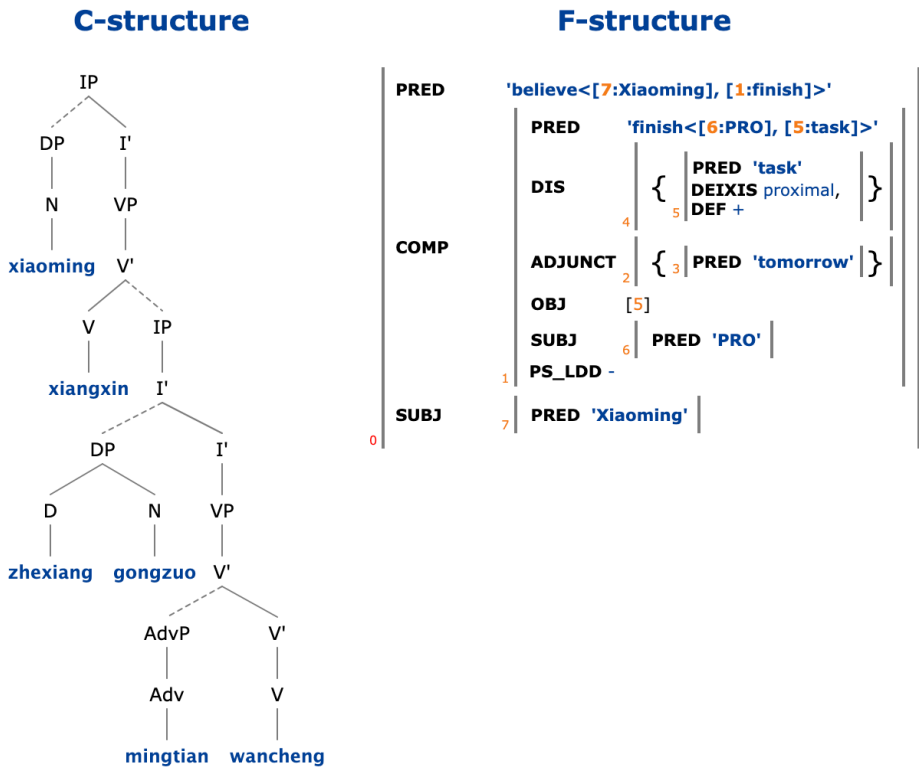

**Test case 8: Partial subject control with the inner topic crossing control verb (expressed embedded subject)**

(8) xiaoming zhe-xiang gongzuo ta jueding mingtian wancheng
Xiaoming this-CL task 3SG decide tomorrow finish
'Xiaoming decides that he will finish this task tomorrow.'

No formal solution could be produced.

**Test case 9: Non-control verb with the inner topic residing in the complement clause**

(9) xiaoming xiangxin zhe-xiang gongzuo mingtian wancheng
Xiaoming believe this-CL task tomorrow finish
'Xiaoming believes that (he) will finish this task tomorrow.'




**Test case 10: Non-control verb with the inner topic crossing the non-control verb**

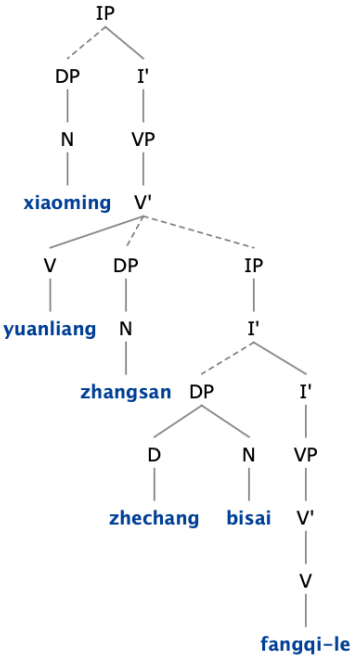
(10) xiaoming zhe-xiang gongzuo xiangxin mingtian wancheng
Xiaoming this-CL task believe tomorrow finish
'Xiaoming believes that (he) will finish this task tomorrow.'

No formal solution could be produced.

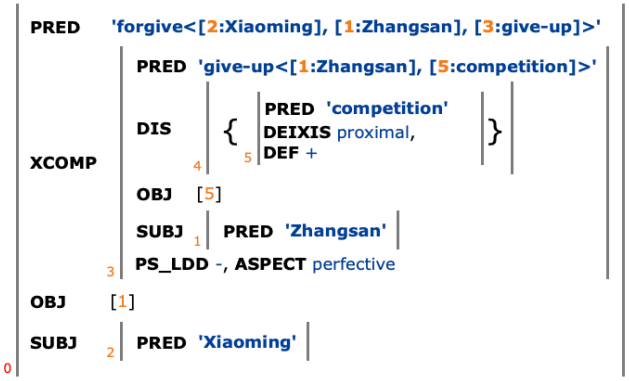
**Test case 11: Object-control verb with the inner topic residing in the complement clause**

(11) xiaoming yuanliang zhangsan zhe-chang bisai
Xiaoming forgive Zhangsan this-CL competition
fangqi-le
give.up-PFV
'Xiaoming forgives Zhangsan for giving up this competition.'

**C-structure**




**F-structure**



**Test case 12: Object-control verb with the inner topic crossing the object-control verb**

(12) xiaoming zhe-chang bisai yuanliang zhangsan
Xiaoming this-CL competition forgive Zhangsan
fangqi-le
give.up-PFV
'Xiaoming forgives Zhangsan for giving up this competition.'

No formal solution could be produced to characterise *zhe-chang bisai* 'this competition' as the displaced object of *fangqi-le* 'give.up-PFV'.

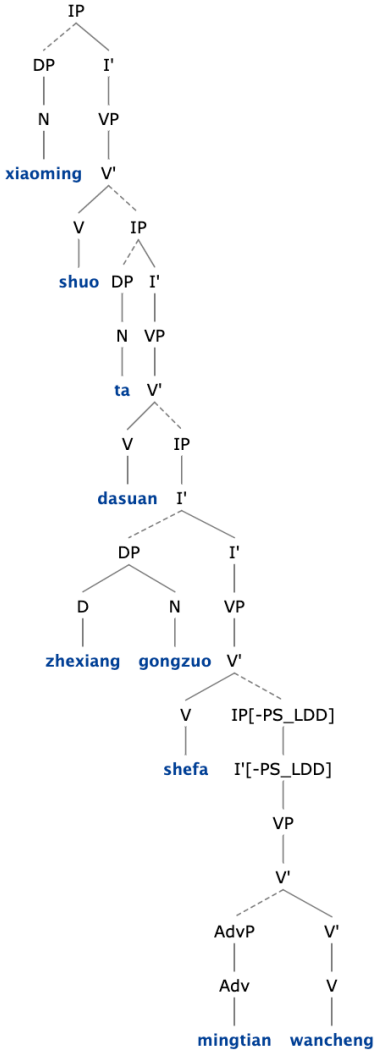
**Test cases 13–16: Complex embedding**

(13) xiaoming shuo ta dasuan shefa zhe-xiang gongzuo
Xiaoming say 3SG intend try this-CL task
mingtian wancheng
tomorrow finish
'Xiaoming says he intends to try to finish this task tomorrow.'

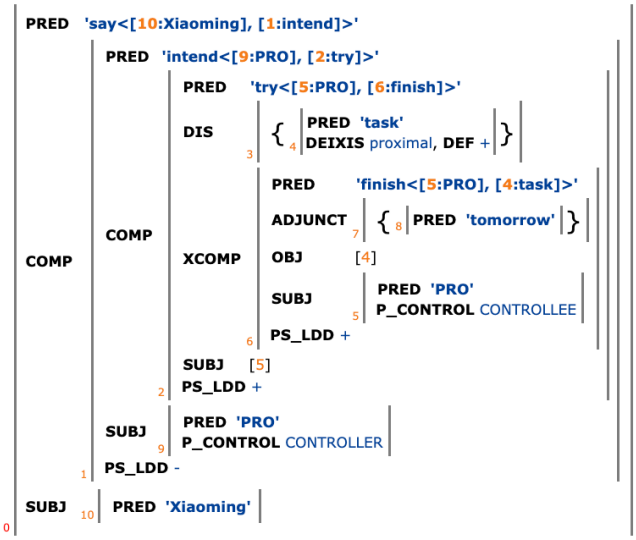
No formal solution could be produced.

(14) xiaoming shuo ta dasuan zhe-xiang gongzuo shefa
Xiaoming say 3SG intend this-CL task try
mingtian wancheng
tomorrow finish
'Xiaoming says he intends to try to finish this task tomorrow.'

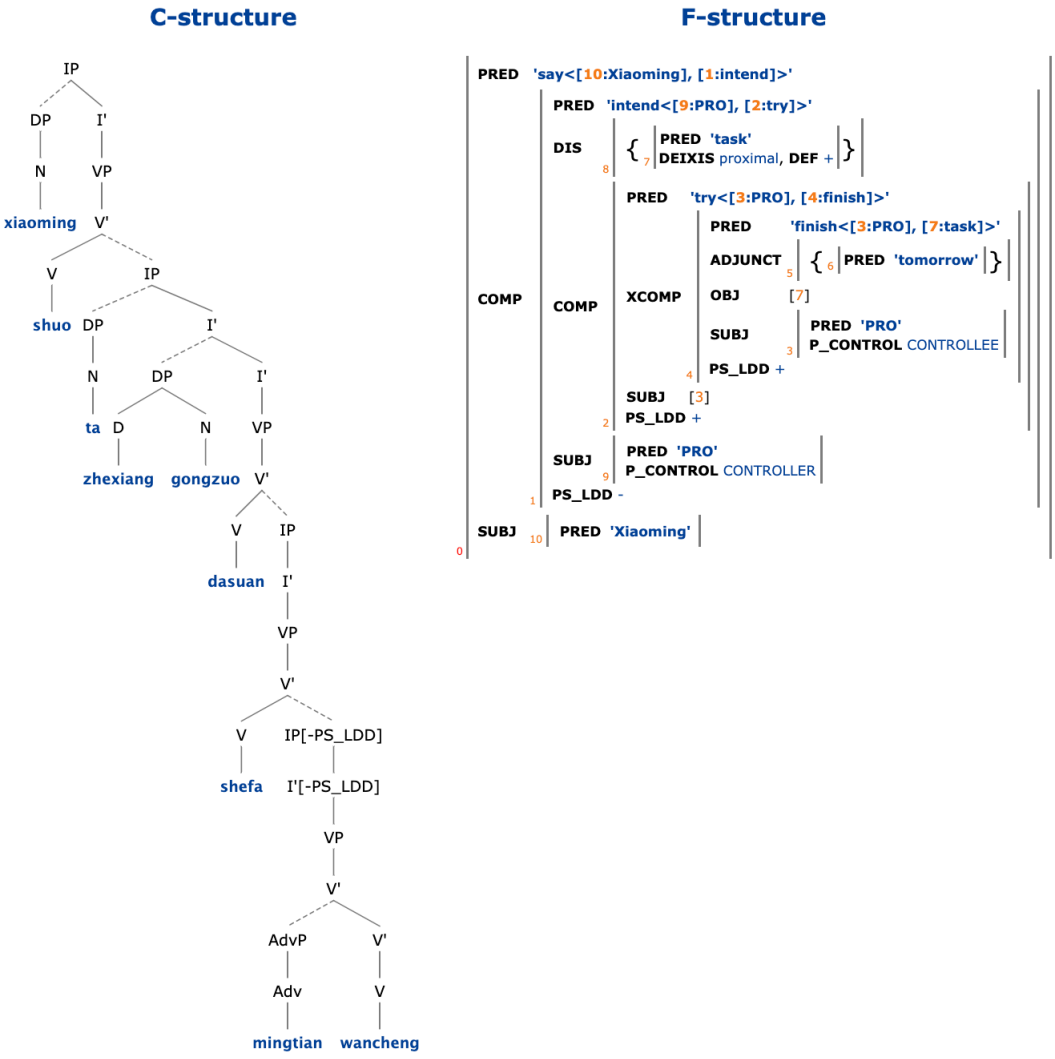
**C-structure**




**F-structure**




(15) xiaoming shuo ta zhe-xiang gongzuo dasuan shefa
Xiaoming say 3SG this-CL task intend try
mingtian wancheng
tomorrow finish
'Xiaoming says he intends to try to finish this task tomorrow.'




(16) xiaoming zhe-xiang gongzuo shuo ta dasuan shefa
Xiaoming this-CL task say 3SG intend try
mingtian wancheng
tomorrow finish
'Xiaoming says he intends to try to finish this task tomorrow.'

No formal solution could be produced.

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